

# INNOVATIVE ROAD MARKING DESIGN PROTECTING THE (VULNERABLE) ROAD USERS

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- Rumble strips at critical intersections
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# Rumble strips at critical intersections



# Rumble strips at critical intersections

- Location: intersection in community of Forst near German-Polish border Sacro
- no. of accidents in 2010: 8, with people injured
- despite the presence of red rumble strips (not very visible, little rumble effect)
- main reasons for accidents:
  - inadequate speed
  - disrespect of yield

# Rumble strips at critical intersections

New design developed in cooperation with Technical University of Aix-la-Chapelle:

- Use coldplastic material (Limboplast D480)
- Modify layer thickness to unusual 1 cm
- Modify colour to bright yellow (RAL 1026)
- Use high quality reflective drop-on materials (SOLIDPLUS 100 glass bead blend 100-600 T18 GG 25)

# Rumble strips at critical intersections



# Rumble strips at critical intersections



# Rumble strips at critical intersections



# Rumble strips at critical intersections

- No. of accidents since installation of new, bright yellow rumble strips: 0
- Rumble strips are meanwhile recommended as effective accident killer by German Road Research Institute BASt

# Rumble strips

- Burgenland / Austria in 1990s:
  - Motorway A3 becoming a 2-lane road with two-way traffic and no overtaking on a length of 3.25 km
  - 20 severe accidents in 4 years
  - 1.27 million EUR of „economic damage“ due to accidents between 1994 and 1998

# Rumble strips



road situation:  
straight, far view, drivers have  
motorway speed still in mind

road marking pictogram  
alternating with static  
signage

# Rumble strips



# Rumble strips

After investing 50,000 EUR to modify road section with rib-like rumble strips for centerline and repeated „no overtaking“ pictogram as road marking:

- **minus 77%** of accidents with people injured
- **minus 79%** of people involved in accidents
- **economic damage dropped to 25,000 EUR** for period 1998-2002 and to **11,000 EUR** for period 2002 to 2010

# Top retroreflectivity at pedestrian crossings

- Problem in Switzerland:
  - Many fatal accidents at pedestrian crossings
  - In canton Bern alone 4 pedestrians died in a period of 6 weeks
  - night visibility and colour of road marking are crucial issues
- Swiss zebra-crossings are painted in yellow
- Search for a cost-effective countermeasure to raise driver attention and respect at zebra-crossings

# Top retroreflectivity at pedestrian crossings

- Develop a road marking systems that is very durable and has extraordinary retroreflectivity at night
- Our solution: highly durable SOLIDPLUS beads embedded into high quality STRUCTURED coldplastic
- Modify the yellow to a brighter tone
- Monitor longer-term performance of the new markings

# Top retroreflectivity at pedestrian crossings



# Top retroreflectivity at pedestrian crossings

- SOLIDPLUS beads perform particularly well in coloured road markings (yellow, orange)
- titanium-stabilized beads developed by SWARCO's competence center for glass technology
- very good abrasion resistance
- initial retroreflectivity values in structured road markings between 1000 and 1300 mcd/m<sup>2</sup>\*lx

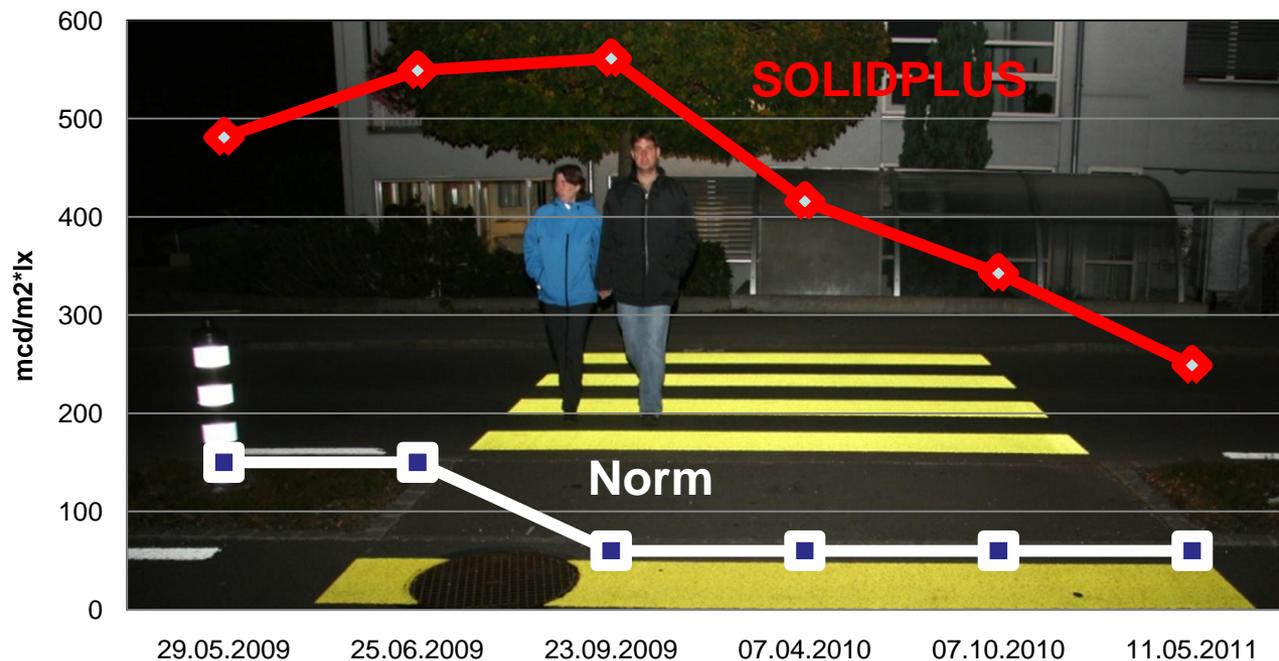
# Top retroreflectivity at pedestrian crossings

## SOLIDPLUS on yellow structured coldplastic Test deck Switzerland

Canton road No. 211 in Uetendorf / zebra-crossing

road surface: dry; bead type: Swarcoperle 2009 / paint: RAL 1023 (traffic yellow) OPTIMIZED

Source: Public Works Office Canton Bern



After 2 years in place – incl. 2 winters – the marking still outperforms the required norm values by **415%**!

# State-of-the-art bike lane markings



Sofia, Bulgaria



# State-of-the-art bike lane markings

- Create homogeneous smooth surface
- Create colour contrast to normal roadway
- Create reflective separation line between bike lane and roadway
- Create good grip (skid resistance)
- Use marking material with sufficient elasticity

# State-of-the-art bike lane markings

➤ red markings made of coldplastic



for manual distribution



machine-applied

# State-of-the-art bike lane markings

- coarse coloured glass granulate to support colour intensity and skid resistance



# State-of-the-art bike lane markings

- perfect contrast / visibility with white separation line



# Instant conspicuity with reflective paint

- the traffic environment contains many obstacles
- night-time visibility is essential to avoid damage and accidents
- simple paint-on retroreflectivity is a quick and cost-effective solution
- using high-end glass beads and a special paint formulation (SWARODIT)

# Instant conspicuity with reflective paint

- Highly reflective paint holds on many surface types (metal, stone, wood, concrete ...)
- easy to apply by brush or roller
- instant conspicuity guaranteed
- not only for street furniture like curbstones and guard-rails, but also for bicycles, agricultural machines, trees in alleys, tunnel portals, protruding edges of buildings, etc.

# Instant conspicuity with reflective paint



# The „4M recipe“ for successful road markings

Quality and durability increases of road markings with modern systems will only be achieved when ...

**Man...**



Sofia, Bulgaria



# The „4M recipe“ for successful road markings

## ...Material...



# The „4M recipe“ for successful road markings

## ...Machine...



# The „4M recipe“ for successful road markings

... and **M**eteorology optimally interact



Sofia, Bulgaria





# THANKS FOR YOUR INTEREST

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