



## PTWS IN THE SAFE SYSTEM

- The major challenge is to **stop** neglecting and actually include PTWs in all ways
- The lack of implementation of the four obvious recommendations from Lillehammer shows that much more has to be done
- A safe system based on the car **is not** a safe system for PTWs
- In a safe system for **all** motorvehicles it is the motorcyclists as the most vulnerable road users who should set the standard for design and maintenance
- A safe system includes PTW:s at all stages of infrastructure: compulsory regulation, include in planning and building and maintenance



## **FOUR RECOMMENDATIONS FROM LILLEHAMMER**

### **2. Transport and infrastructure policy**

It is a fundamental motorcycle safety requirement that, by default, PTWs should have a place in overall transport policy and infrastructure policy/management.

### **8. Guidelines for the development of road infrastructure.**

Each level of government should include in their infrastructure guidelines, measures for accommodating PTWs, developed with input from relevant stakeholders. The guidelines should be relevant to the needs of the jurisdiction concerned and coordinated with other jurisdictions and levels of government. An international transfer of best practices is also recommended.





## THERE IS A DIFFERENCE IN THE SAFE SYSTEM FOR PTWS

- The safe system model – a human error in traffic shall not result in serious injuries – is not enough for a PTW-rider
- A PTW-rider can't afford this and must prevent that accidents happens since every accident can result in a serious injury or death

### Vision Zero Safety Philosophy

1. Severe injuries not crashes
2. People make errors, mistakes and misjudgements
3. Humans have a biomechanical tolerance
4. Energy control is key
5. Eliminations is the target (backcasting)



## **MOST ACCIDENTS WITH PTWS IN BENDS**

- **Cost efficient solutions:**
- Warning signs showing the radius and a recommended lower speed
- Road markings to show how to enter the curve to avoid collisions
- Increase friction
- Increase the curve width
- Paved shoulders to minimize the risk of gravel
- Avoid obstacles, barriers and poles in the outer bends
- Forgiving road sides instead of side barriers



## MANY ACCIDENTS – COLLISIONS – OCCUR IN INTERSECTIONS AND ROUNDABOUTS

- **Cost efficient solutions:**
- Lower speed limits
- Ban overtakings – road marking and warning signs
- Increase friction
- Minimize the number of signs and poles to improve visibility
- More space in median barrier to improve visibility of PTW:s
- Paved shoulders
- Ban art installations in roundabouts



# OTHER WAYS TO INCREASE THE VISIBILITY OF MOTORCYCLISTS

- **Cost efficient solutions:**
- Allow motorcycles in buslanes
- Allow PTW:s in advanced stoplines – advanced stop boxes
- Promote filtering with a code of conduct





## MOST FATAL BARRIER ACCIDENTS OCCUR ON TENT- AND 2+1-ROADS 100-120 KM/H

- **Cost efficient solutions:**
- Always choose barriers **without** unprotected poles and protruding parts
- Install barriers further away from the road (allowed limit is 5-75 cm from the asphalt edge in Sweden)
- Create a paved and wider shoulder between the barrier and road – recovery zone
- Choose forgiving road sides instead of side barriers
- Increase friction on the road to minimize the risk of crash and collision with barriers



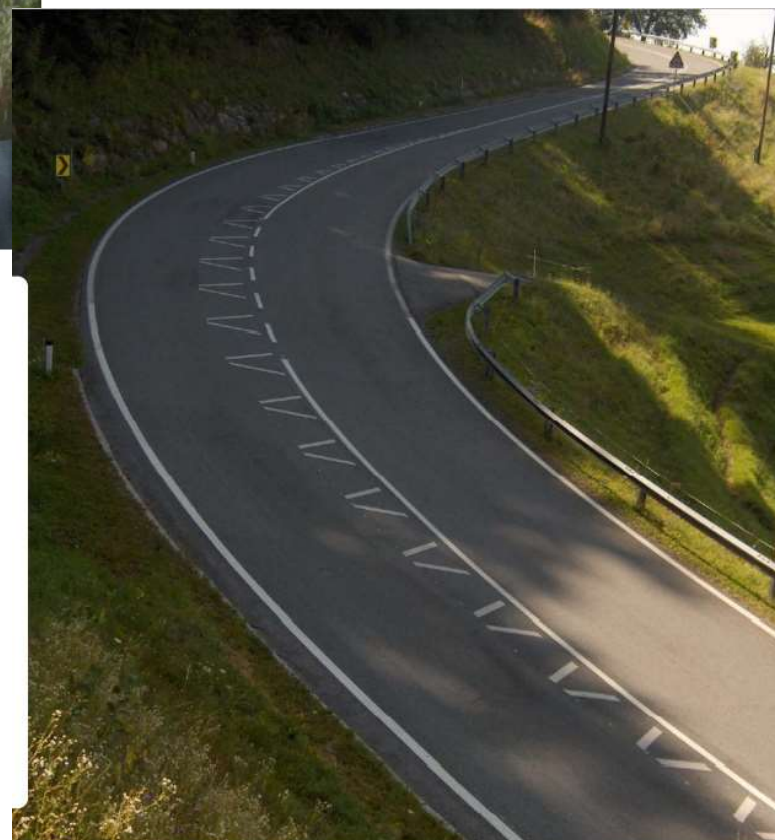
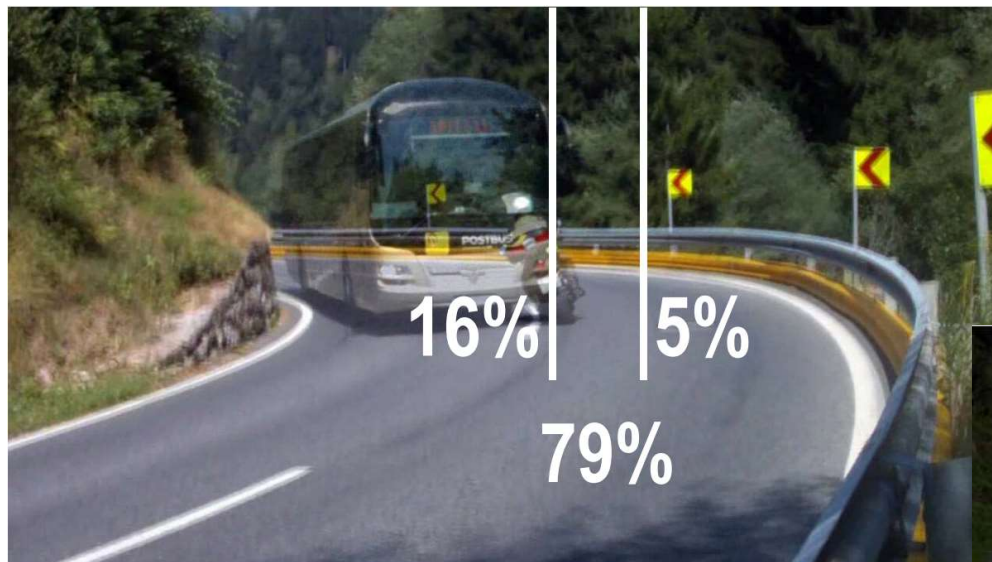


## IMPROVED MAINTENANCE LEADS TO LESS PTW ACCIDENTS

- **Cost efficient solutions:**
- Friction is crucial for all vehicles with 2 wheels
- Minimize gravel, debris and spillage
- Paved shoulders instead of gravel
- Develop alternative methods to repair potholes and sealings
- Demand friction tests on new asphalt before traffic is allowed
- Direct PTW:s to other roads to minimize the risk of crashing in deep gravel and slippery asphalt
- Increase controls of entrepreneurs and introduce fines when accidents occur

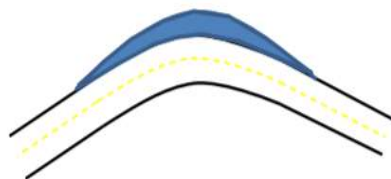


# EXAMPLES IN BENDS



Riding Left Hand Corners: Facts and Measures, Martin Winkelbauer, Austria  
 95% of riders were moving in the death zone  
 Floor markings applied successfully – riders avoid road markings

# EXAMPLE BENDS



The cost of constructing a recovery area in bends is less than the cost of an accident with minor injuries, Thomson et al VTI 2015



Warning sign showing both curvature + recommended speed, NZ



Flexible road signs, Germany



# VISION ZERO ROAD NORWAY- MANY GOOD EXAMPLES

**Problem: Poor visibility on curve**

**Measure: Remove trees**

Before

After



## MORE VISION ZERO ROAD TO IMPROVE CURVES

**Problem: Poor visibility on curve and hazardous elements in the safety zone**

**Measure: Remove trees, move columns to the inside, move mailbox to the entrance**



After



  
 Statens vegvesen

Norwegian Public Roads Administration



## EXAMPLES INTERSECTIONS AND ROUNDABOUTS



Avoid art installations in roundabouts-increased injury risk (left Norrköping, Sweden, below Germany)



Friction is extra important where you need to brake and turn- intersections and bends – where most accidents occur (Stockholm area Sweden)



# EXAMPLES INTERSECTION NORWAY

**Problem: Poor visibility at junction**

**Measure: Remove vegetation and lower the terrain  
New signs are raised and mounted on a  
passive safety mast**

Before



After





## EXAMPLE BARRIERS



Avoid barriers with protruding parts which increase the injury risk since clothes and body parts are caught in them (Dvårsätt, E16, Sweden)

Always use barriers with protected poles and without protruding parts. Install them at a safe distance from the road for VRU like motorcyclists and moped riders (min 1,5-2 meters). Most important on TENT and 2+1 roads where most motorcyclists are killed in allowed speed (100-120 km/h, Sweden)





## FORGIVING ROAD SIDES INSTEAD OF SIDE BARRIERS



Always use forgiving roadsides instead of side barriers when possible (E 20, Skara, Sweden)

When sidebarriers are used in difficult bends – install MPS (Jönköping, Sweden)



## MAINTENANCE IS IMPORTANT FOR PTW SAFETY



Bleeding asphalt causes loss of friction and severe accidents among riders (road 86, Sweden, 68 km problems after the road was repaired)

The joint between two roadways was left in this condition which caused several severely injured and one fatality among riders on different parts of motorways (E4, Söderhamn, Sweden)





## MINIMIZE GRAVEL



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There are plenty of cost-efficient solutions to avoid gravel from the road side on the road which will reduce the risk of PTW accidents (Värmland left, Slingerbulten right, Sweden)





skilt.psd



## EXAMPLES FRICTION



This method to repair potholes with bitumen and gravel means loose gravel on the road for 12-48 hours. Gravel on asphalt reduce friction to winter conditions and increase the accident risk for PTWs (Stockholm, Sweden)

Norway allow this method only for 5 km, then the gravel must be removed. Also extra warning for PTW:s. These measures are done to minimize accident risk for PTWs.



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