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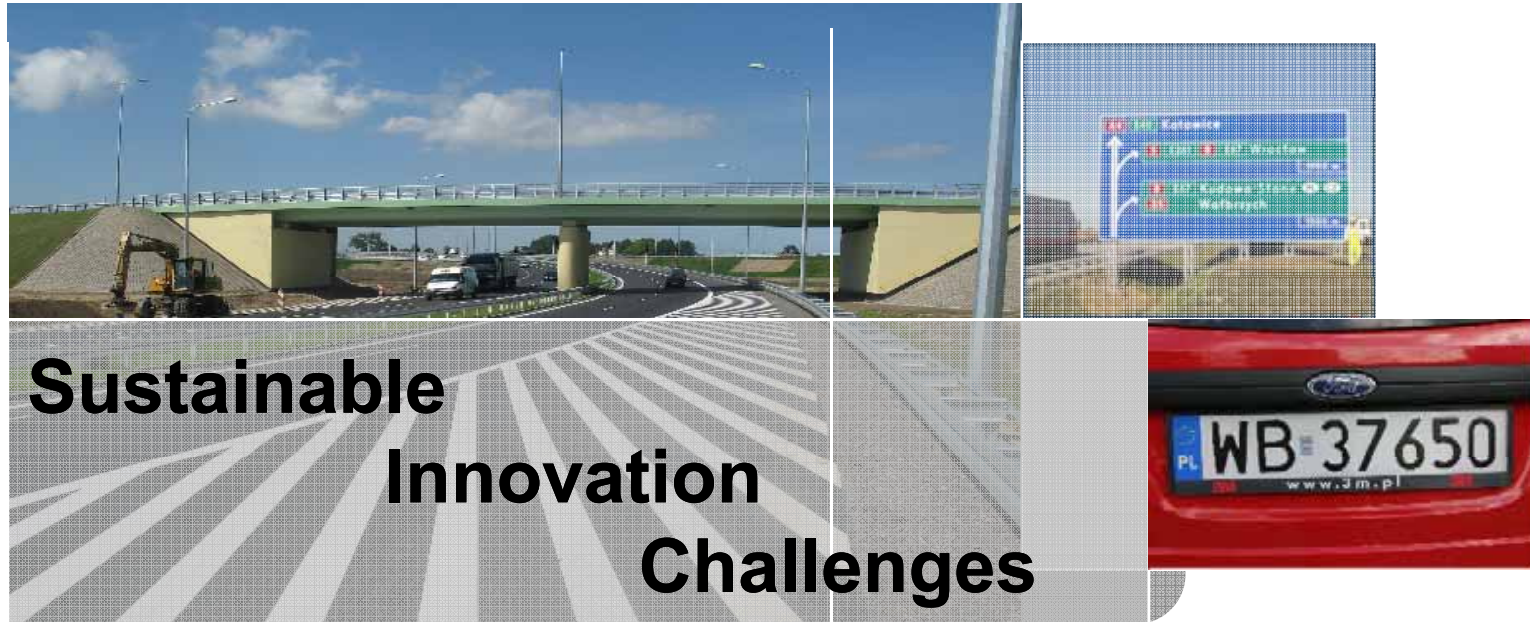
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Seminarium

GAMBIT
2008

Safe Road Infrastructure



**Sustainable
Innovation
Challenges**

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3M Europe

Traffic Safety Systems





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Responsibilities of Authorities

- Improve or maintain mobility
- Road safety : reduce accidents
- Manage environmental impact of road & traffic

Find acceptable balance between cost to society and the economic benefits of the system.

“If we cannot always physically protect the motorist from hazards, we must give him enough information so that he can protect himself.”

N. Tiemann – FHWA Administrator- US Congressional testimony



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People will continue to make mistakes.....



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Other challenges...

- Increasing number of vehicles
- More kilometers traveled by person
- Increasing heavy truck traffic
- Aging population
- Vulnerable road users (pedestrians / cyclists)
- Congestion in and around cities
- Pollution



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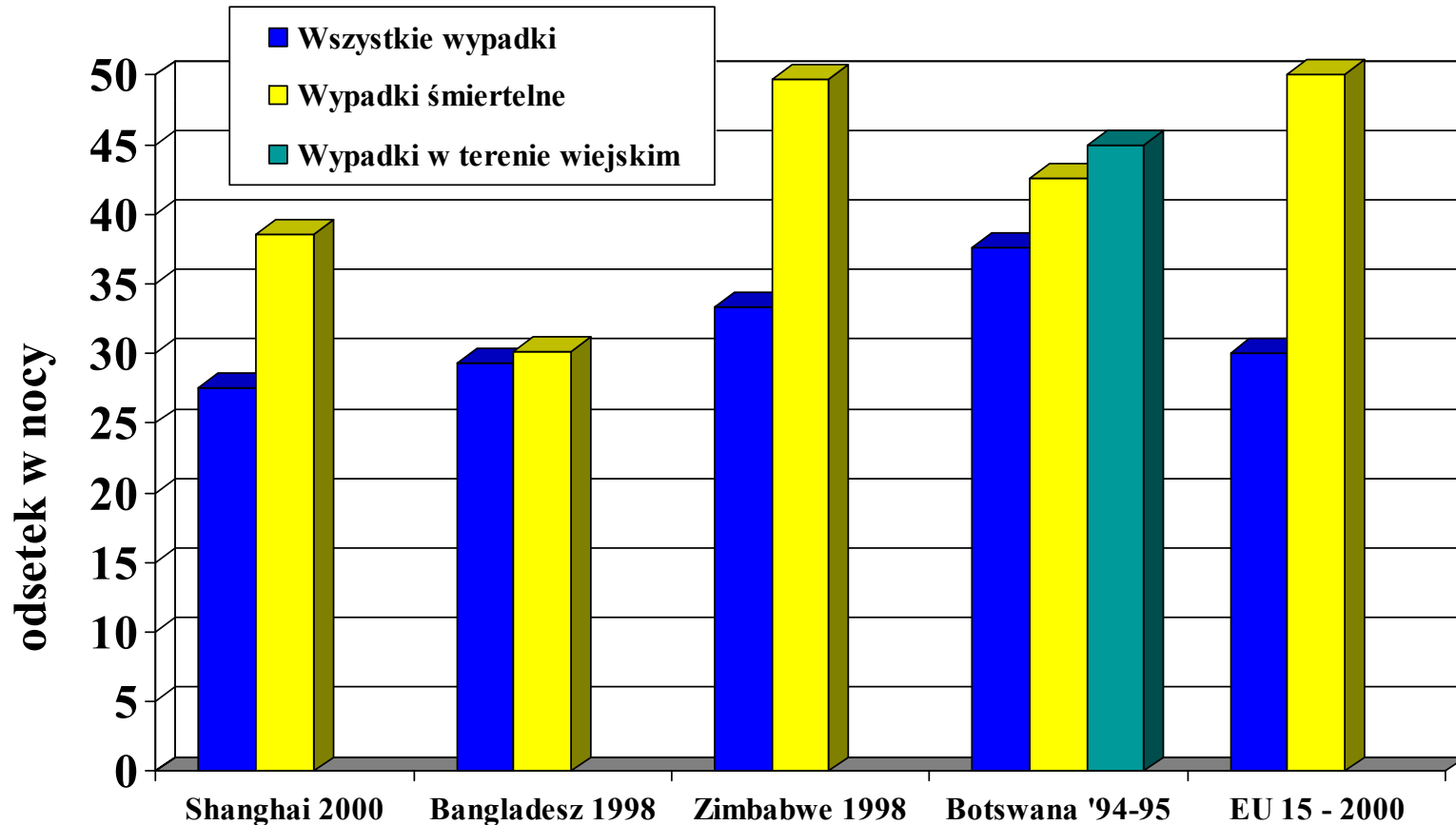
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Night Time Accidents & Fatalities



Źródło: "Road Transport Lighting for Developing Countries,"
August 2002 Draft, CIE TC 4-37.

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Driver Information Needs



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Road Safety Improvement

Past & Present (Reactive Measures)

- Driver training and education
- Traffic law enforcement / Penalties
- Vehicle crashworthiness
- Remove high accident areas

Future (System Approach)

- Safe roadway designs
- Transportation planning
- Speed management
- Novice drivers
- Alcohol / drugs

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Safe Roadway Design

- **Intelligent Traffic Systems**
 - Priority projects?
 - For intelligent people?
- **Wybacząca droga**
 - Passive Safety
- **Efektywne pionowe i poziome oznakowanie dróg**
 - Low cost measures
 - Accomodate driver & vehicle changes
 - Night & Day visibility + conspicuity
 - All weather performance



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Bezpieczne projektowanie dróg

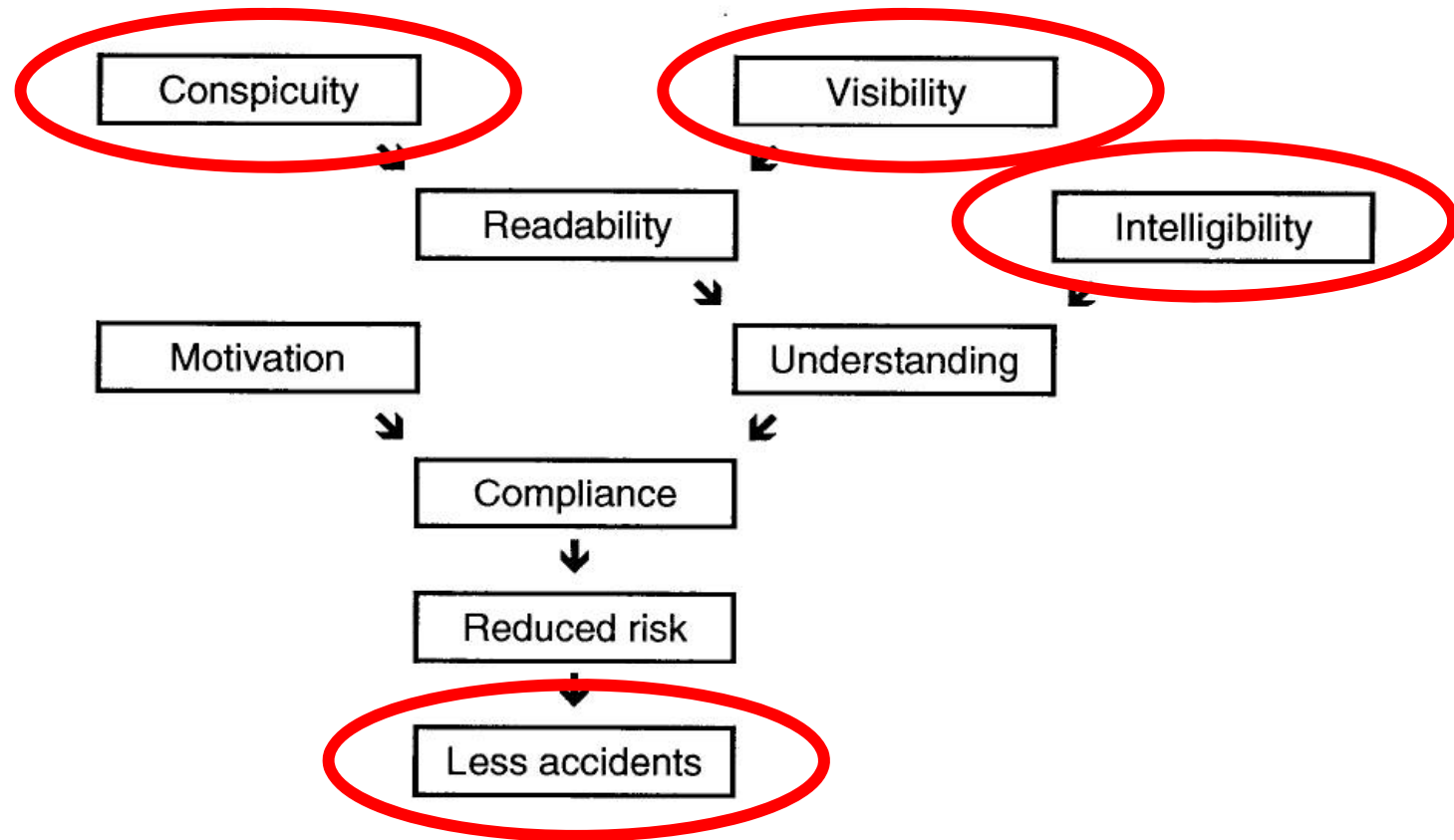


Figure 24: A general model of factors that affect the effects of traffic signs on road safety

Source: "General Overview on Road Safety," Lecture Notes, Dr. Rune Elvik, Institute of Transport Economics, Norway, September, 1999

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Sign brightness

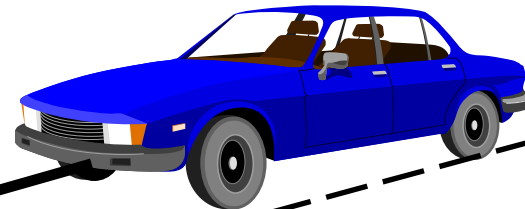
Critical Distances
Speed
Sign Size
Legend Complexity
Sign Criticality
Sign Contrast Ratio
Dirt on Sign

ROADWAY

Glare
Background Complexity
Surround Luminance
Roadway Alignment
Sign Position
Entrance Angle

VEHICLES

Vehicle type
Dimensions
Headlamp types
Headlamp output
Windshield
Transmission



DRIVERS

Visual Acuity
Age
Perception Reaction Time
Blood Alcohol Level





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Effective Traffic Signs

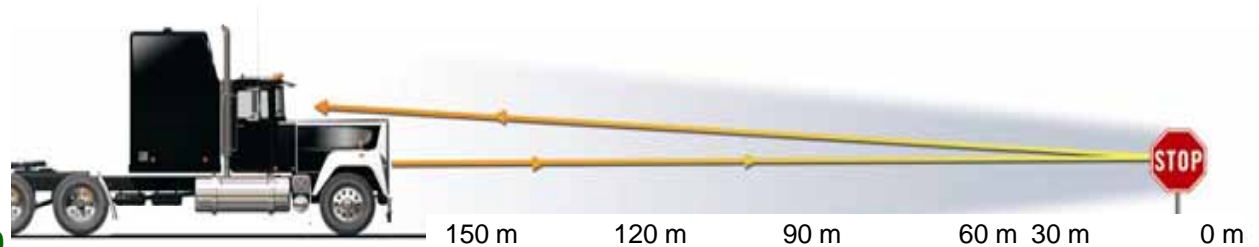
Observation Angle

150m = 0.70°

120m = 0.90°

90m = 1.20°

60m = 1.75°

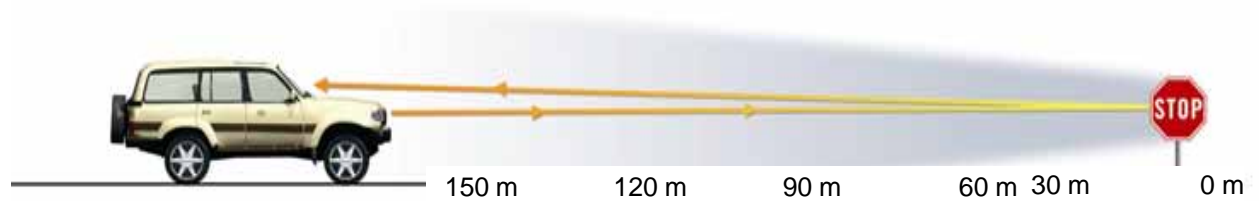


150m = 0.35°

120m = 0.45°

90m = 0.60°

60m = 0.90°



150m = 0.30°

120m = 0.40°

90m = 0.50°

60m = 0.75°



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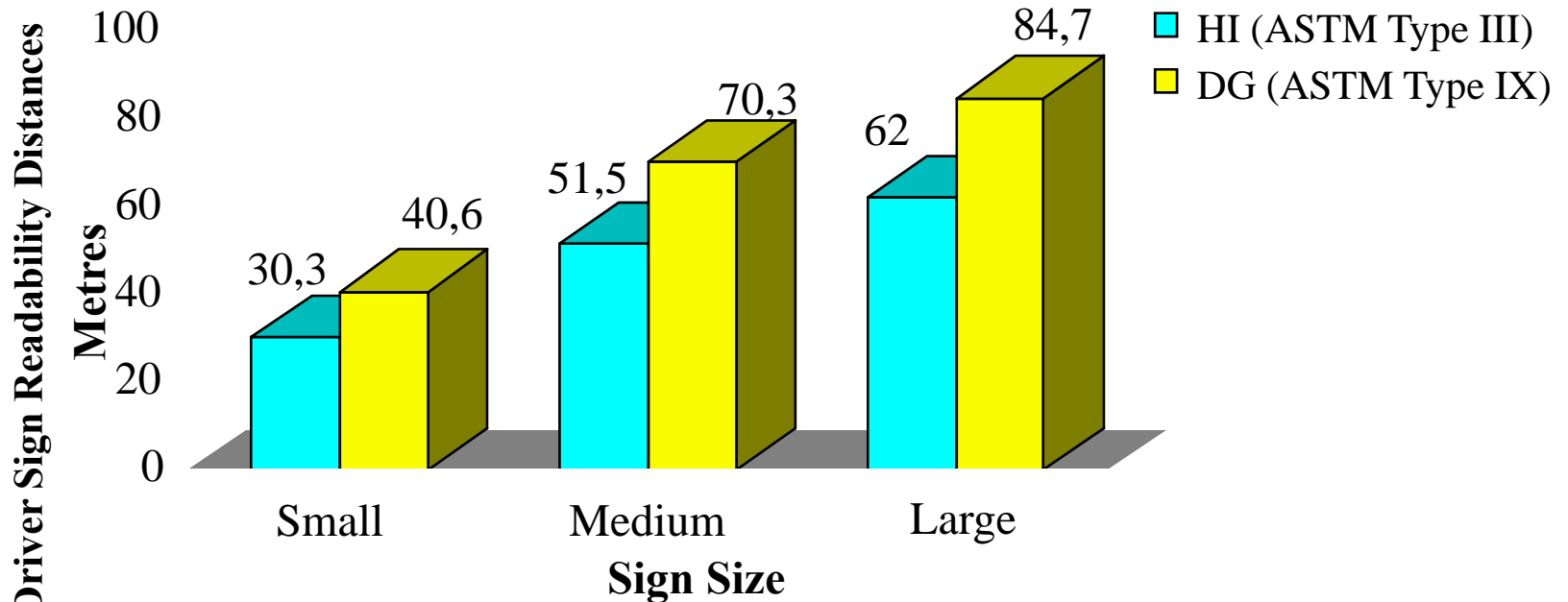
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Sign Legibility Research



Conclusion:

For all sizes used for directional signs the use of DG sheetings increases the legibility distance on average 35,7 %



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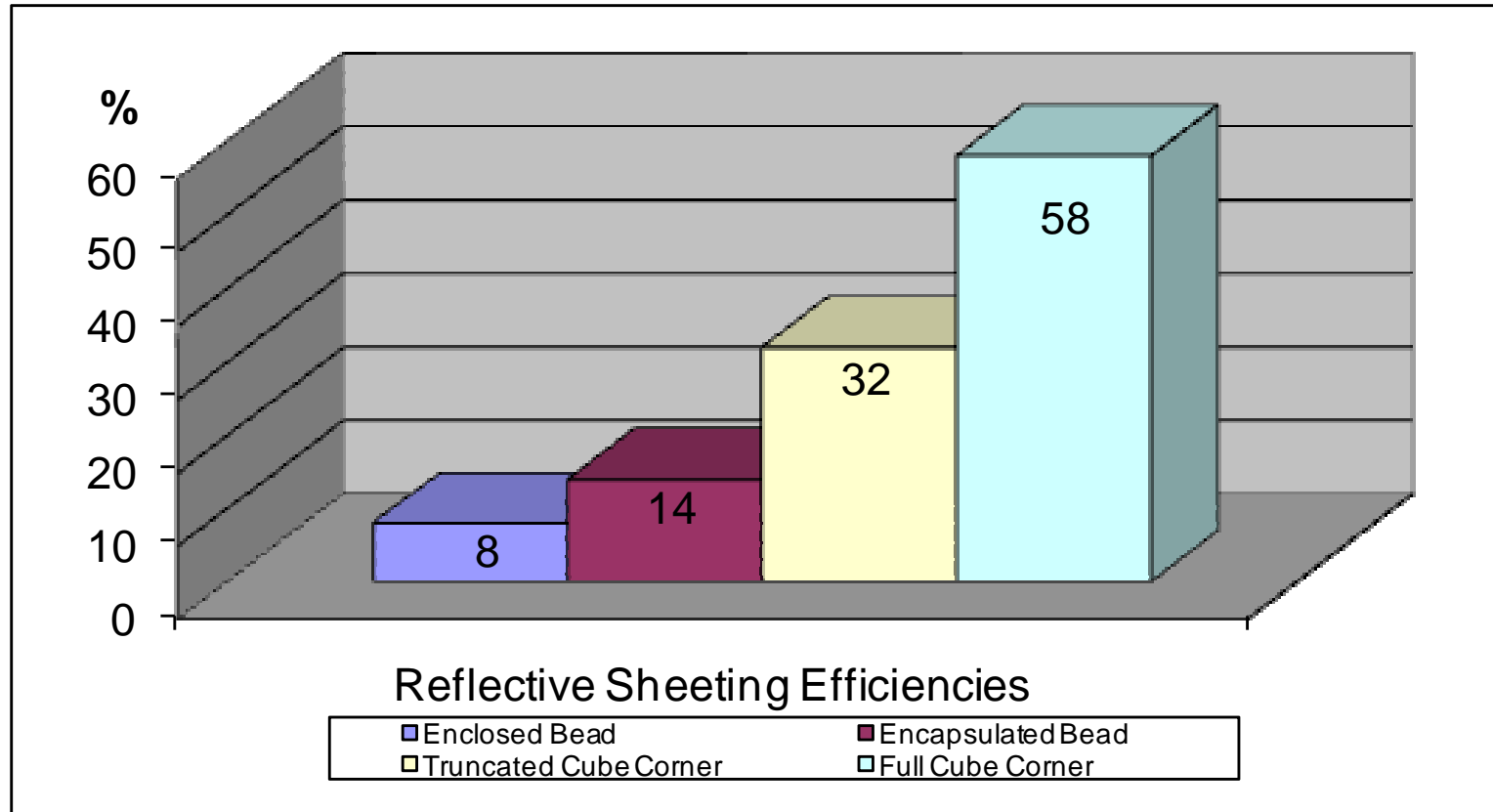
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Sign Legibility Research



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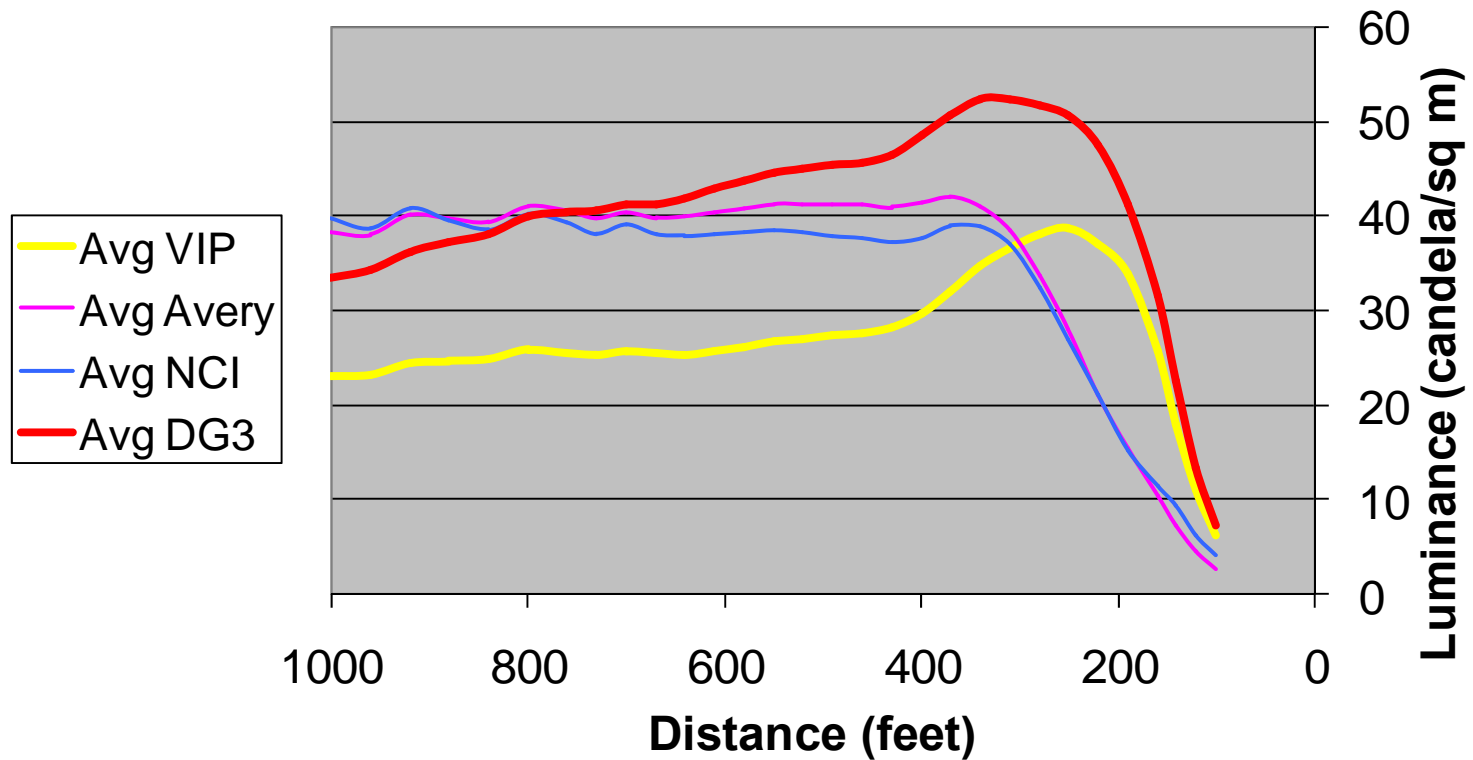


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How to return the light ?

Luminance for RS Sign, Std Sedan, 0 Entr US 25% Headlight



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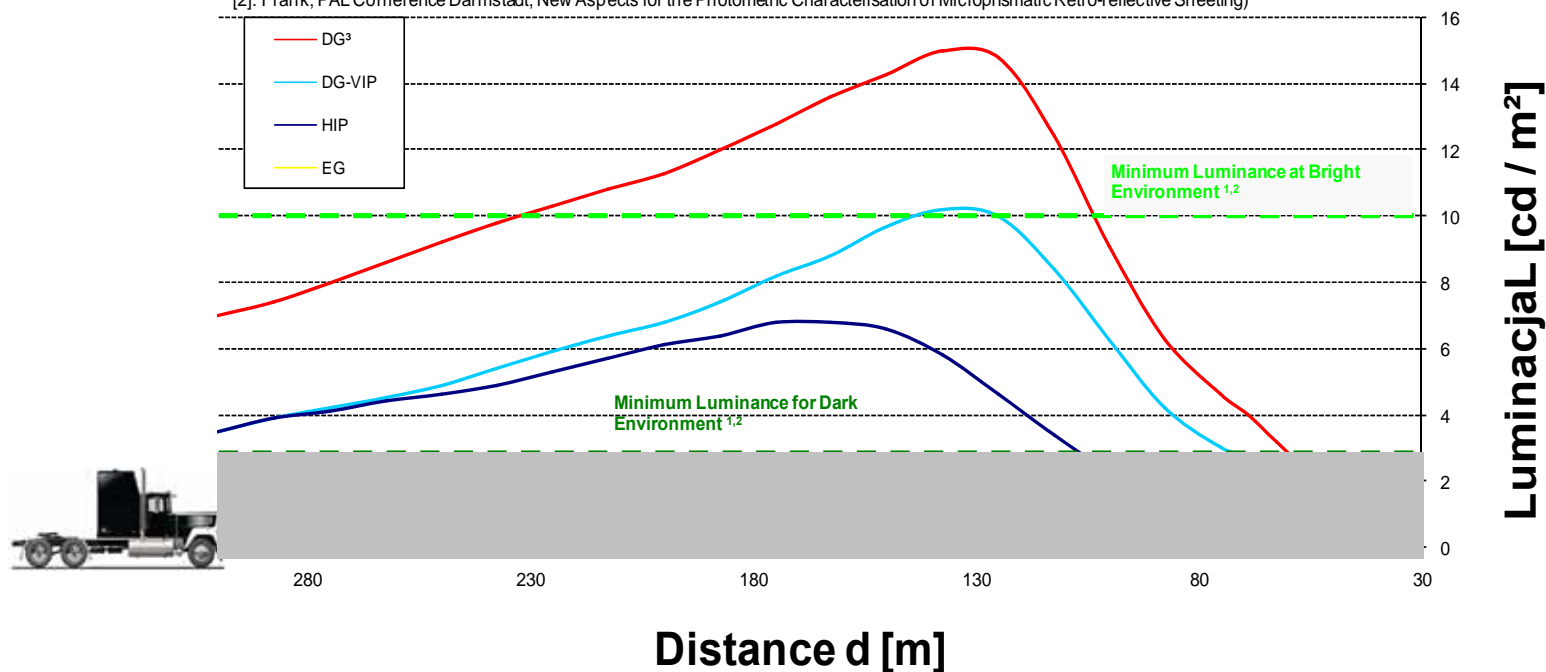
Not only for cars !

Luminance Curves - Minimum Driver Required Luminance

Right Shoulder mounted Sign; Truck with Standard Headlamps

([1]: Schmidt-Clausen; IRF Genf; "Retro-reflective Road Traffic Signs: Minimum and Optimal Luminance Requirements.

[2]: Frank; PAL Conference Darmstadt; New Aspects for the Photometric Characterisation of Microprismatic Retro-reflective Sheeting)



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Sustainable Technology for Vertical Signs

- **“Prismatic” versus “glass bead” sheeting manufacturing process**
 - 97% less VOC
 - 77% less energy
 - 46% less solid waste
 - Higher Mw polymers resulting in more durable sheeting
- **DG³ returns up to 58 % more light versus traditional prismatic sheeting**
 - **Replace illuminated signs**
 - Save energy to illuminate the signs
 - Lower infrastructure investment costs
 - Greatly reduces maintenance costs
 - (praxis : Illinois DOT)



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Passive Safety : EN 12767



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Passive Safety : EN 12767



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Evolution in Road Markings

- **Performance based contracts**
- **Products with improved durability**
 - Tapes
 - Fewer lane closures – Better mobility
- **Products with improved optics**
 - EN 1436 : RL, RWL & RRL
 - “All weather performance”



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Pavement Marking Technology



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Implementation of UN ECE Reg 48 (supported by EU Dir 76/756)



- Nov 10th 2007
 - All new types to be marked by OEM
 - Types N3(>7,5T) – N4 – O3 – O4
- Nov 10th 2009
 - All new registrations to be marked by owner
 - Types N3(>7,5T) – N4 – O3 – O4

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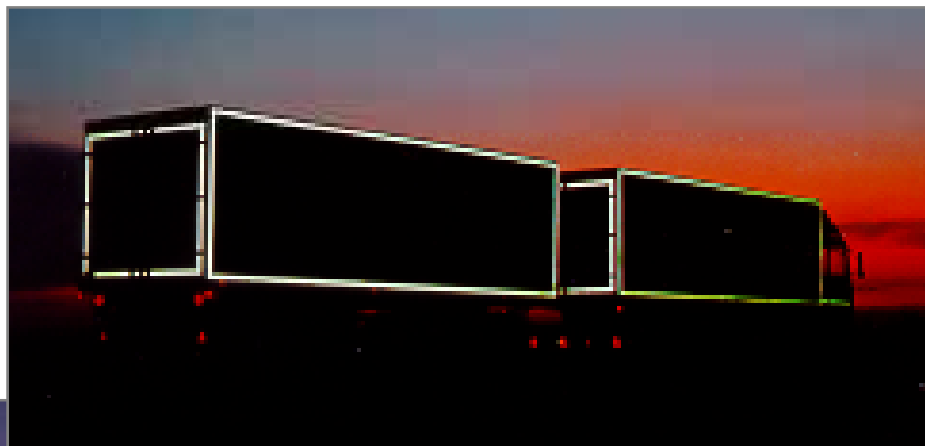


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...but even with the best sheeting on a big sign...



...make sure the message is clear...

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Thank you!

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