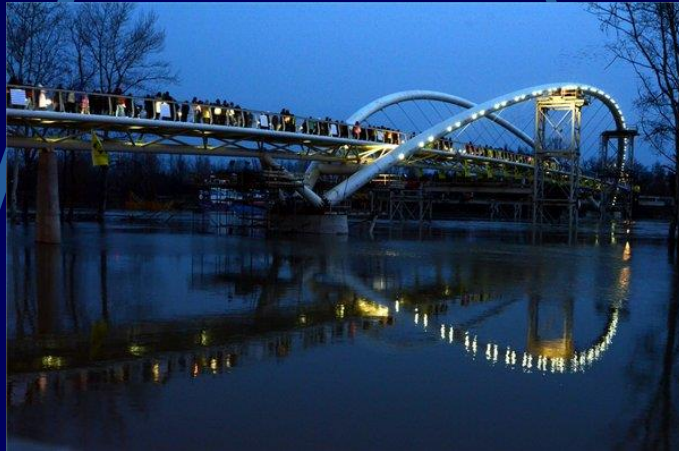


# Pedestrian and bicycle traffic



**Urban Transport 5.**  
**András Gulyás PhD habil**  
**associate professor**

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- **Pedestrian traffic**
  - Principles of pedestrian traffic
  - Elements of pedestrian traffic
  - Examples of pedestrian solutions
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# Principles of pedestrian traffic

**All movement includes pedestrian movement that is performed on the elements of the pedestrian traffic system.**

**Knowledge of pedestrian flow directions is important for planning and design of pedestrian elements as well as public areas, parks etc.**

**Common usage is possible for pedestrian and cyclists, by joint pedestrian and bicycle path or mixed usage path (with priority for pedestrians).**

# Principles of pedestrian traffic

**Planning principles: no obstacles, safety, comfort, shortness, information**

**Technical needs: lighting, winter maintenance, proper evenness and skidding resistance**

**Pedestrian zone: ambitious architectural and horticultural formation, decorative pavement, street furniture, staying areas**

**Usually pedestrian zones are in city centres (first in Hungary: Eger 1981). Pécs has a nice zone, too.**

# Elements of pedestrian traffic

## Elements of pedestrian traffic:

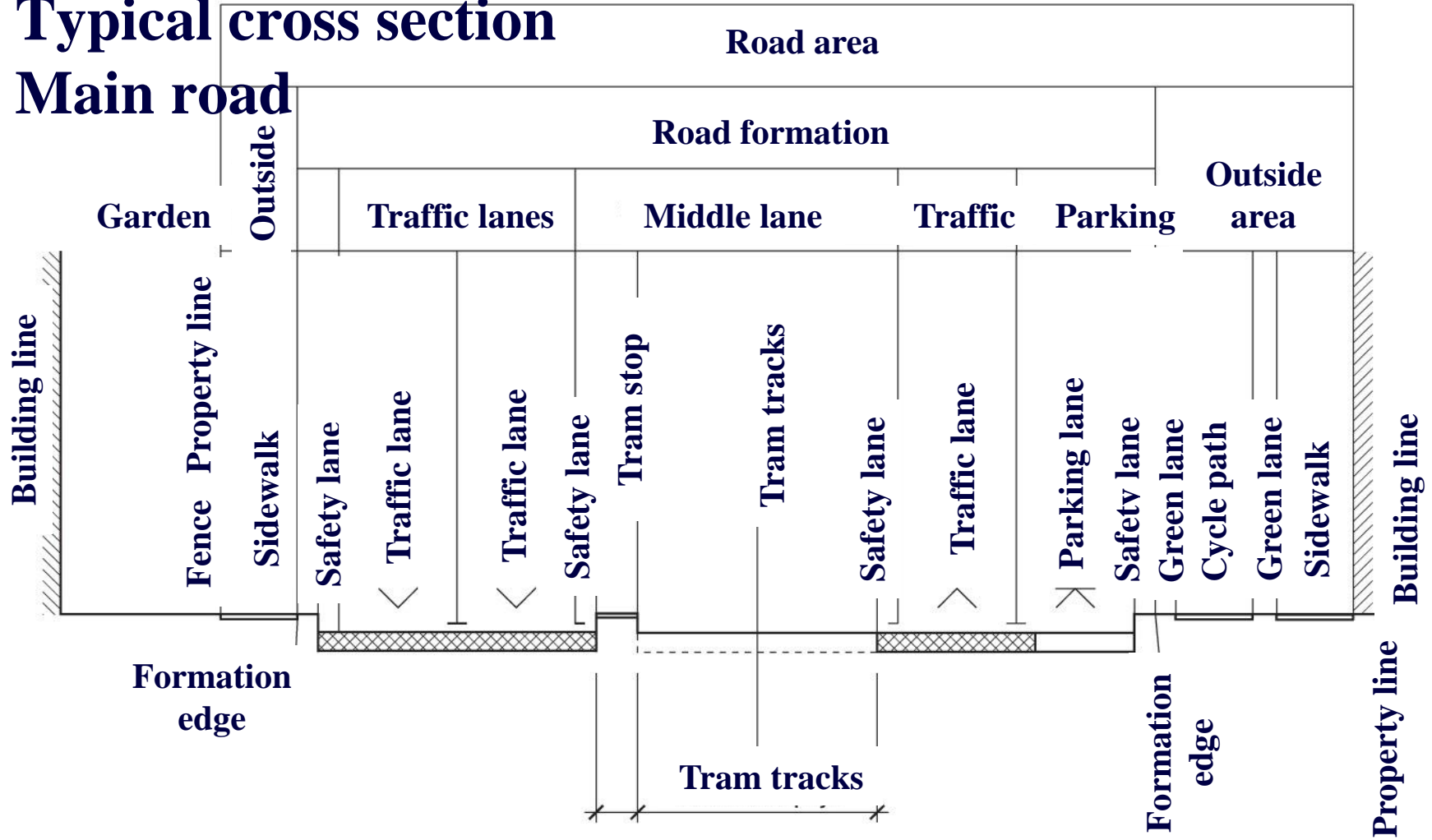
- sidewalks,
- paths (independent),
- slopes,
- stairs,
- pedestrian zones,
- dedicated crossings.

**Multilevel crossing is possible for network, safety or capacity reasons although pedestrians don't like it. Overpasses and underpasses must be directed into main pedestrian flow.**

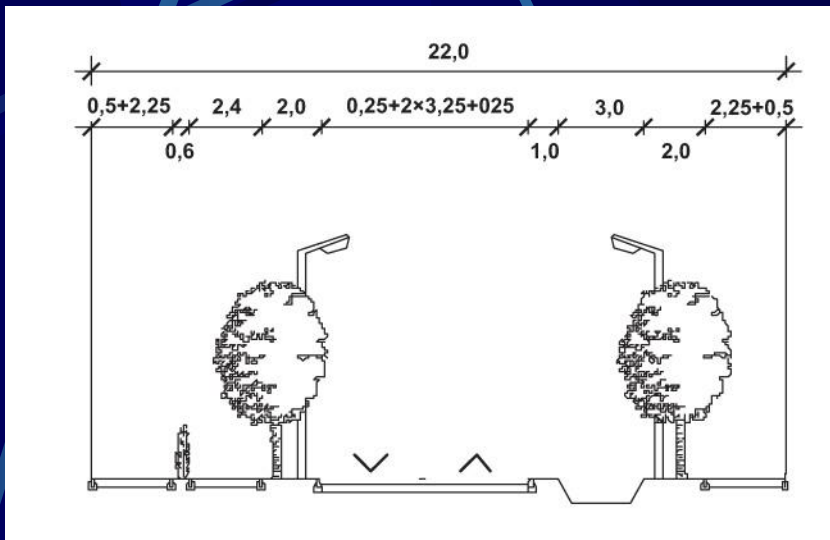
# Elements of pedestrian traffic

## Typical cross section

### Main road

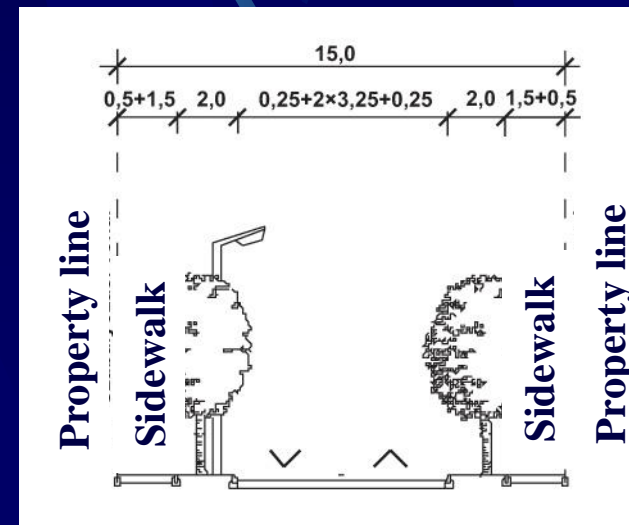


# Elements of pedestrian traffic



**Typical cross section  
Collector road**

**Typical cross section  
Service road**



# Elements of pedestrian traffic

**The fundamental formula is valid for pedestrians as well:**

$$V \text{ [person/m s]} = v \text{ [m/s]} d \text{ [person/m}^2\text{]}$$

**Capacity (for a given time unit):**

$$C \text{ [person]} = V \text{ [person/m s]} w \text{ [m]} t \text{ [s]}$$

**Capacity is affected by obstacles, street furniture, shop windows etc.**

**Opposite traffic considerably reduces capacity.**



# Elements of pedestrian traffic

Calculation of the capacity and saturation is important, especially in case of under- or overpasses, stairs and sidewalks (paths) with bigger pedestrian traffic.

Service levels in corridors:

A – F, 1600 – 3500 person/mh

Planning for peak periods: 5 or 10 minutes.

Planning mainly means calculation of necessary width trying to avoid bottlenecks and crossings.

# Elements of pedestrian traffic

**Width of sidewalks: min. 1,5 m (because of two opposite prams or baby carriages), in case of bigger traffic: 3 m or  $k * 1,5$  m.**

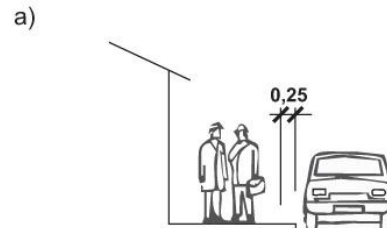
**There is a need for a safety distance at walls, fences, railings.**

**Width of independent pedestrian path: min. 3 m.**

**Stair step height in public areas: 10 - 15 cm, recommended is 13 cm.**

**Stair step depth is 60 - 64 cm.**

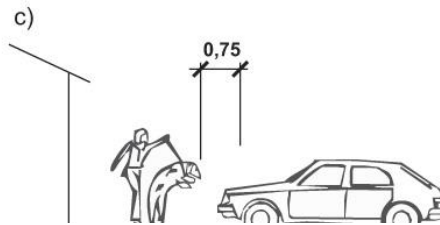
# Safety distances of sidewalks



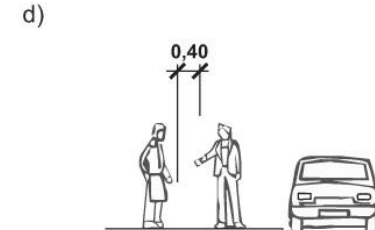
**Sideway obstacles**



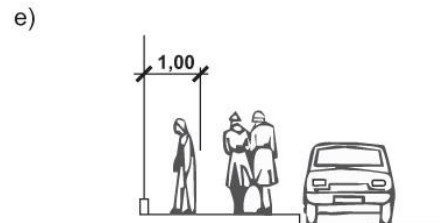
**Big volume traffic**



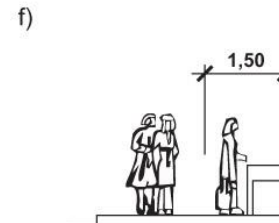
**Parking vehicles (perp.)**



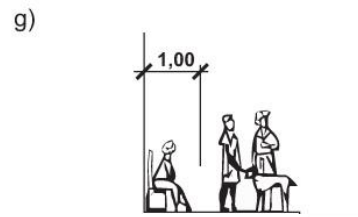
**Meeting of people**



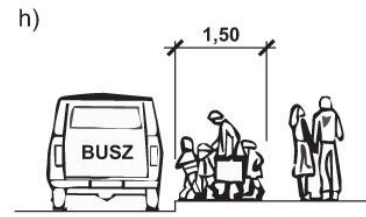
**Shop windows**



**Street shopping**



**Resting**



**Stops**

# Elements of pedestrian traffic

**In junctions, especially in signalised junctions the walking speed of pedestrians must be taken into account in planning and design.**

**Characteristic pedestrian speeds are 0,7 – 1,8 m/s, calculations are usually performed for speed values of 1,0 m/s or 1,5 m/s.**

**A properly calculated waiting area for waiting pedestrians must be provided at signalised crossings.**

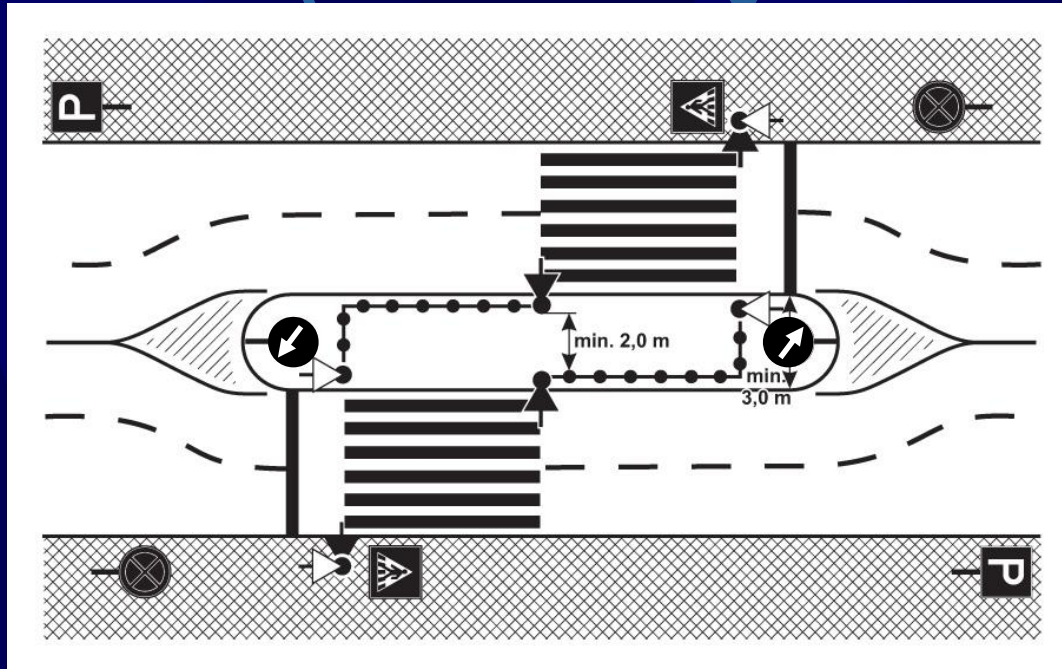
# Elements of pedestrian traffic

**Rules for dedicated pedestrian (zebra) crossings: special lighting, signalisation if necessary.**

**In case of 2 traffic lanes a dedicated crossing is obligatory above 1000 veh/h volume at 50 km/h speed or above 500 veh/h volume at more than 50 km/h speed. Below these values a dedicated crossing may still be implemented.**

**In case of 5 or more traffic lanes at built-in areas a pelican crossing (separation in the middle of the road by an isle) or a signalised crossing is needed.**

# Elements of pedestrian traffic



**Pelican crossing for pedestrians**

# Examples of pedestrian solutions



Source: Google Earth

**Finland (constructed in 1978)**

# Examples of pedestrian solutions

**Budapest  
Lövház u.**



**Constructed  
in 2010**



**Car traffic is  
physically  
restricted**



# Examples of pedestrian solutions

**The Mayday bridge in Szolnok is a new bridge on the river Tisza for pedestrian and bicycle traffic.**

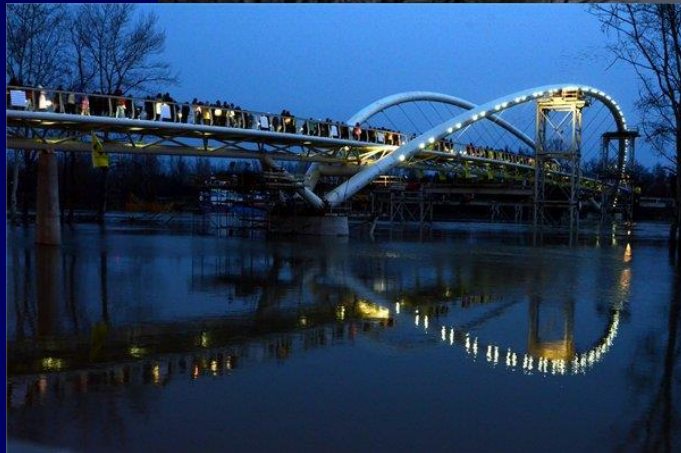
**The bridge was financed by 75 % EU funds plus 25 % local resource.**

**The special steel structure has a weight of 550 tons, its length is 444 m, the distance of its river pillars is 120 m.**

**Another example is an elevated pedestrian circle in a large intersection in China.**

# Examples of pedestrian solutions

Szolnok



Source: Internet, Photos: Túry Gergely

# Examples of pedestrian solutions

China



# Summary – pedestrian traffic

**Planning principles for pedestrian traffic:**

**no obstacles, safety, comfort, shortness, information.**

**Planning mainly means calculation of necessary width.**

**In signalised junctions the walking speed of pedestrians must be taken into account.**

**A dedicated pedestrian crossing is obligatory above certain volume and speed values of road traffic.**

# Principles of bicycle traffic

**Cycling is an environment-friendly transport mode, part of the integrated transport system.**

**There is a difference between leisure time cycling and everyday urban cycling to work or school.**

**Volume of bicycle traffic is depending on the size and structural features of the settlement, the traffic safety, the motorisation level, the public transport system, the terrain and the traditions.**

# Principles of bicycle traffic

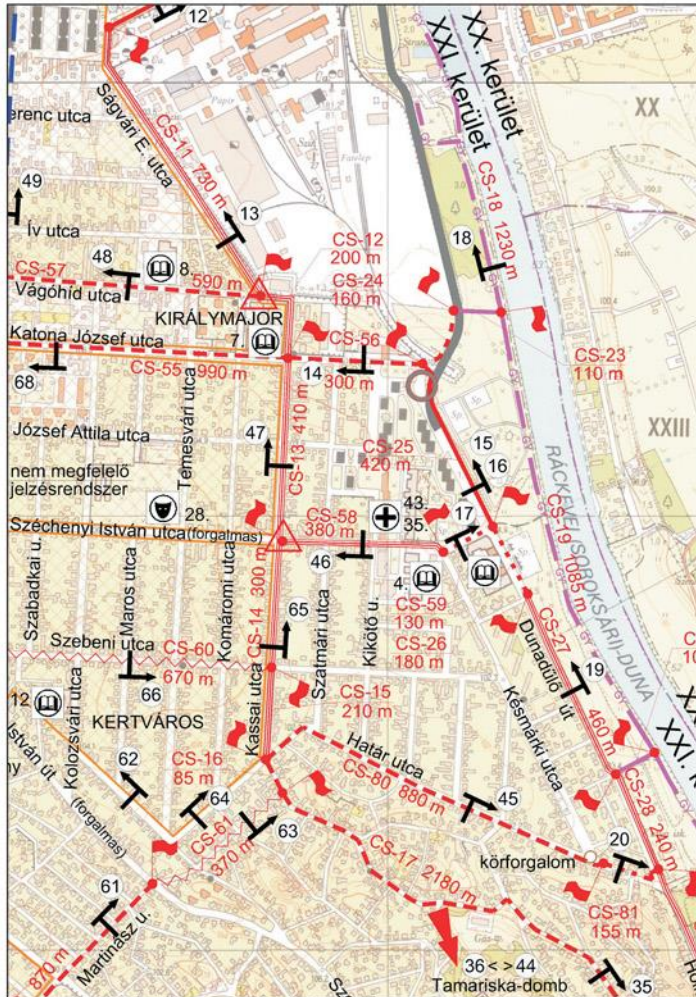
**There are more cyclists in smaller cities and plain terrain. There are traditionally bicycle trafficked countries like the Netherlands.**

**The increase of the proportion of bicycle traffic may be helped by a cyclist-friendly urban structure with proper network, parking places and good pavement quality.**

**Information system is important with maps and direction signs that can be cityscape features.**

# Elements of bicycle traffic

## Example of a bicycle network map



# Elements of bicycle traffic

## Independent elements of bicycle traffic

- **Bicycle lane**
- **Two-way bicycle path**
- **One-way bicycle path**
- **Separated bicycle and pedestrian path**
- **Unified bicycle and pedestrian path**

## Elements of bicycle traffic signed on the pavement

- **Bicycle trace – signed for emphasising the presence of cyclists and to show the place for cyclists**
- **Open bicycle lane in case of not sufficient road width**



# Elements of bicycle traffic

## Mixed traffic surfaces for bicycle traffic

- Traffic calming area
- One-way street with bicycle traffic in the opposite direction
- Low volume street (road traffic below 200 veh/h)
- Other special solutions

**The kinetical energy of an average cyclist is 30 times more than of a pedestrian – any unified or mixed traffic is a source for conflicts.**

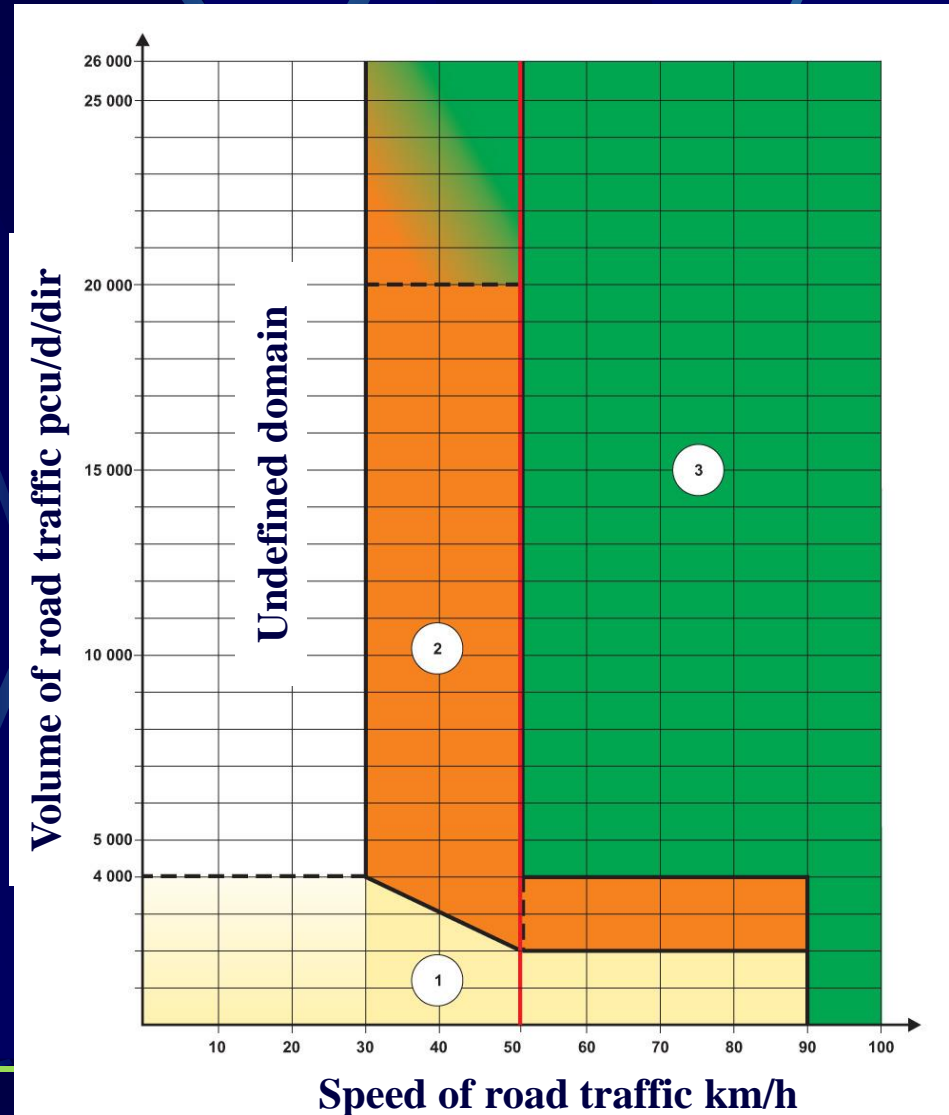
# Elements of bicycle traffic

Separation of cyclists from the road traffic depending on its volume and speed

1 – mixed

2 - transitional

3 - separated



# Elements of bicycle traffic

**Separation from pedestrians**

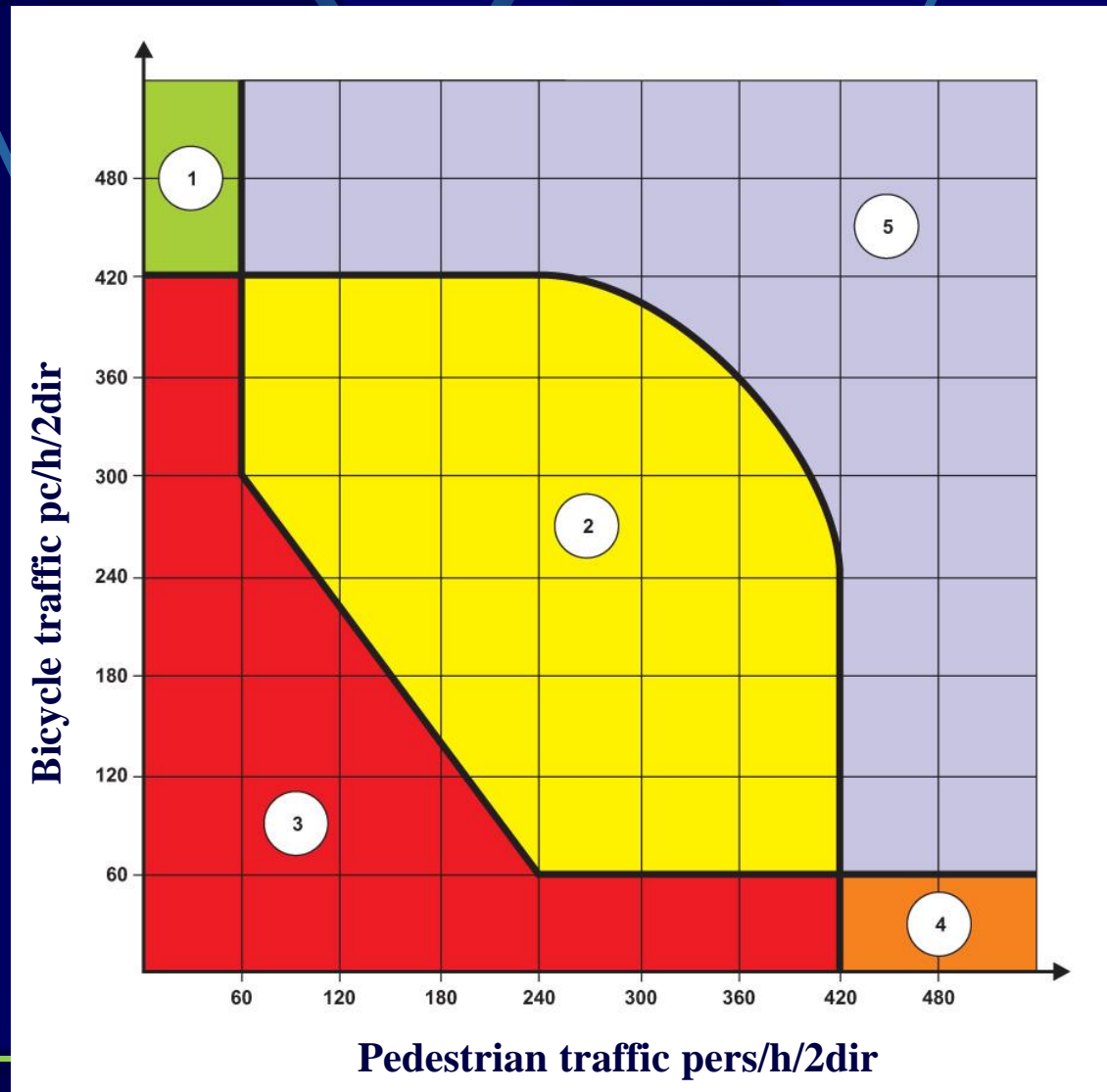
**1 – independent bicycle path**

**2 – separated**

**3 – mixed**

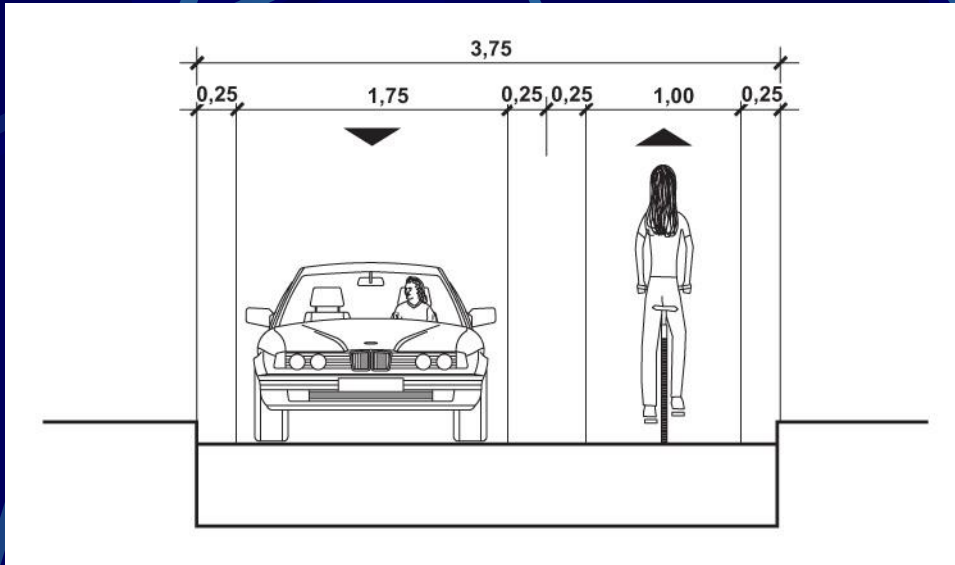
**4 – independent pedestrian path**

**5 – bicycle plus pedestrian path**

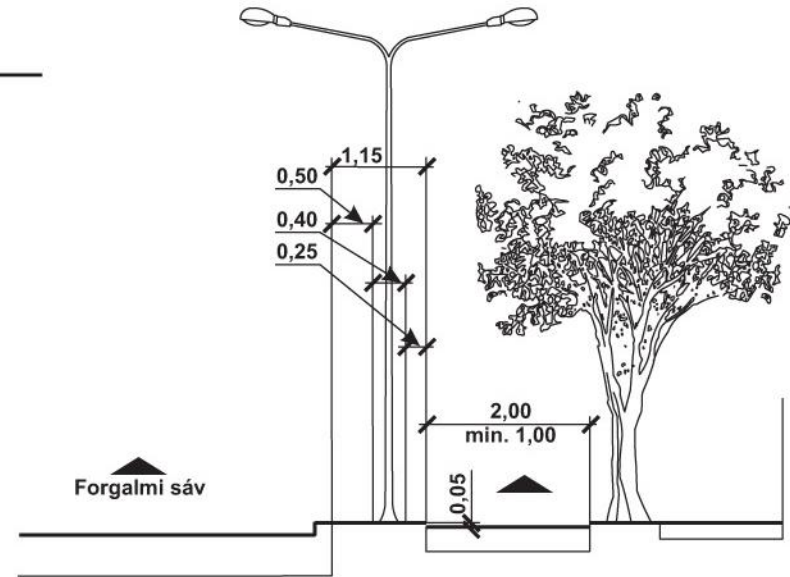


# Elements of bicycle traffic

## Typical cross sections Bicycle lane



## Typical cross sections Bicycle path



# Elements of bicycle traffic

## Examples of usable width:

- **Bicycle lane: 1,25 m (min 1,0 m),**
- **Bicycle path:**
  - **One-way: min. 1,0 m,**
  - **Two-way: min. 2,0 m,**
  - **Bigger volume: 3,0 m,**
  - **Above 20 km/h: 2,5 m,**
- **Mixed pedestrian and bicycle path: 2,75 – 3,5 m**

# Elements of bicycle traffic

**In junctions the movements of cyclists must be taken into account in planning and design.**

**In junctions the cyclists always must be seen by car drivers.**

**A coloured pavement can be applied in case of the priority of cyclists.**

**Multilevel crossing is possible for network, safety or capacity reasons although cyclists don't like it.**

**An underpass is better because of its smaller level difference.**

# Elements of bicycle traffic

**In a signalised junction an independent bicycle signal can be applied or it can be a unified pedestrian and bicycle signal.**

**In roundabouts the guidance of cyclists on an independent path is a better solution.**

**Special consideration of bicycle traffic is necessary in case of parking lanes or bus stops.**

**A bicycle path requires good pavement, drainage and lighting as well as safe alignment.**

# Elements of bicycle traffic

**Bicycle parking or storage: standard by area or capacity of attractive units.**

**Storage can be short time or long time.**

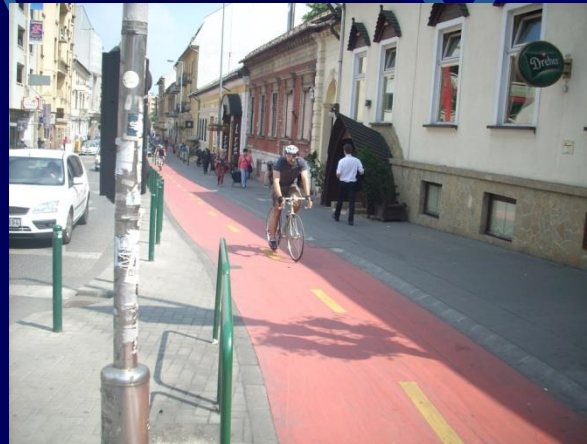
**Bicycle cases are safer at suburban railway stations.**

**A multilevel car parking or garage may contain a bicycle storage area.**

**Information of bicycle parking or storage places is important.**



# Examples of bicycle solutions



**Bicycle traffic at Budapest, Lövőház u.,  
Retek u. (one-way with opposite, signs)**



# Examples of bicycle solutions



**Bicycle and pedestrian paths,  
bicycle parking - Budapest,  
Széna tér**



# Examples of bicycle solutions



**Bicycle trace in a one-way street -  
Budapest, Varsányi Irén u.**



**Preference of the bicycle path in a  
junction - Budapest, Varsányi Irén u.**



# Examples of bicycle solutions



**Amsterdam, the Netherlands**



# Examples of bicycle solutions



**Amsterdam, the  
Netherlands**

# Examples of bicycle solutions



**Denmark**

# Summary – bicycle traffic

**Cycling is an environment-friendly transport mode, part of the integrated transport system.**

**The increase of the proportion of bicycle traffic may be helped by a cyclist-friendly urban structure.**

**Separation from road traffic and pedestrians is reasonable above certain volume and speed values.**

**Special attention is required in junctions.**

**There is a need for bicycle parking and storage.**

Thank you for your attention!

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