

SUSMILE Capsule 2.3.1 Source 1

Word document

TRAFFIC FLOW AND CONGESTION

Ing. Michal Turek, Ph.D.

Land infrastructure

A traffic flow is the movement of sets of traffic, in practice vehicles (or pedestrians), moving along a particular land road in one direction behind or alongside each other in one direction.

Traffic density is a parameter for determining the quality of a formula:

$$H = I / V$$

where:

H - traffic density [cars/km],

I - traffic volume [wagon/h],

V - average travel speed of passenger cars [km/h].

Traffic density indicates how many vehicles are on a section of road at a given time.

The traffic intensity determines the number of vehicles that will pass through a certain cross-section of the road or parts of it in one direction in a selected period of time.

A lane is a section of roadway that allows vehicles to travel in a single lane in succession.

A road is a thoroughfare intended for use by road and other vehicles and pedestrians, including fixed facilities necessary to ensure such use and its safety. Surface roads are divided into the following categories: motorways; roads; local roads; dedicated roads.

Roads are divided according to their purpose and transport importance into: expressways; Class I roads; Class II roads; Class III roads. Roads and motorways are further subdivided according to the nature of the traffic into: unrestricted access roads, expressways and limited access motorways.



The free traffic flow represents the traffic flow at which the traffic density approaches zero and vehicles reach the maximum permissible speed.

Road capacity

Capacity indicates the maximum number of vehicles that can travel along a road in one direction or in both directions together (a specified section) per unit of time under given conditions.

Factors affecting capacity are mainly:

- construction conditions,
- traffic conditions,
- climatic conditions,
- longitudinal gradient,
- proportion of slow vehicles,
- lateral layout,
- possibility of overtaking.

Intensity of traffic flow

The traffic flow intensity determines the number of vehicles that will pass through a particular cross-section of the road or parts of it in one direction in a selected period of time.

It is the number of vehicles that have passed through the road profile in a period of time. Intensity is thus expressed as the ratio of the number of vehicles to the time. Depending on the time period (in relation to a specific aspect or aspects) for which the intensity is expressed, the following types of intensity are distinguished, for example:

- hourly traffic volume,
- daily traffic volume.

The traffic volume is determined either from previous traffic surveys or by carrying out and evaluating it according to the source of the information on:

- long-term counts, which are mainly carried out on roads of higher traffic significance by automatic traffic detectors, which record traffic volume by vehicle type and older types record the volume of all vehicles in total. These are mainly speed detectors, camera systems and dynamic traffic light control,
- national traffic counts are carried out on selected roads in five-year cycles by automatic traffic detectors and by short-term surveys carried out manually on specific sections.



Speed

The driver must adapt his speed to his immediate abilities, the characteristics of the vehicle and load, the anticipated structural and traffic engineering condition of the road, weather conditions and other foreseeable circumstances. He may drive only at such a speed as to be able to stop the vehicle within the distance for which he has visibility.

Speed is one of the most widely observed components in traffic and is physically distinguished into instantaneous speed and average speed.

Instantaneous speed is the speed at a given moment in time.

Average speed, which is given as the total distance covered in a given time over short selected sections.

Average travel speeds on roads by level of service (LOS).

Transport quality level

The traffic quality level indicates the assessment of the quality of traffic conditions on the roads, which are divided into traffic quality level grades as shown in the table below:

Traffic Quality Level Designation:

- A - traffic flow is smooth
- B - free flow of traffic is restricted
- C - traffic condition is stable
- D - traffic condition is still stable
- E - lane capacity is reached
- F - section is congested

Characteristics of transport quality:

- A - very good
- B - good
- C - satisfactory
- D - adequate
- E - unstable
- F - unsatisfactory



Traffic density:

- A - less than 5 vehicles per kilometre
- B - less than 12 vehicles per kilometre
- C - less than 20 vehicles per kilometre
- D - less than 30 vehicles per kilometre
- E - less than 40 vehicles per kilometre
- F - more than 40 vehicles per kilometre

Grades A to D correspond to the level of traffic flow intensity at which the required traffic flow COD is achieved. The different levels of TQO describe the characteristics of the traffic quality on a given section and are an important factor for road users when choosing a route.

Tools to reduce traffic congestion

Tools to reduce traffic congestion include:

- urban charging
- banning vehicles from entering city centres
- increasing the capacity of transport infrastructure
- reducing the demand for individual car transport
- reducing congestion through traffic lights
- preference for occupied vehicles

Sources:

ČSN 736101: Projektování silnic a dálnic. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2004.

ČSN 736110: Projektování místních komunikací. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2006.

TECHNICKÉ PODMÍNKY 123: Zjišťování kapacity pozemních komunikací a návrhy na odstranění kongescí. Praha: CityPlan s.r.o., 1999

