



ROAD MARKINGS INCREASE DRIVER COMFORT AND SAFETY DURING NIGHT

RAINVISION

WP 5 – Recommendation Handbook

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Purpose of the Recommendation Handbook

It represents the final work of the Rainvision Project and aims to inform the reader about the results and research findings of the project.

Those guidelines should provide the scientific background for specifiers and regulators to choose from the available performance classes in the European Norm EN 1436.

The focus of the Rainvision project is on wet-reflectivity performance, relevant for nighttime driving in wet or rainy conditions. The guidelines also take into account the general visibility performance for both daytime and nighttime driving referring to the 'state of the art' in pavement marking design.

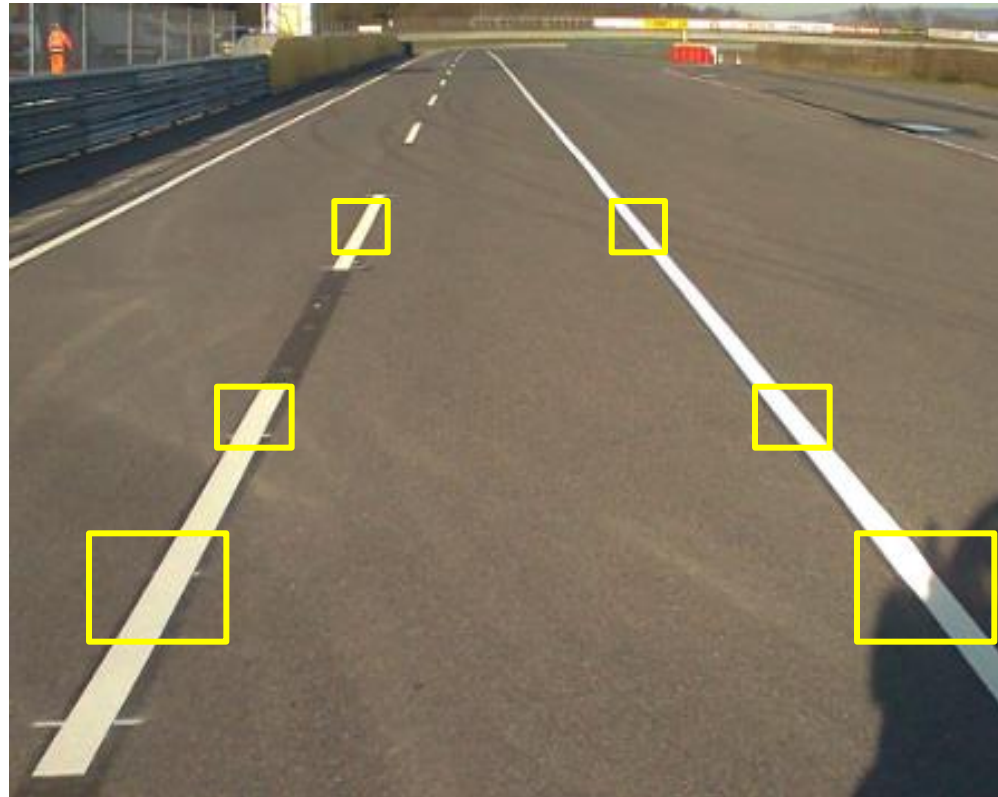
Daytime Visibility



- Rainvision focus on the nighttime visibility of pavement marking during rain
 > Only limited findings for daytime visibility
- Daytime visibility at the Q_d performance class Q4 in Work package 4 (Road Trials)
- Results WP 4 indicate that renewed pavement markings did not lead to higher vehicle speeds.
- Class Q4 corresponds to the recommendation in Cost 331 for lighter surfaces

Daytime Visibility and Driver Assistance

- Daytime Visibility relevant for effective operation of Lane Departure Warning Systems 'LDWS'
- LDWS typically with windscreen camera technology reading the contrast between the markings and the surrounding road surface
- Camera focus is fairly close to the vehicle > less relevance of the retroreflective properties



Nighttime Visibility (dry)



- The conclusion of the WP 4 Road Trial experiment was that the improved road markings do not lead to higher speeds. This is important to note, as the speed effect on the test track was not observed in real traffic.
- Based on the 'state of the art' it is recommended to introduce a minimum maintained performance level of the coefficient of retroreflected luminance R_L of Class R3 (minimum 150 cd/m² lx) in dry condition for pavement markings in use.

Nighttime Visibility during rain

WP3
Track Test



Figure 1. Marking material I, without additional wet reflectivity (picture shows wet track)

Nighttime Visibility during rain

WP3
Track Test



Figure 2. Marking material II, with additional wet reflectivity (picture shows wet track)

EN 1436 Test method for 'wet-reflectivity' Class RW

'Bucket-Method'

'Recovery Method'

60 seconds flow-out



EN 1436 Test method for 'rain-reflectivity' Class RR



- Complex setup to measure rain-reflectivity
- Only some reflectometers with 'external beam'

- No standard equipment to produce continuous rain
- Rain drops or spray/mist ?



Research findings ,Highways for Life‘ 2008

- In wet recovery, all three prototype marking systems and the wet-reflective tape sustained 60-80 percent of their dry average detection distances, and in rain, they sustained 50-70 percent of their dry average detection distances.
- The conventional glass beads-on-paint benchmark system dropped to 28 percent (wet recovery) and 17 percent (continuous rain) of the dry detection distance.

‘wet-reflectivity’ vs. ‘rain-reflectivity’

EN 1436 Class RR: 20 mm/hr

- 6 Type I markings
- 9 Type II markings (structured)
- 3 High Index markings (rain-reflective)

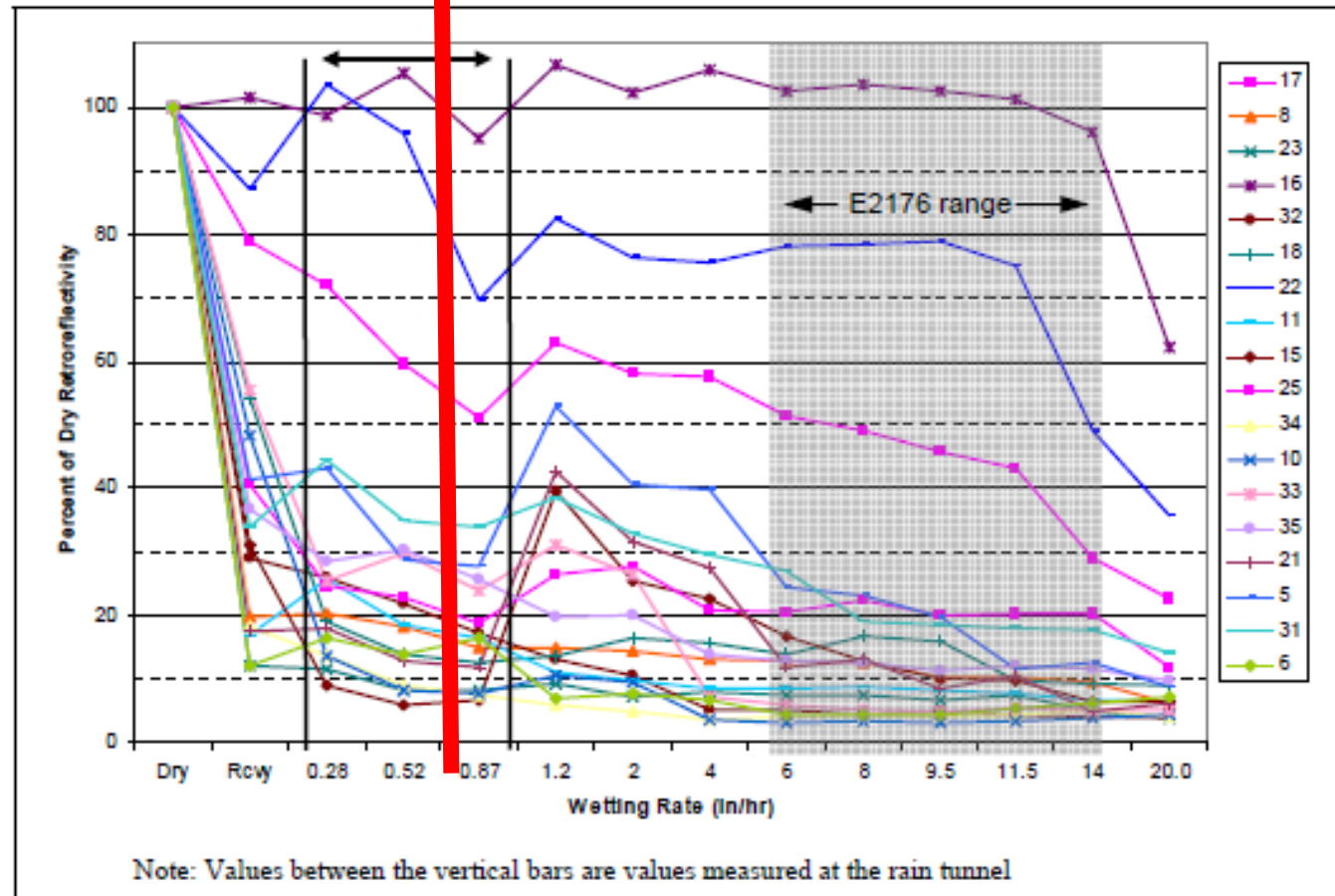


Figure 9. Retroreflectivity Retention as Percentage of Dry.

Evaluation of Wet-Weather and Contrast Pavement Marking Materials and Applications

•URL: <http://tti.tamu.edu/documents/0-5008-2.pdf>

Nighttime Visibility during rain



Common structured Type II markings show significant differences between wet-reflectivity and rain-reflectivity performance



Rainvision...not ,wet vision'

Nighttime Visibility during rain

- Enhanced wet reflective pavement markings show positive effects on visibility, driving comfort and safety (Rainvision WP2, WP3 and WP4)
- minimum performance level of the coefficient of retroreflected luminance R_L during the condition of rain of Class RR2 (minimum 35 cd/m² lx) (for pavement markings in use)
- Alternatively R_L during the condition of wetness of Class RW3 (minimum 50 cd/m² lx) should be applied



THANK YOU!

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