

Road Markings: An essential contributor to Road Safety

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Road markings : one of the most cost-effective safety solutions

BUT

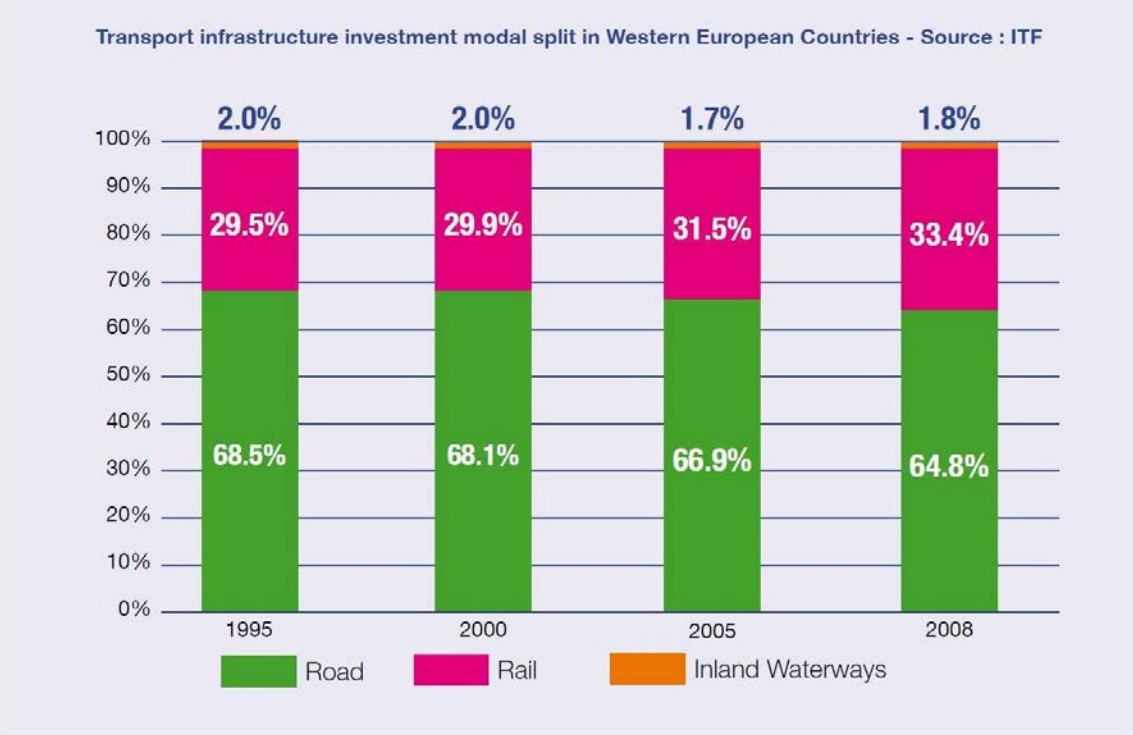
- **Fiscal pressure on state budgets**
- **More focus on vehicle and driver's behaviour**
- **Declining quality of road markings**
- **Impact on safety and economy**



Some critical issues

Declining investments into roads

Confirmed by the EC DG Move White Paper for Transport 2020-2050



Poor investments into roads

COURT OF AUDITORS REPORT 2011 GERMANY (Schleswig-Holstein)

- **Expenditures in road markings : ineffective**
- **Reasons: choice of marking types in tenders**
 - **Low performing paint (>75% of the cases)**
 - **Markings invisible in rainy conditions (85% of the cases)**

Declining quality of road markings

2012 VTI SURVEY (Sweden)

- **Percentage of road markings fulfilling requirement:**
 - **Less than 50 %** of markings for dry road markings
 - **21%** of markings for wet-road markings

Road markings not replaced as needed

2012 RSMA extensive survey / 7250 km of roads
(England, Scotland and Wales)

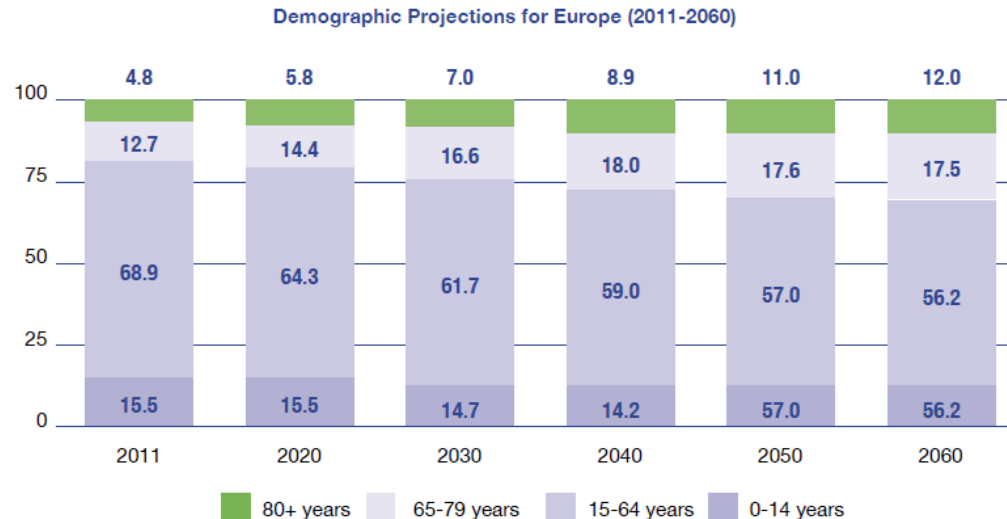
CONCLUSIONS

- Immediate replacement required on:
 - **40% markings** on Scotland motorways and dual carriageways
 - **40% markings** on dual carriageways in Wales

- Immediate or scheduled repair required on:
 - **38% markings** on dual carriageways maintained by HA in England
 - **25% markings** on HA single carriageway (**19%** scheduled)

Ageing Population in Europe

- Growing part of the population
- More mobile
- Reduced vision capacities / Longer reaction times
- Specific requirements for better quality markings



Source: Eurostat

A Road that a car cannot read

- Lane departure Warning Systems can provide significant benefits... if the markings are visible



SOLUTIONS EXIST

Case studies

Case Study – Cheshire County Council (2007)

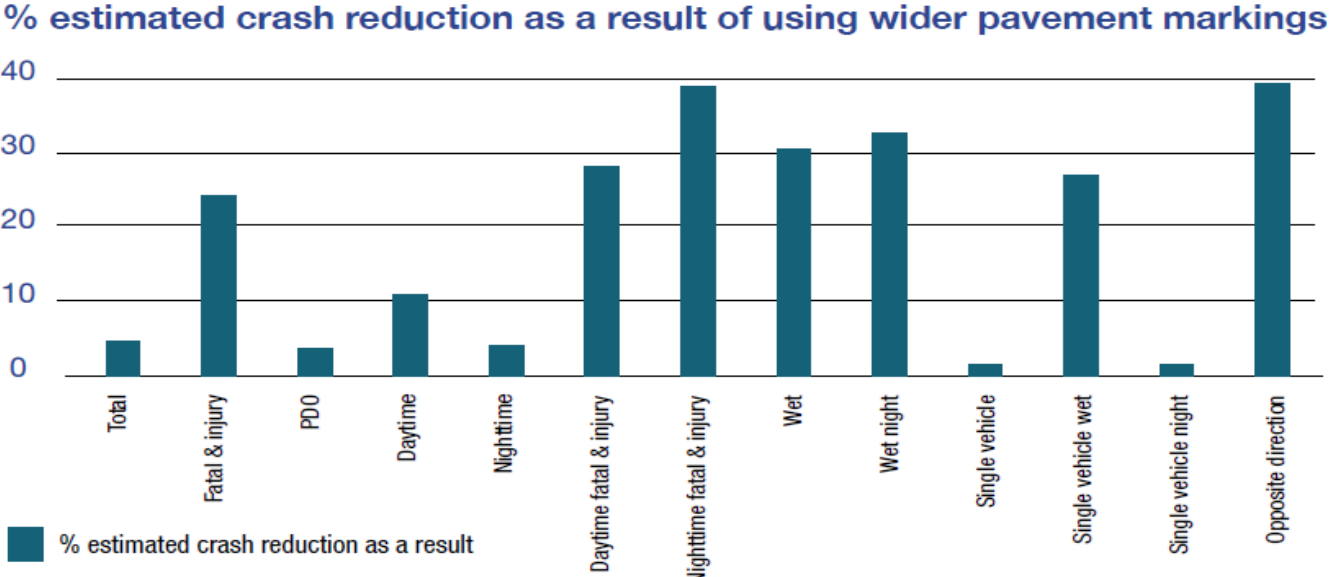
- Highway section (A556)
- 16 personal injuries during the 3 previous years
- Estimated societal cost: 1,4 M £
- Application of wet-night visible road markings

Accidents before and after application of wet-night visible product

Status	Total Accidents	Serious accidents	Slight accidents	Wet-Dark accidents
Before treatment	16	2	14	4
After treatment	6	0	6	0

Case Study – Michigan (2006)

- Study to assess benefit of wider road markings
- Before (2001 – 2003) / after (2005 – 2006) analysis



RainVision

- EU funded project (2013 -2015)
- Driver impact study to understand the effectiveness of reflective road markings : Dry – Wet – Rain
- One step further than COST 331.
- Compare Age and Gender

- Consortium :
 - ERF European Union Road Federation
 - 3M Germany (Lab)
 - Aximum France (Develter Driver Simulator)
 - Test & Training Austria (Track Test)
 - Road Safety Marking Association (RSMA) UK (Road Tests)

RainVision



Milestones :

- **Driver Simulator : Establish wet-night visibility levels with significant impact on driving behaviour (age and gender)**
- **Test Track : Reproduce the findings towards towards real-life situations**
- **Improve high accident areas using different road markings – monitor speed and incidents.**

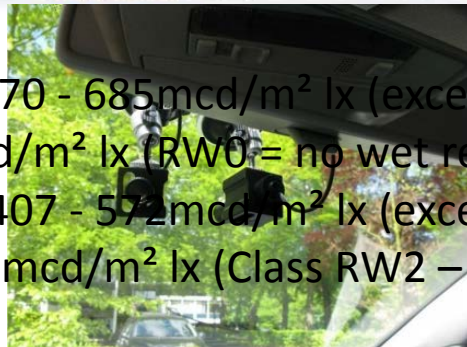
Age group	20-40 years		41-60 years		61 years and over	
	male	female	male	female	male	female
n=88 (90)	17 (15)	15 (15)	15 (15)	16 (15)	15 (15)	10 (15)

	Condition		
	baseline	marking material I	marking material II
Group A	test day 1	test day 2	test day 3
Group B	test day 3	test day 1	test day 2

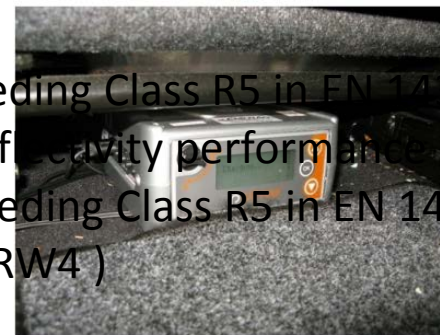
RainVision : Test Track



MMI = RL (dry) 570 - 685mcd/m² lx (exceeding Class R5 in EN 1436)
 RL(wet) 3 - 12mcd/m² lx (RW0 = no wet reflectivity performance according to EN 1436)
 MMII = RL (dry) 407 - 572mcd/m² lx (exceeding Class R5 in EN 1436)
 RL (wet) 43 - 112mcd/m² lx (Class RW2 – RW4)



Cameras – e.g. behind rear mirror



Data logger (pdrive) - under seat

RainVision : Test Track

The screenshot displays the RainVision software interface for analyzing a test track. The interface is divided into several panels:

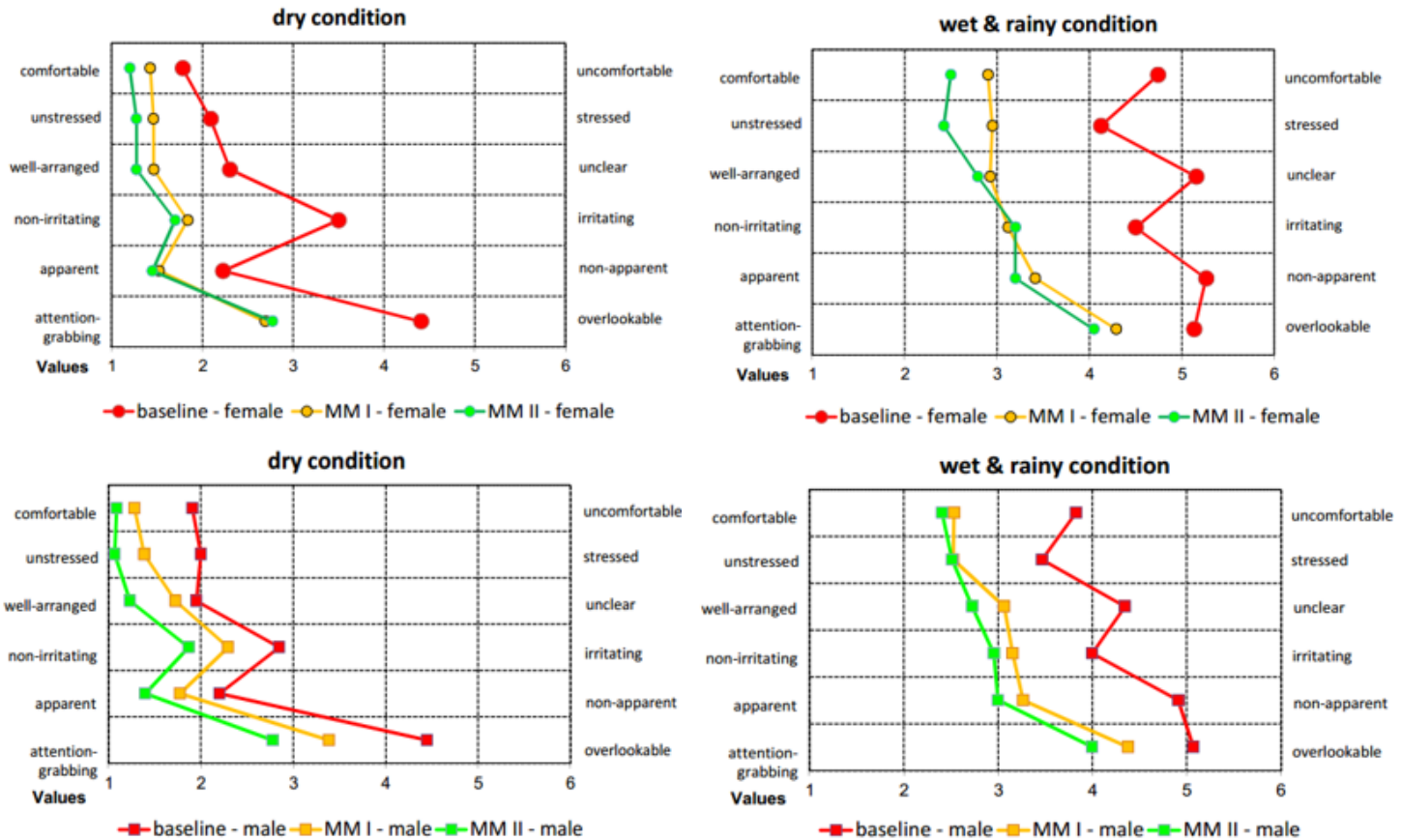
- Track Map View:** Shows a top-down view of the track layout with a red arrow indicating the current position and direction of the vehicle.
- Camera View:** Provides a first-person perspective from the driver's seat, showing the road ahead, a steering wheel, and a dashboard.
- Summary Statistics:** A table of key performance indicators for the selected area.
- Bar Chart:** A line graph showing a specific metric over time.
- XY Graph (top):** A line graph showing two data series (black and red) over time.
- XY Graph (bottom):** Another line graph showing two data series (black and red) over time.
- Real time play back controls:** Includes a play button and a time display of 10.50.
- Lap And Sector Times:** A table showing lap and sector times for the current run.
- Values Table:** A table of detailed performance metrics.

Parameter	Value
Maximum of long axis (G)	0.9422
Minimum of long axis (G)	-0.4271
Maximum of lat axis (G)	0.8341
Minimum of lat axis (G)	-1.2128
Maximum of distance (km)	1.6340
Maximum of speed (km/h)	108.10
Minimum of vector angle (°)	0.3808
Maximum of vector angle (°)	1.8322

Best	Run	Sector 1	Sector 2
28.55	0.50	28.55	0.50
28.55	28.55		
0.50	0.50		

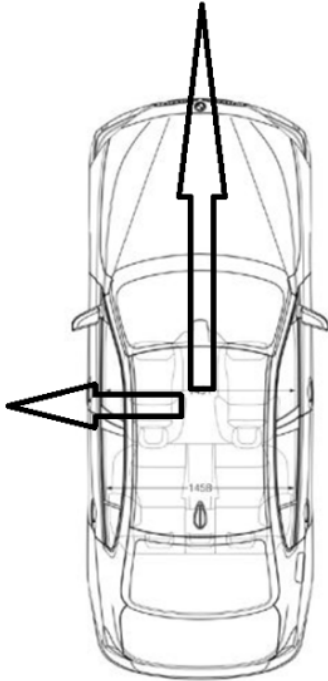
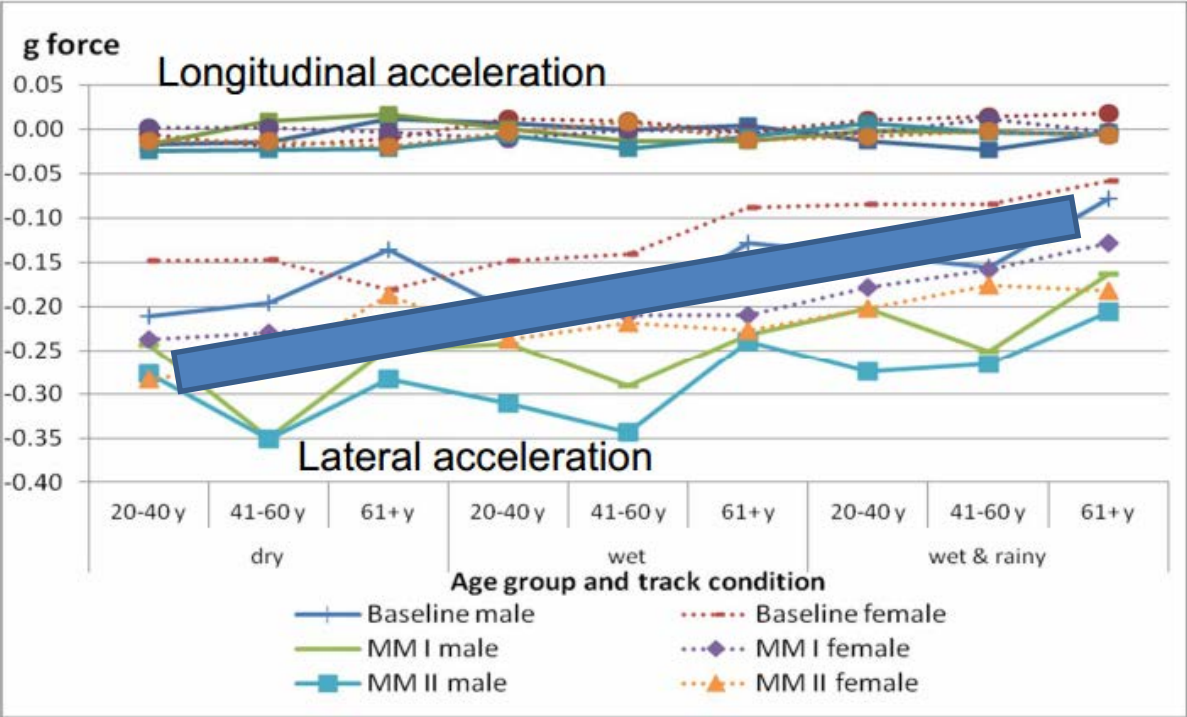
Parameter	Value
time (s)	10.5200
avg speed (km/h)	0.317468
lat axis (G)	0.02166
vector angle (°)	0.37874
speed (km/h)	12.8623
distance (km)	0.02228

RainVision : Test Track : Experience

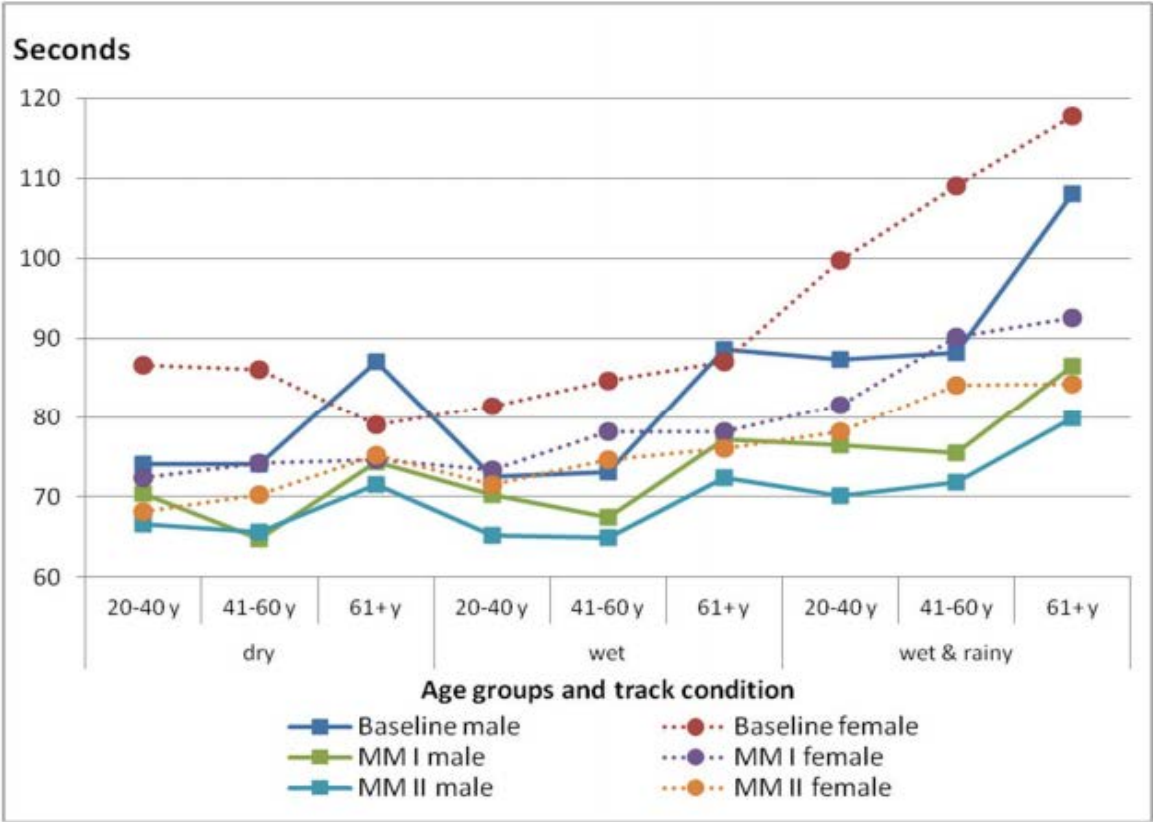


RainVision : Test Track : Behaviour

Left turn



RainVision : Test Track : Speed



Up to 30% faster but still save speed.

Less differences by age group or gender.

RainVision : Overall Conclusions

- **« MM II » Markings generally preferred by all drivers**
- **Better « wet-night visibility » assists all drivers and does not cause « unsafe » driving and speeding.**
- **All age groups benefit, especially elder drivers.**

- **Better visibility of the road network promotes more comfort and road safety.**
- **Technology exists – European Norms (EN1436) can be used to implement it today.**

ERF Position Paper on Road Markings

THE ERF CALLS FOR:

- Establishing a minimum intervention and maintenance level for RM in EU
- Applying good road markings, i.e.:
 - Marking visible at all times
 - For both the driver and the intelligent vehicle
 - Irrespective of :
 - light conditions (day / night)
 - weather conditions (dry / wet / wet-rainy)
 - Driver's age (young > < old)

ERF Position Paper on Road Markings

THE ERF PROPOSAL:

- Minimum intervention and maintenance policies
- Guarantee of visible horizontal signage all year round
- Minimum marking width: **150 mm**
- Minimum Performance under dry conditions: **150 mcd/lux/m²**
- Minimum performance under wet conditions: **35 mcd/lux/m²**

ERF Position Paper on Road Markings

MARKING THE WAY TOWARDS

A SAFER FUTURE

AN ERF POSITION PAPER ON HOW ROAD MARKINGS CAN MAKE OUR ROAD SAFER

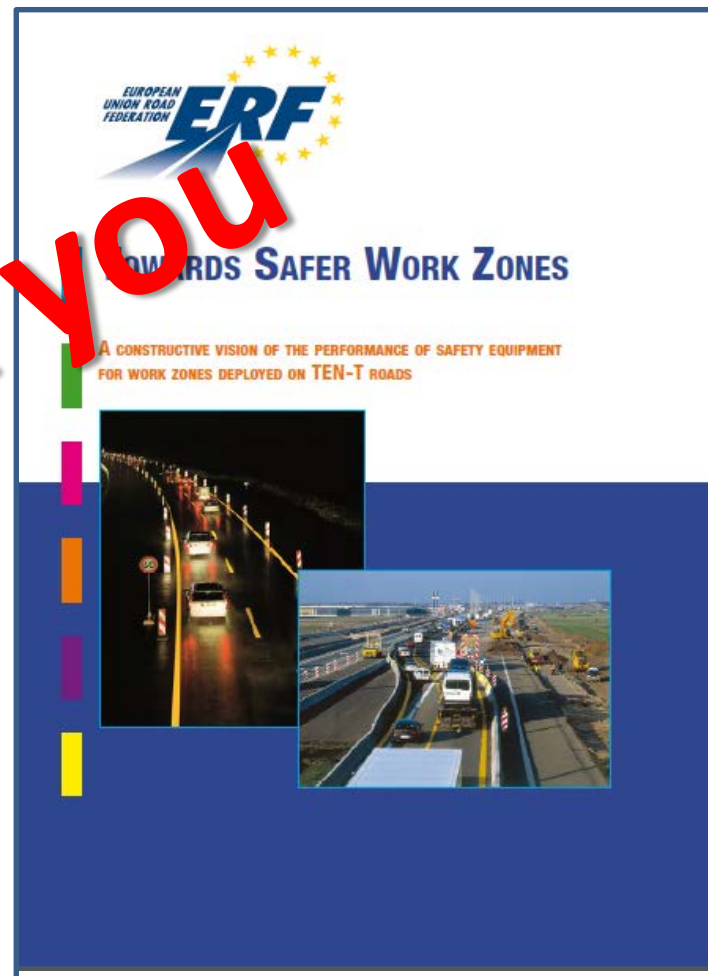



http://www.erf.be/images/ERF_Paper_on_Road_Markings_Released.pdf



Available in English, German, French & Italian




Improved Signage for Better Roads
An ERF Position Paper towards improving Traffic Signs in European Roads




TOWARDS SAFER WORK ZONES
A CONSTRUCTIVE VISION OF THE PERFORMANCE OF SAFETY EQUIPMENT FOR WORK ZONES DEPLOYED ON TEN-T ROADS



Thank you