

## 30.8 TRAFFIC ENGINEERING

Traffic engineering is a branch of civil engineering that uses engineering techniques to achieve the safe and efficient movement of people and goods. It focusses mainly on research and construction of the immobile infrastructure necessary for this movement, such as roads, railway tracks, bridges, traffic signs and traffic lights.

Increasingly, however, instead of building additional infrastructure, dynamic elements are also introduced into road traffic management (they have long been used in rail transport). These use sensors to measure traffic flows and automatic, interconnected guidance systems (e.g. traffic signs that open a lane in different directions depending on the time of the day) to manage traffic, especially in peak hours.

The relationship between lane flow ( $Q$ ) (vehicles per hour), maximum speed ( $V$ ) (kilometres per hour) and density ( $K$ ) (vehicles per kilometre) is  $Q = KV$ . Observation on limited access facilities suggests that up to a maximum flow, speed does not decline while density increases, but above a critical threshold, increased density reduces speed, and beyond a further threshold, increased density reduces flow as well. Therefore, managing traffic density by limiting the rate that vehicles enter the highway during peak periods can keep both speeds and lane flows at bottlenecks high. Ramp meters, signals on entrance ramps that control the rate at which vehicles are allowed to enter the mainline facility, provide this function (at the expense of increased delay for those waiting at the ramps).

Highway safety engineering is a branch of traffic engineering that deals with reducing the frequency and severity of crashes. It uses physics and vehicle dynamics, as well as road-user psychology and human factors engineering, to reduce the influence of factors that contribute to crashes.

Traffic engineering is closely associated with other disciplines such as:

1. Transport engineering
2. Highway engineering
3. Transportation planning
4. Urban planning
5. Human factors engineering

Highway engineering is the process of design and construction of efficient and safe highways and roads. It became prominent in the twentieth century and has its roots in the discipline of civil engineering. Standards of highway engineering are continuously being improved. Concepts such as grade, surface texture, sight distance and radii of horizontal bends and vertical slopes in relation to design speed and in addition to road junction design (intersections and interchanges) are all important elements of highway engineering. Most developed nations have extensive highway networks. Transportation planning is the field involved with the development of transportation facilities such as streets, highways, sidewalks, bike lanes and public transport lines. Transportation planning historically has followed the rational planning model of defining goals and objectives, identifying problems, generating alternatives, evaluating alternatives and developing the plan.

## 30.9 MUNICIPAL OR URBAN ENGINEERING

Municipal engineering is concerned with municipal infrastructure. This involves specifying, designing, constructing and maintaining streets, sidewalks, water supply networks, sewers, street lighting, municipal solid waste management and disposal, storage depots for various bulk materials used for maintenance and public works, such as salt and sand, public parks and bicycle paths. In the case of underground utility networks, it may also include the civil portion of the local distribution networks of electrical and telecommunication services. It can also include the optimizing of garbage collection and bus service networks. Some of these