

TRAFFIC SIGNALIZATION QUALITY MEASUREMENTS – PRACTICE IN CROATIA

Traffic signalization represents a visual guideline in traffic and affects the behaviour of all participants. Regarding road traffic, the impact of direct information comes into play more than in other traffic modes due to the large number of participants and intensity of traffic flow. Quality, design and implementation of traffic signalization have significant impact on the overall transport network flow, safety enhancement and behaviour of all traffic participants.

In Croatia, for more than ten years, the **Department for Traffic Signalization** at the Faculty of Transport and Traffic Sciences, University of Zagreb, provides detailed traffic signalization measurements. The Department's main focus is measuring the retroreflectivity of road markings and traffic signs on Croatian state and county roads as well as on highways.

Road marking retroreflection measurements are performed by dynamic and static methods. For dynamic measurements the Department uses **Zehntner's ZDR 6020 Dynamic Retroreflectometer** (Fig. 1.) which measures the night visibility R_L (retroreflection) of road markings on a complete road network at speeds up to 130 km/h. The measuring head ZDR 6020 has a measuring area of 50 x 100 cm. The road marking within the measuring area is measured continuously and the average value is displayed for every 25, 50 or 100 meters depending on the predefined settings. With a variety of settings regarding different measurement intervals, the Department can effectively adapt to different customer requirements.

As Croatia is a relatively small country with a land surface of 56.594 km², the road network is also relatively small with 1.570,10 km of highways, 6.584,60 km of state roads, and 18.752,70 km of other county and local roads. Since 2010 the retroreflection of markings on Croatian state roads has been continuously measured and a total of 64.972,00 km of road markings on the state roads have been successfully evaluated by the Department. Apart from state roads, the Department has also measured 10.434,50 km of road markings on Croatian highways.



Figure 1. Department's measuring vehicle with Zehntner ZDR 6020 Retroreflectometer

Besides dynamic, the Department also takes static measurements, using **Zehntner's ZRM 6013 and ZRM 6014** handheld **Retroreflectometers** (Fig. 2.). Most static measurements are ordered by contractors for the application of road markings in need for the verification of their work.



Figure 2. Handheld Retroreflectometer Zehntner ZRM 6014

The retroreflection of traffic signs is measured using **Zehntner's ZRS 6060** handheld retroreflectometer (Fig. 3.). These devices use LED lighting, providing a 3.5" high-resolution adjustable colour touch screen and can be used for all types and colours of retroreflective material. Measurements and the corresponding GPS coordinates are stored automatically and can be evaluated with the included mapping and data analysis software "MappingTools".

Using this retroreflectometer, the Department for Traffic Signalization has measured more than 137.321 traffic signs on several Croatian state roads in different counties so far.



Figure 3. Zehntner's ZRS 6060 Retroreflectometer for traffic sign retroreflection measurements

The department has developed the online-based application "Retroreflection" for providing a great measuring results overview combining the dynamic retroreflection measurement of road markings and the handheld measurements of traffic signs. The "Retroreflection" application enables interactive and

detailed review of measuring data. The application is divided in two fields: road markings and traffic signs; each related to the type of traffic signalization.

The road markings model includes a digital map of the measured road which displays colour coded retroreflection interval. Retroreflection interval can be set on 25 m, 50 m and 100 m in length and represents average retroreflection value of measured interval. Also, pictures or a video recording of a specific road marking measurement section respectively is shown below the map (Fig. 4).

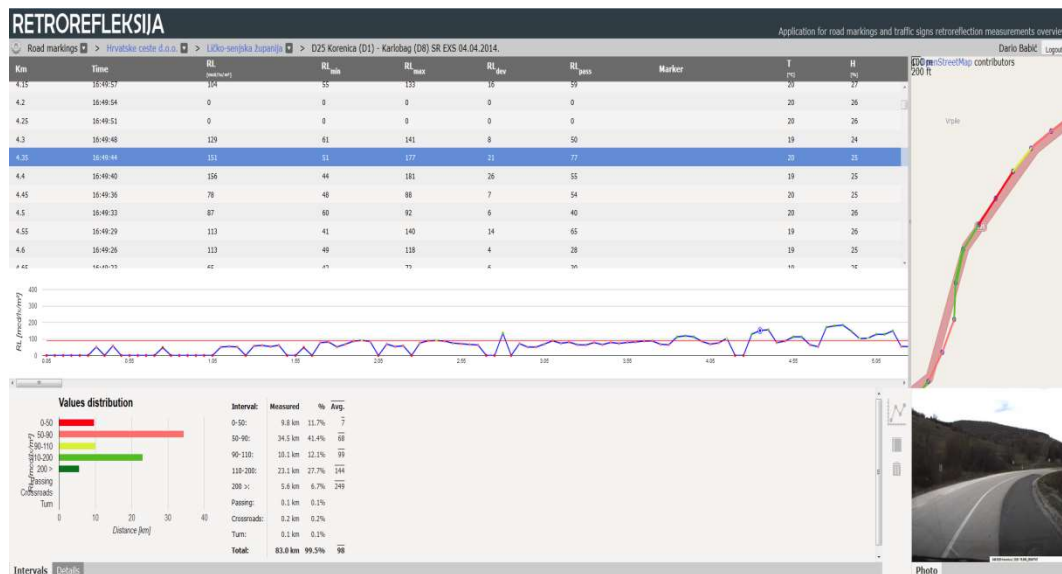


Figure 4. Detailed road marking measurements overview

Similar to the road markings the traffic signs model allows road authorities to overview traffic signs retroreflection and several technical characteristics. Also, every measurement represents a data base of traffic signs on specific roads (Fig. 5).

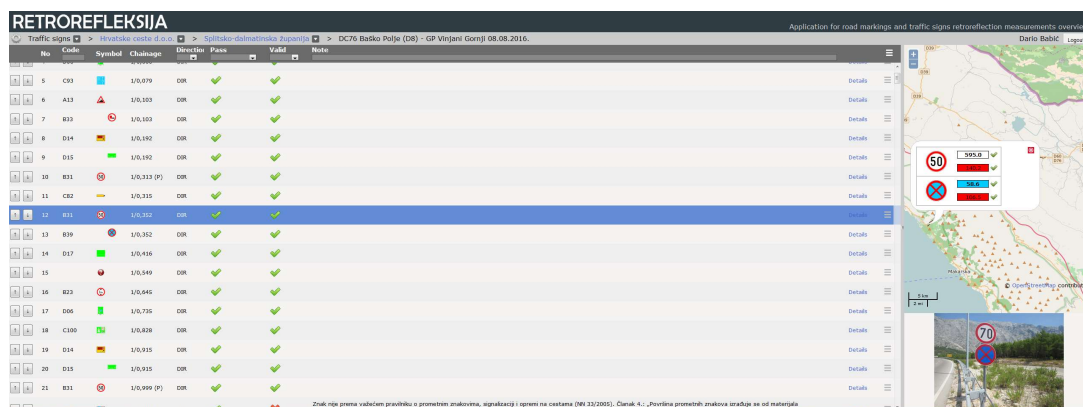


Figure 5. Detailed traffic sign measurements overview

All measurements taken by Department are uploaded to the “Retroreflection” application to the corresponding field after the measurement. With this, road authorities can easily and systematically see what has been measured, including a detailed measurement overview which can help them in optimizing the maintenance process.

To conclude, the main advantages of the newly developed “Retroreflection” application are:

- on-line review of the results on an interactive map, completed with an automatic report
- easier and faster data entry and delivery to end user
- elimination of CDs or DVDs that have been used as a medium for the results delivery
- detailed statistical data analysis on various predefined parameters
- optimization of maintenance process
- review of critical places
- cost reduction
- prioritization of maintenance etc.

Furthermore the Department uses several other **Zehntner** products for quality checking and testing road markings as: **ZRM 1021** for field test of the luminance factor β , **ZMM 5000** for the rapid determination of the road markings dry film thickness and the **ZMK 5050** testing kit for all other quality related testing of road markings. Mentioned instruments are mostly used for contractor’s control before and during the application of markings.

From all above it is important to understand that road markings and traffic signs are investment both economic and social. However, using the services of the Department, you can achieve that money is only spent in areas where it is necessary to improve the quality of the road infrastructure to meet the necessary safety targets.

Please contact us to get a quote for providing any of the above mentioned services. Further information is available at <http://www.fpz.unizg.hr>.

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