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**Road Safety Criteria in Road  
Planning and Design  
Road safety audit RSA -exercise**

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# Basic criteria in road geometric design

1. **Road traffic safety**
2. Environmental (noise, air pollution, .....)  
environment
3. Economical: investment, operation and  
maintenance costs
4. Traffic performance: capacity and level of  
service (LOS) - based on MOEs: delay, stops,  
queues, etc.
5. Technical and construction requirements
6. Needs of pedestrians, cyclists and disabled

# Road safety criteria



# Road safety criteria

are related to:

- a) **Road users:** psychological, psychophysical – taking into account; sight, perception, time for decision, memory (RAM), reaction to monotony, impact of speed, concentration
- b) **Vehicles:** vehicles' body, width, turning radius, acceleration, deceleration,
- c) **Roads;** their geometry, cross sections, pavements, drainage, roadsides

# Road (its geometry, signing, marking should be

- **Recongnizable** – user should be able to recognize alignment, road should be „**self-explaining**”
- **Readable** - signing should be easy to understand, and the amount of information should be limited
- **Drivable** – paths for all, specially turning movements at intersections should be provided, as vehicles when turning occupy wider corridors (long trucks),
- Having **minimum number of collision** points with other traffic movements, with other traffic users
- Provide good visibility of road users, vehicles, road and traffic control devices

# Forms of these criteria depend on stage of planning/design

- Planning stage; road network, hierarchical system
- Conceptual design
- Detailed technical design
- Design of signing and marking
- Monitoring of existing traffic

In all these stages designs should be **audited**

**Road safety audit**

# What should be taken into account in the planning stage?

Consistency of land-use and road planning. It is very important for road safety

- Land use planning; location of traffic generators; housing estates, working places, education, shopping areas, supermarkets, culture, churches, etc.
- Transportation corridors – major roads, streets, public transport lines,

RS aims:

- a) Building of the hierarchical network with roads of various functions and technical classes

# Planning stage

Each network should consist of roads serving:

- flow functions,
  - area collector-distributor functions,
  - access functions
- 
- a) roads/streets should not cross links between traffic generators and destinations i.e. school – houses etc
  - b) minimisation of conflict points; vehicles/vehicles flows, vehicles/pedestrian/ (cycle) flows
  - c) access control should be taken into account – depending on function of road/street

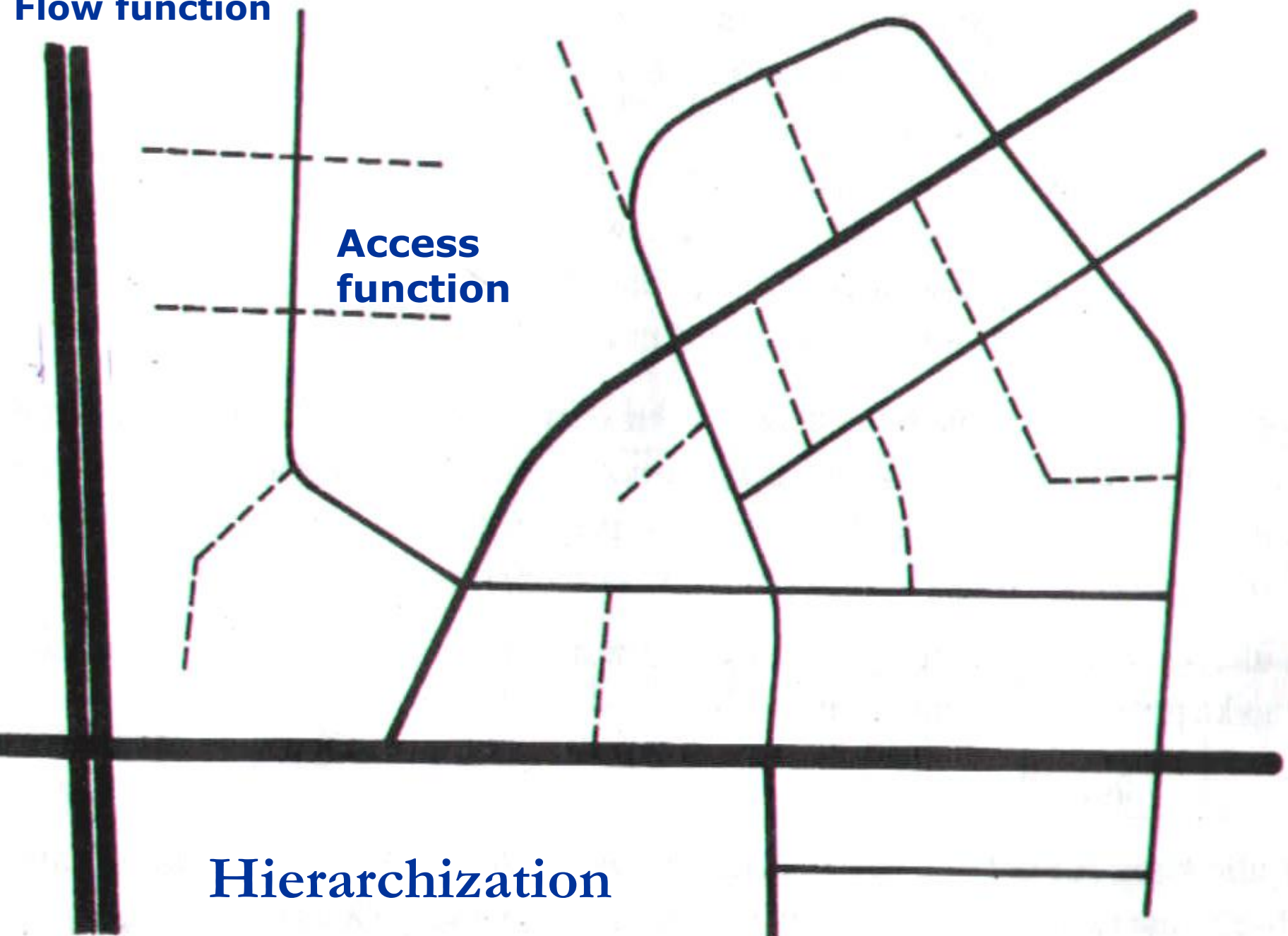


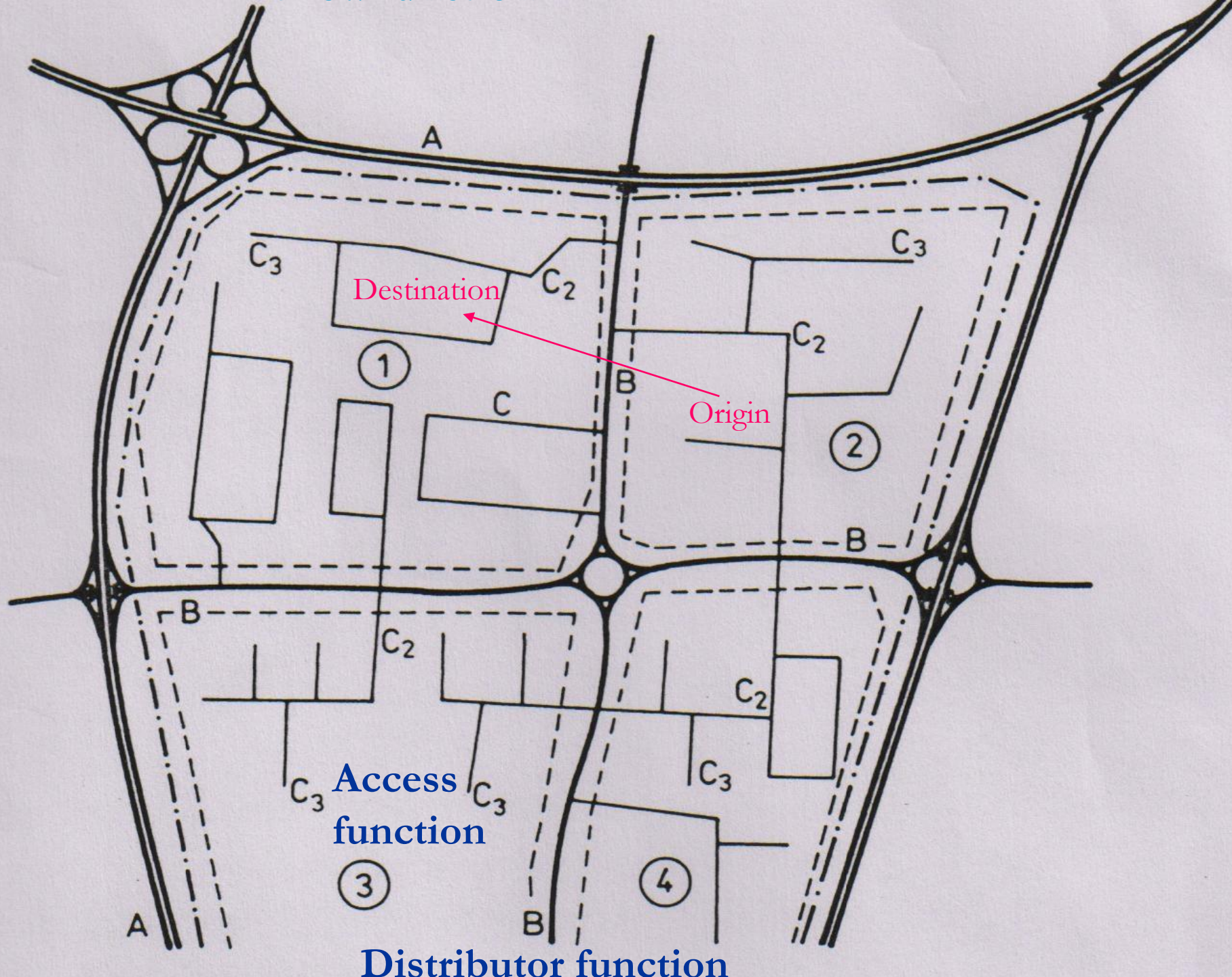
**Distributor function**

**Flow function**

**Access  
function**

**Hierarchization**





Las Vegas





Indianapolis



# Access management

Access management includes planning:

- distances between intersections and interchanges,
- density of access points to and from properties
- density of other driveways

# Current new ideas in design

## Conceptual project stage

„Self explaining roads” – still rather idea ,

„Forgiving roads” - existing guidelines

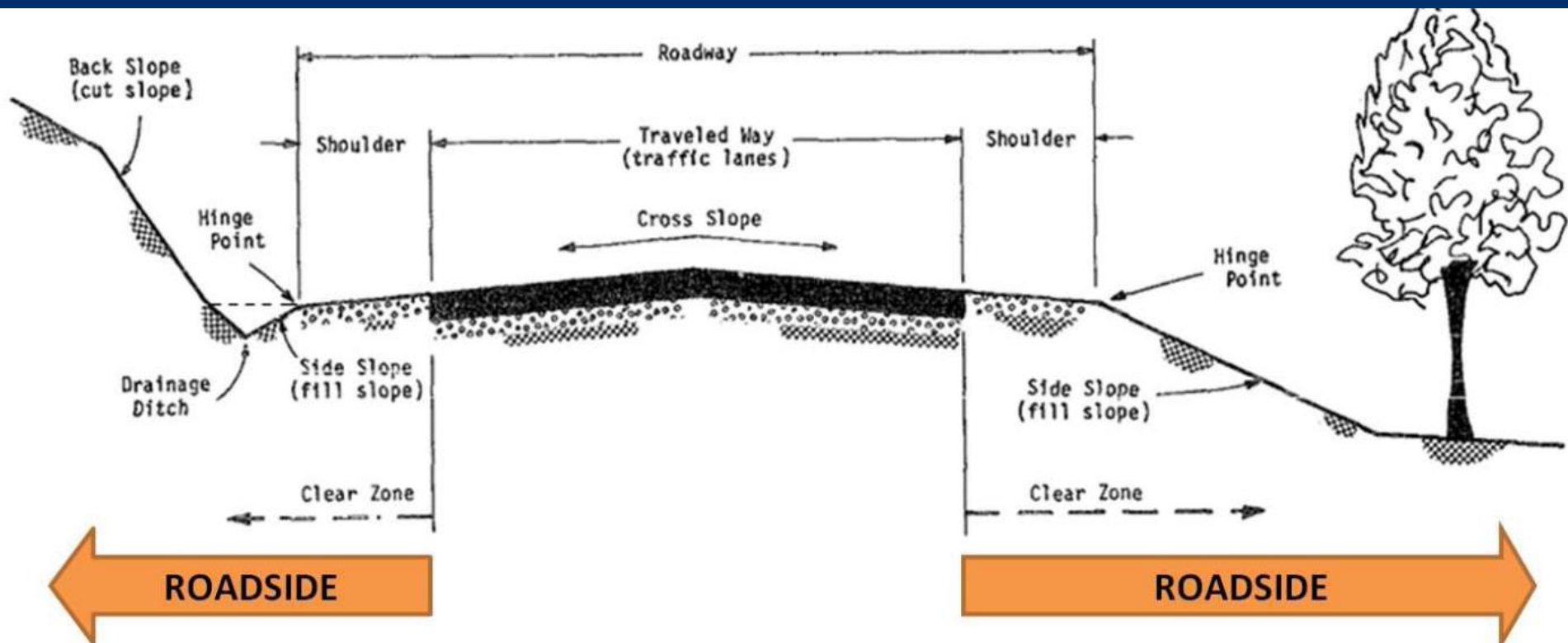
“Safe speed” still rather concept

no time for details

# **„Forgiving roads“: Errors of drivers not necessarily lead to accidents, if so - accident severity can be limited**

- Safety barriers on both sides of the road on high embankments, bridges culverts etc „roofing” may be avoided
- Safety barriers at trees,
- Gentle slopes of embankments in high risk locations (intersections, horizontal curves, instead of 1:1,5; or 1:2 better and safer 1:3–1:5
- Warning marking (well known) – lines warning sleepy drivers on edges of carriageway









Curves and roadside  
Does not forgive errors



# Visibility

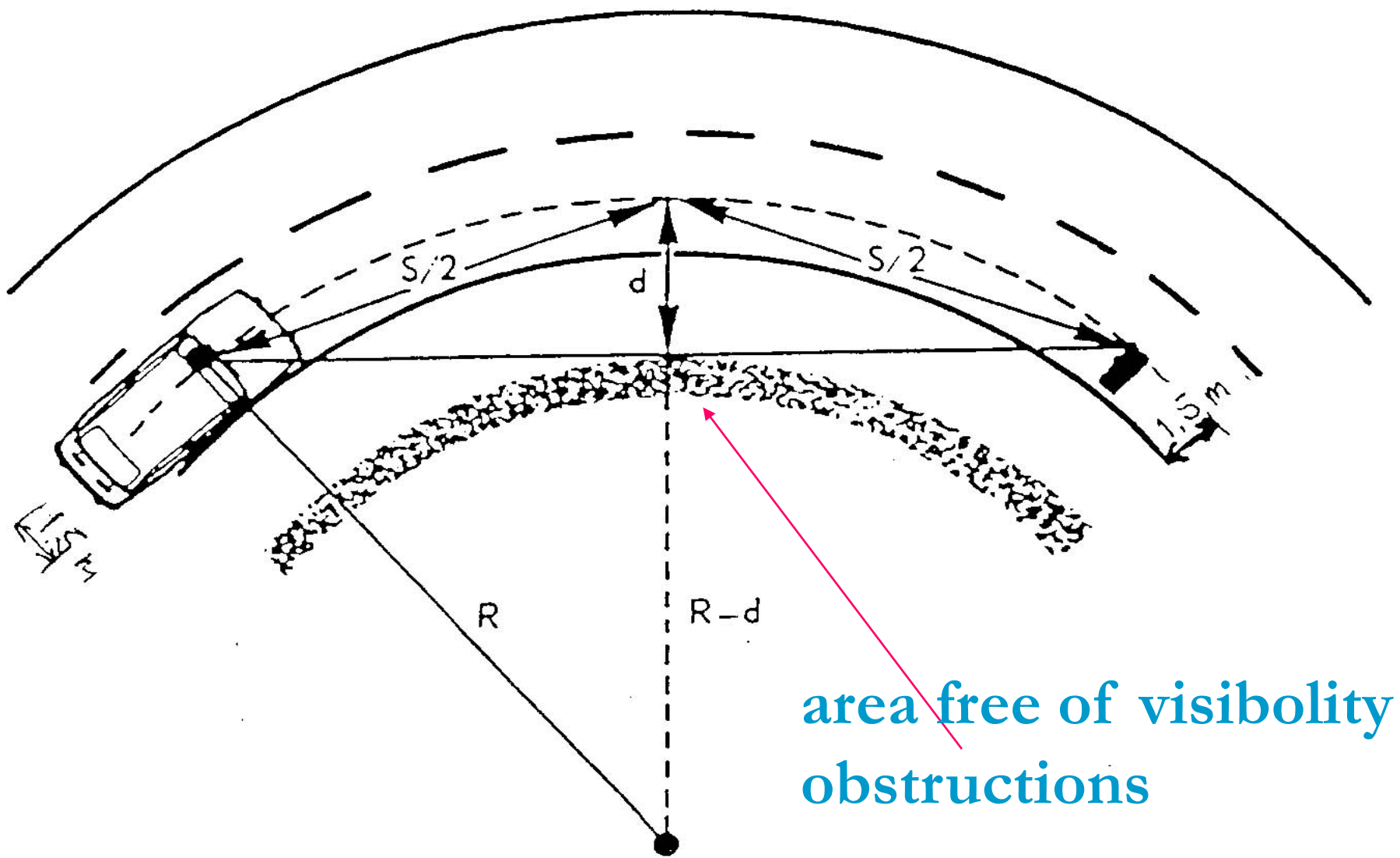
Required sight distances on horizontal and vertical curves based on real speed  $V_{85}$ :  
stopping sight distance, passing (overtaking) sight distance, should be provided

Problems with that criterion; overtaking lanes, slow traffic lanes or 2+1 sections can be considered

# Visibility

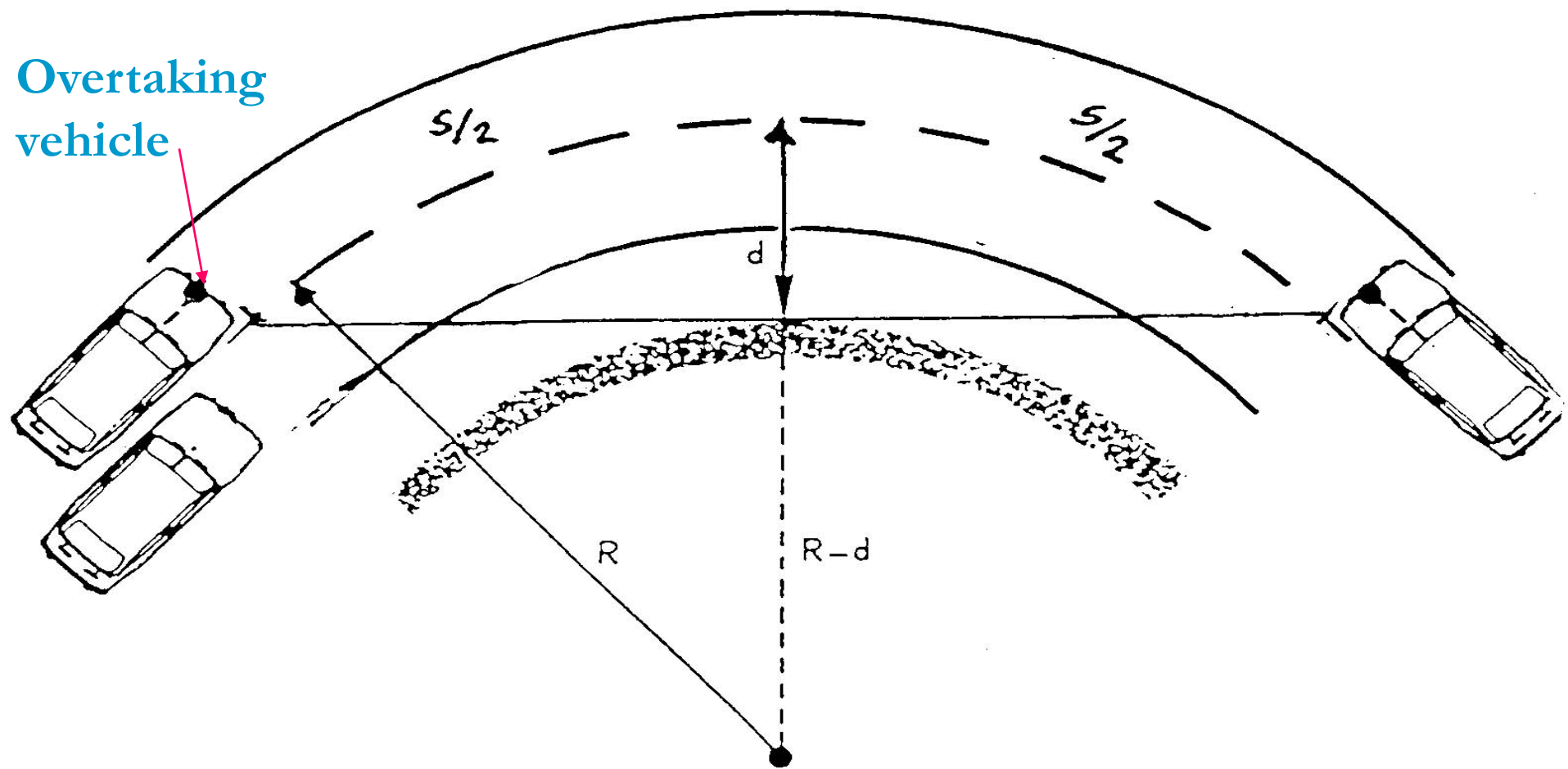
- **Stopping distance: grade, skid resistance of pavement** **no time to discuss**
- **Overtaking requirements** **No time to present and discuss**
- **Percentage of road with allowed overtaking** – some sections should give possibility of overtaking - % of section must give such possibilities
- Now we have also visibility problems created by noise barriers

Visibility	Visibility	
	horizontal alignment	vertical alignment
stopping sight distance		
passing sight distance		



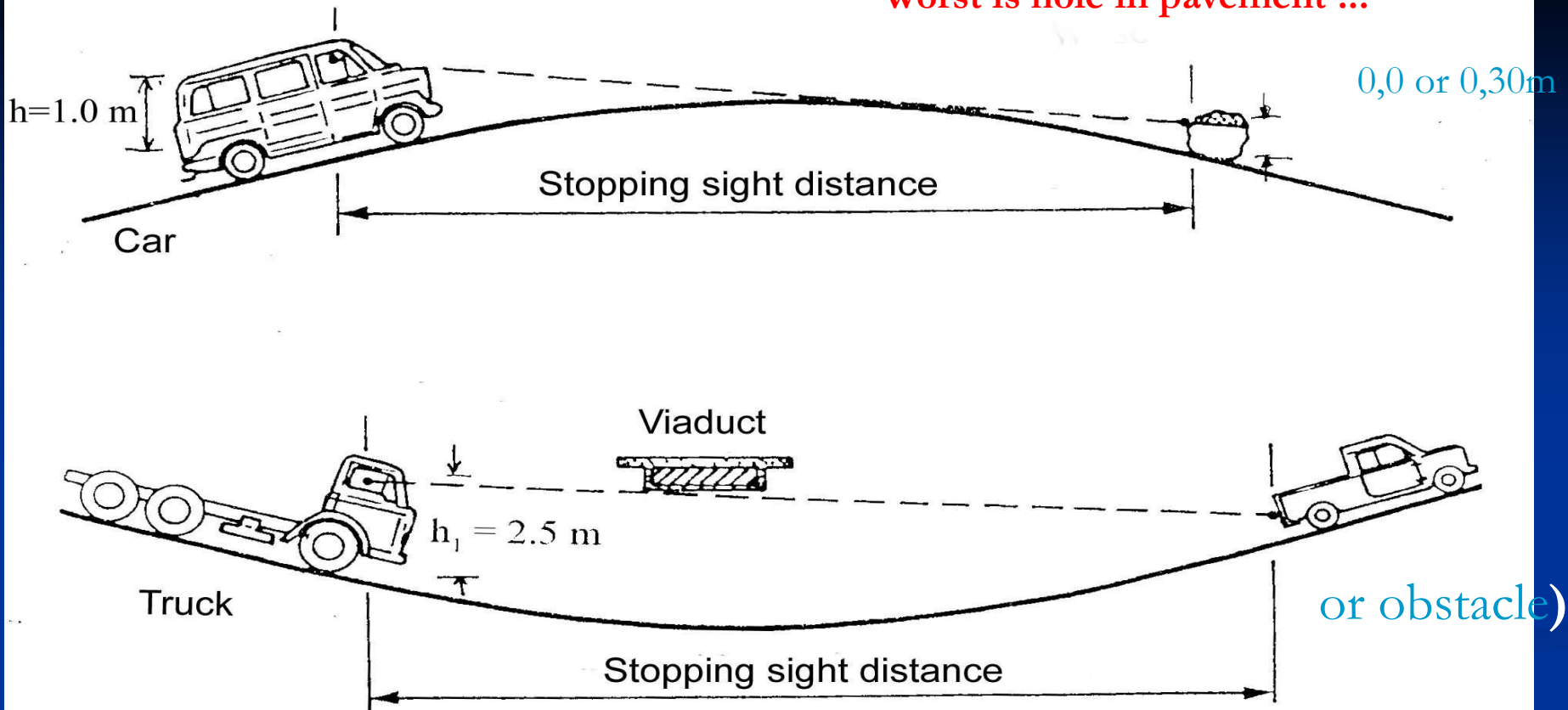
Horizontal curve radius  $R$  should provide stopping visibility (and visibility allowing overtaking - recommended). Area on internal side of a roadside should be free of visibility obstructions





Checking possibility of passing depending on the distance  $d$  – depending on and  $V_{85}$  speed

Worst is hole in pavement !!!



b) Vertical alignment (vertical curve radius  $R$  should provide stopping visibility (and visibility allowing overtaking - recommended)

Checked are: crest and sag vertical curves

# Other problems

- Readability of signing and marking - driver may not stop and consider what to do!

A large blue rectangular road sign with a white T-junction diagram. The sign is divided into several sections by white lines. At the top, a red-bordered box contains the number "631". To the left of the junction, a red-bordered box contains the number "61". To the right, a red-bordered box contains the number "633". In the center of the junction, there is a circular sign with a red border and a white background, featuring a black silhouette of a truck. Below this circular sign, a white rectangular box contains the text "3,5<sup>t</sup>". At the bottom of the junction, a red-bordered box contains the number "632". The sign is mounted on a blue pole.

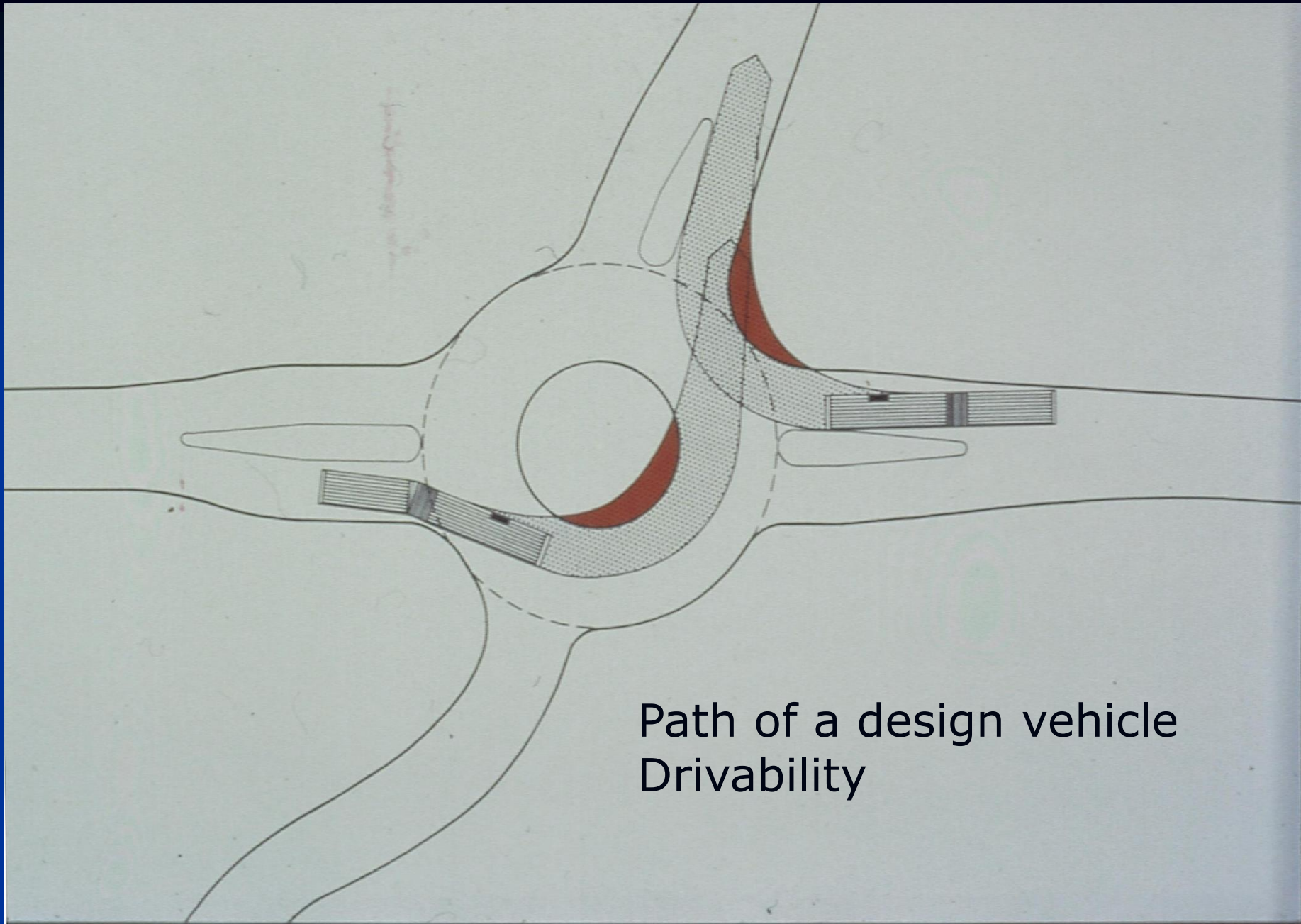
A smaller blue rectangular road sign. It features a white 'f' symbol in a square at the top. Below it, a blue arrow points left with the number "350" and the word "DPEL" below that. At the bottom, a blue arrow points up.

A green rectangular road sign with the word "Niepa" in white. Below the text are four blue arrows pointing up, down, left, and right. A red-bordered circle with a blue 'X' is positioned above the arrows.

A blue circular road sign with a white arrow pointing to the right.

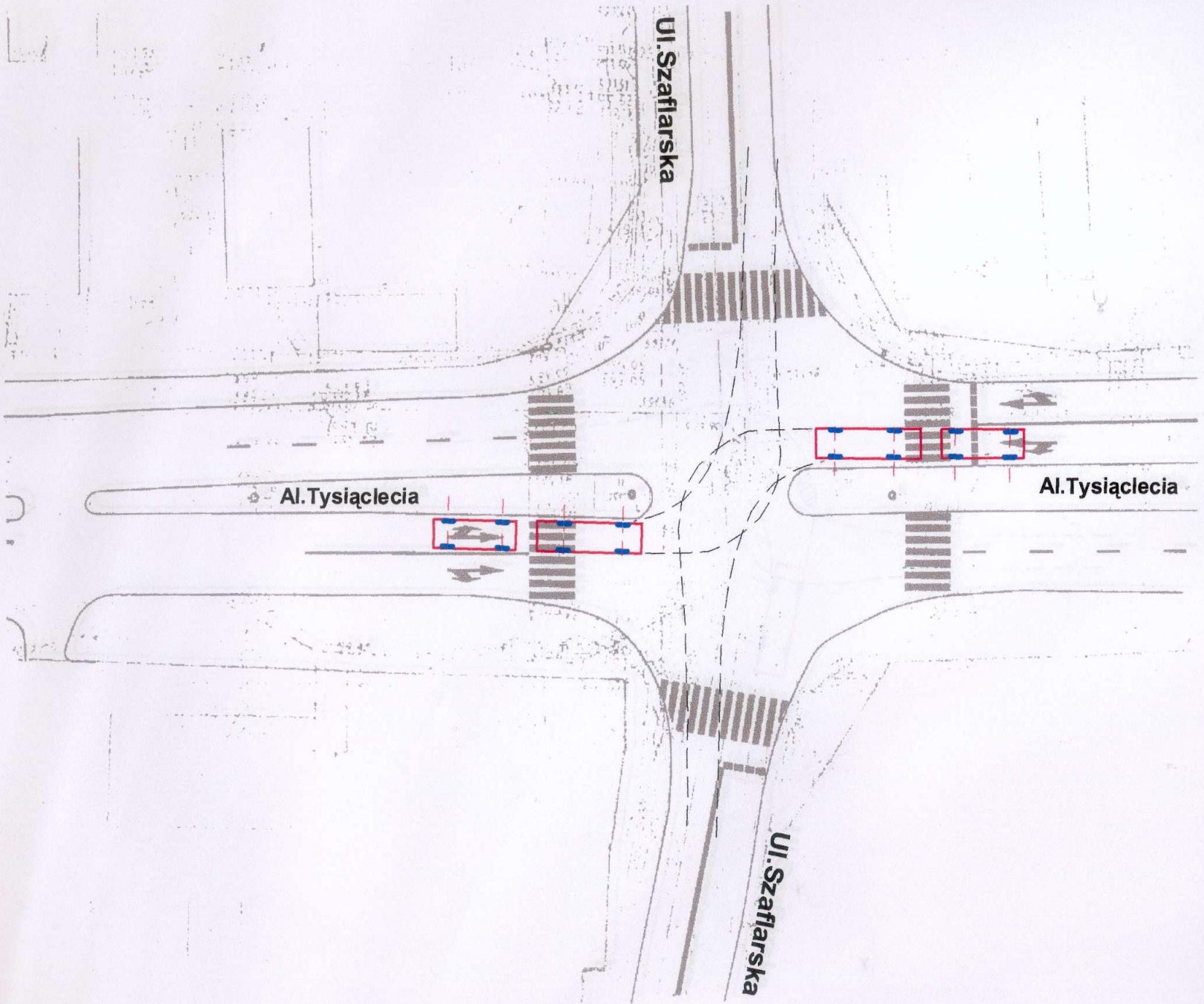






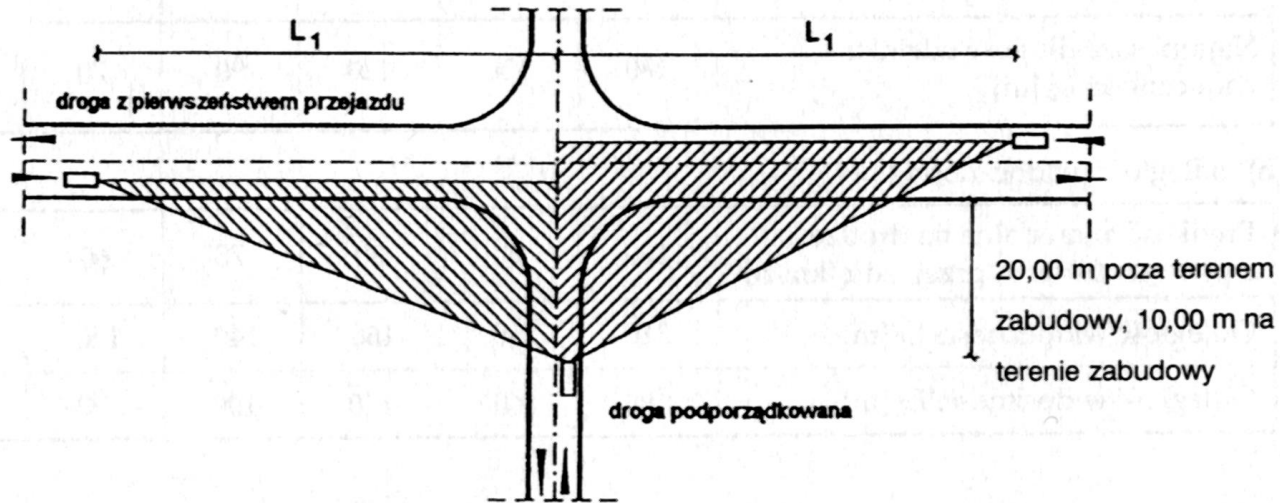
Path of a design vehicle  
Drivability

**SPRAWDZENIE PRZEJEZDNOŚCI SKRZYŻOWANIA  
NA KIERUNKU AL. TYŚIĄCLECIA  
sam. ciężarowy z przyczepą**

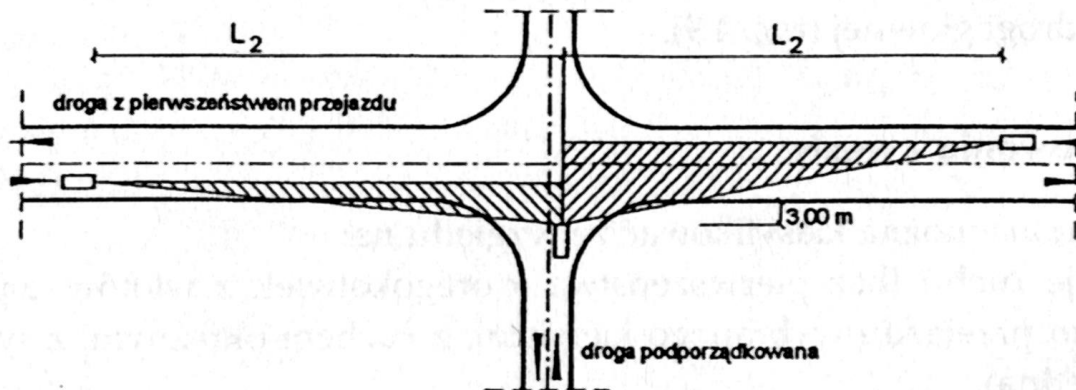


**Dochodzi do nakładania się korytarzy ruchu pojazdów relacji,  
które nie są ze sobą kolizyjne.**

# Intersections. Visibility from minor entry

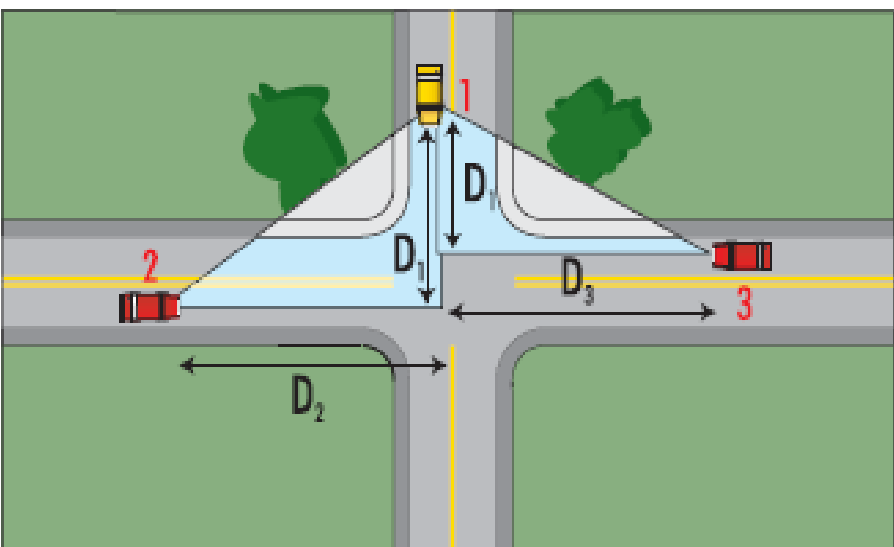


Widoczność przy dojeździe do skrzyżowania

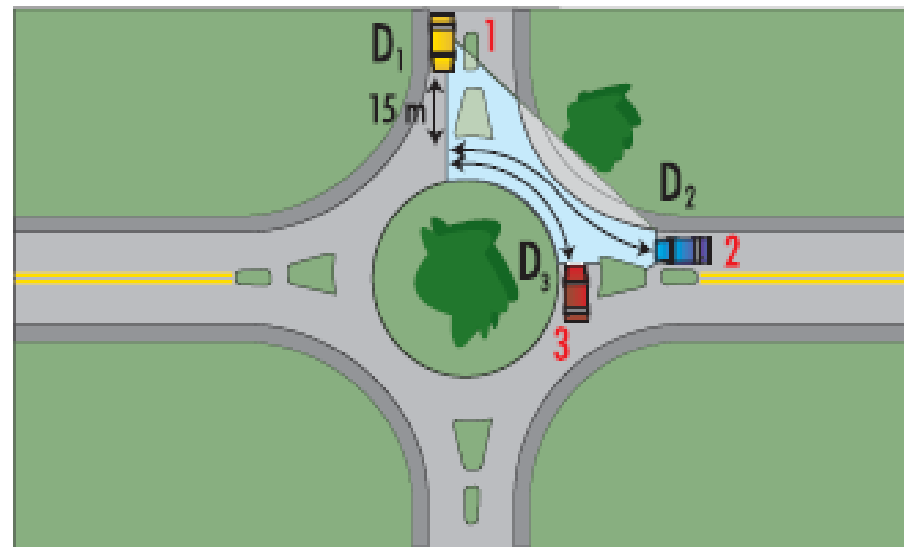


Widoczność przy ruszaniu z miejsca zatrzymania

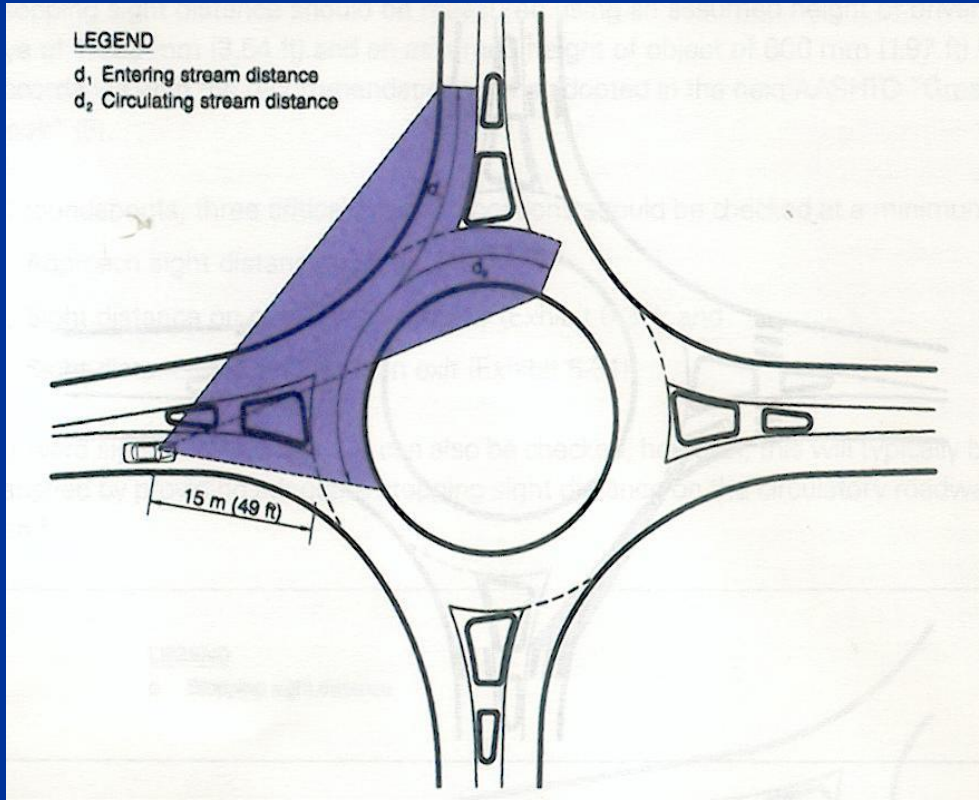




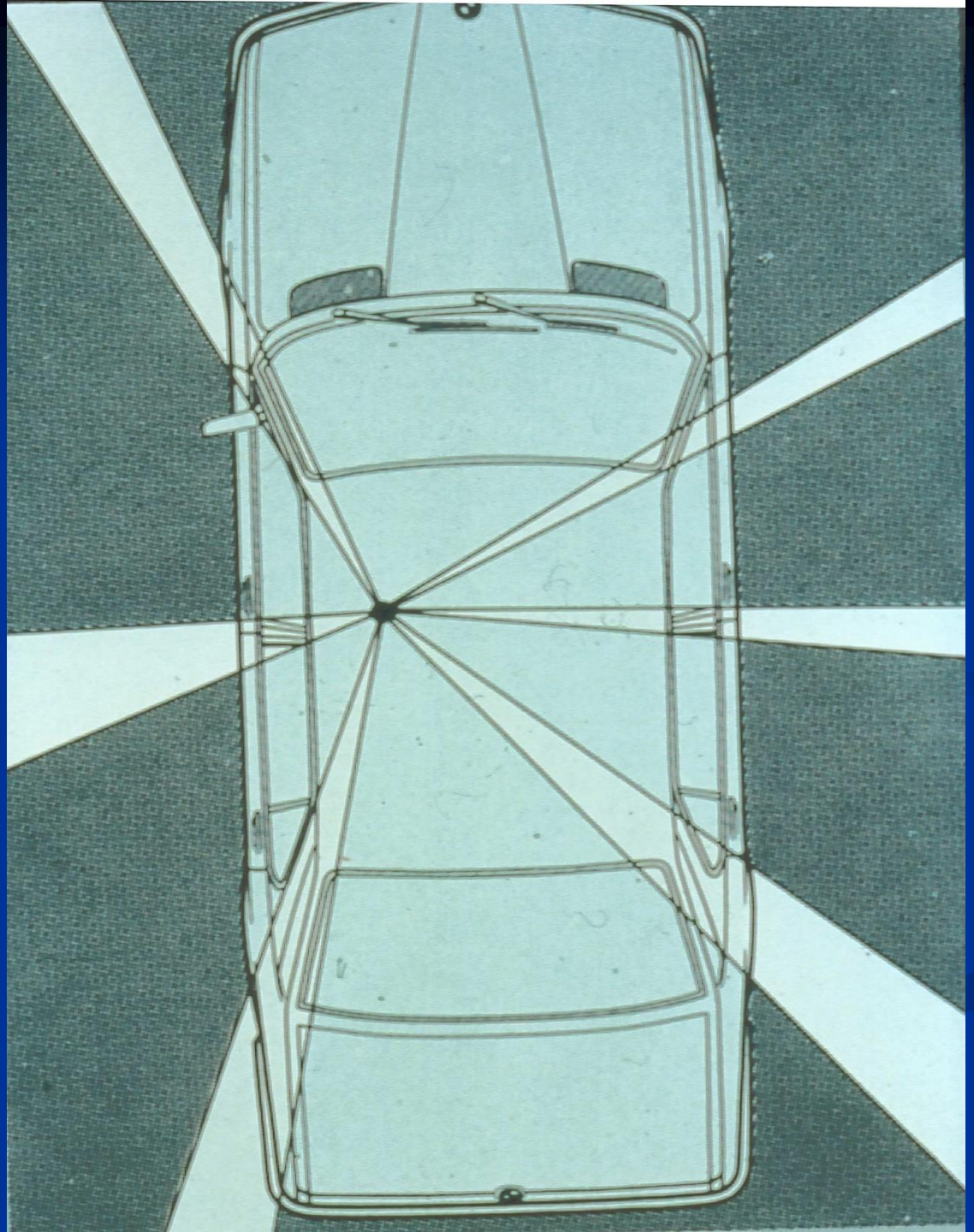
Conventional intersection:



Roundabout:



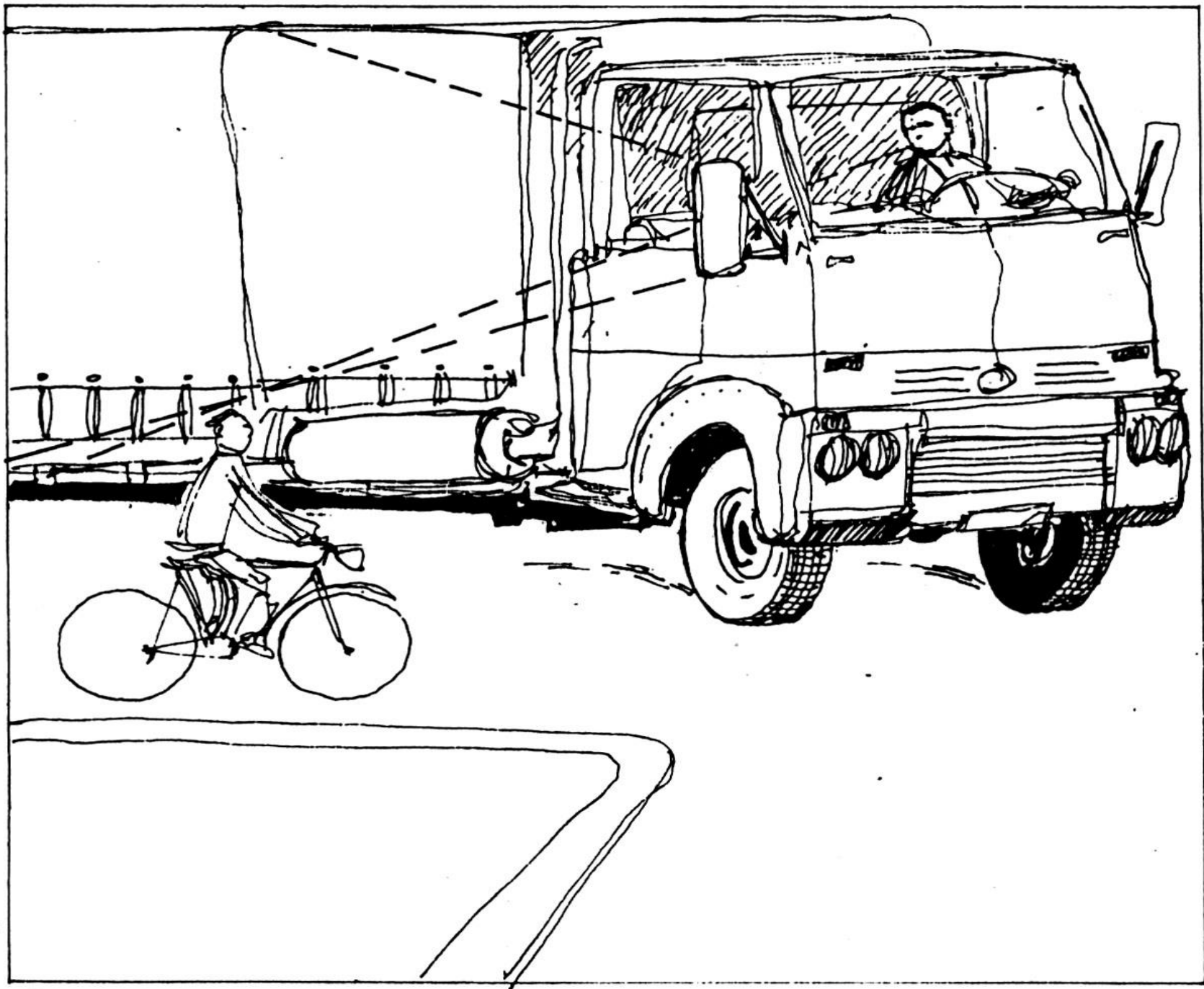
# Ergonomics of visibility

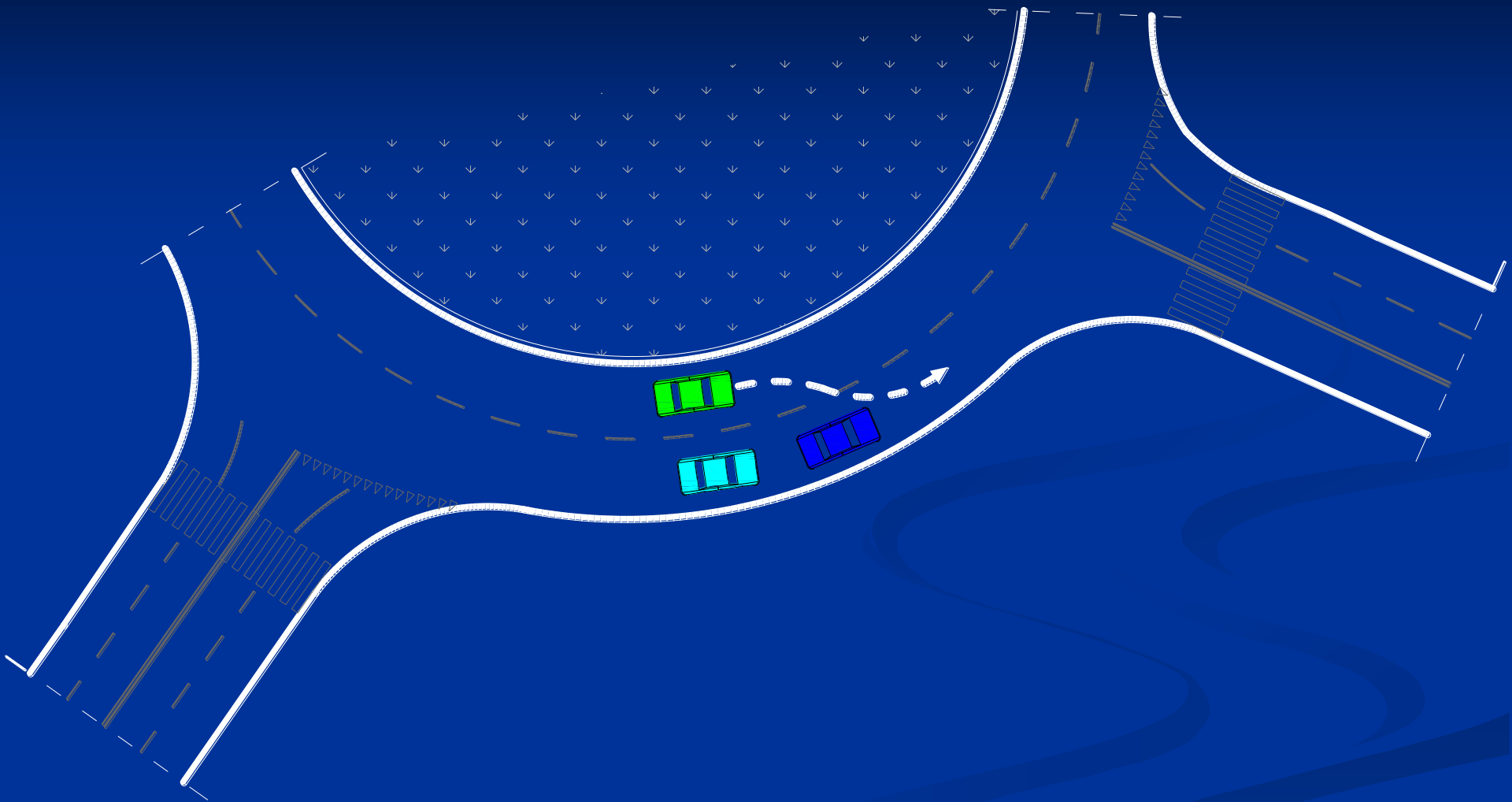


# Merging visibility





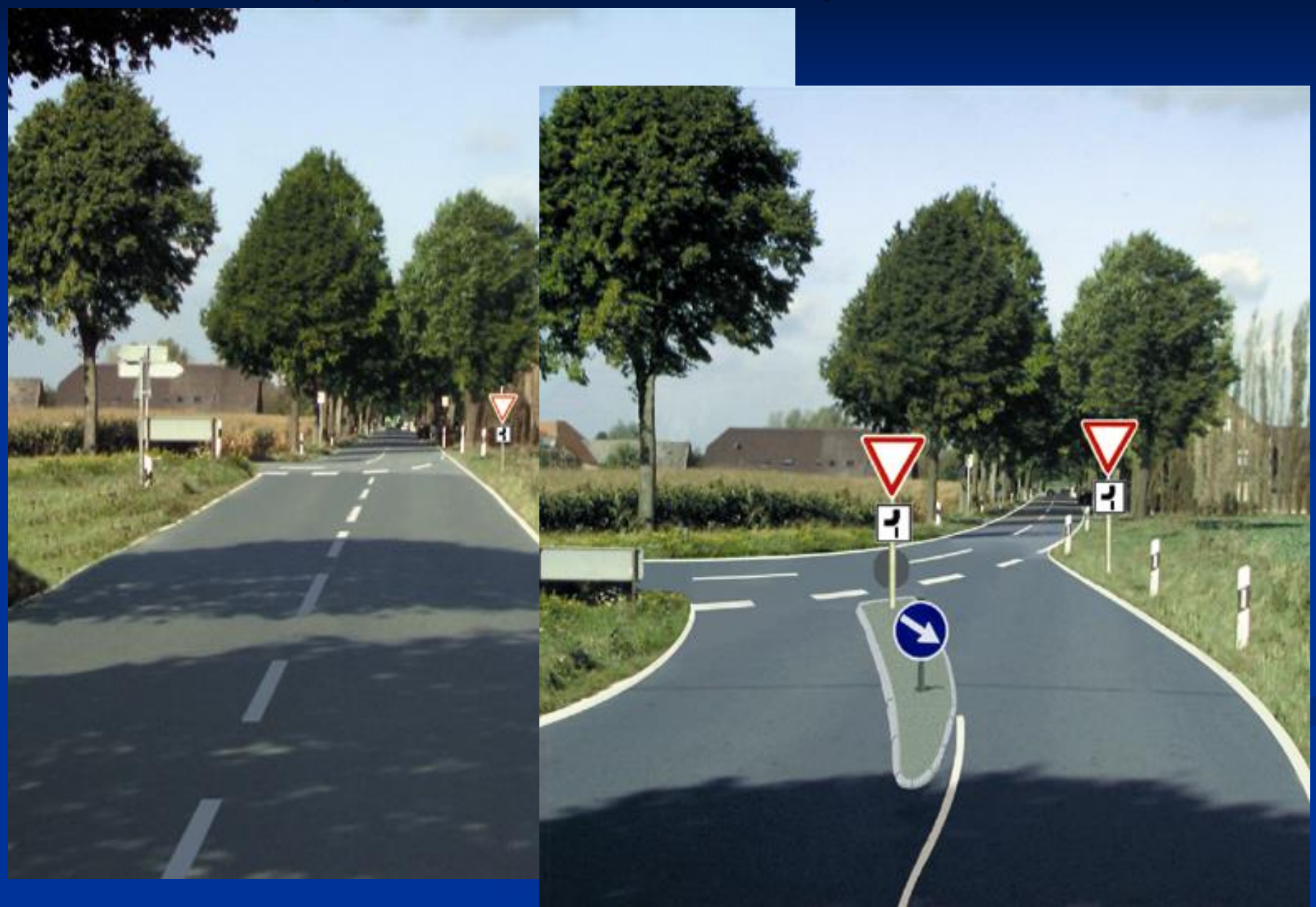






Arriving to pedestrian crossing „in the shadow”

# Typical error and improvement







Technical inspection issue



ITS is most important