

# LEVEL OF SERVICE DEFINITIONS

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## THE LEVEL OF SERVICE CONCEPT

A Level of Service (LOS) is a letter designation that describes a range of operating conditions on a particular type of facility. The 1994 Highway Capacity Manual defines levels of service as “qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers.”

The critical point in this definition is the need to define service quality in terms that are perceived by drivers and passengers. Several key measures are used to describe service quality in these terms:

- ❑ Speed and travel time. One of the most easily perceived measures of service quality is speed, or its inverse, travel time. Drivers and passengers alike are keenly aware of the amount of time it takes to get from place to place. On freeways, speed is a very evident measure of service quality, while on street systems, the driver is very sensitive to total travel time.
- ❑ Density. Density is a parameter not often used in traffic analysis. Nevertheless, it is an excellent descriptor of service quality in many cases. Density describes the proximity of vehicles to each other in the traffic stream and reflects ease of maneuverability in the traffic stream, as well as the psychological comfort of drivers.
- ❑ Delay. Delay can be described in many ways. Highway capacity analysis uses delay in several different ways. At intersections, delay is defined in terms of the average stopped time per vehicle traversing the intersection. On rural two-lane highways, percent time delay is defined as the percent of time that all drivers spend in platoons behind slow-moving vehicles they cannot pass. In any of its uses, it represents excess or additional travel time due to traffic conditions or controls. Delay times

are portions of travel time that are particularly obvious to drivers and are particularly annoying or frustrating.

- ❑ Other measures. A variety of other measures are used to describe service quality. In some cases, measures used are not directly discernible to drivers or passengers. Such measures generally rely upon volumes or flow rates because the state of the art does not yet include other calibrated quality measures.

Six levels of service are defined for capacity analysis. They are given letter designations A through F, with LOS A representing the best range of operating conditions and LOS F the worst. The specific terms in which each level of service is defined vary with the type of facility involved. In general, LOS A describes a free-flowing condition in which individual vehicles of the traffic stream are not influenced by the presence of other vehicles. LOS F generally describes breakdown operations (except for signalized intersections) which occur when flow arriving at a point is greater than the facility's capacity to discharge flow. At such points, queues develop, and LOS F exists within the queue and at the point of the breakdown. Levels of service B, C, D, and E represent intermediate conditions, with the lower bound of LOS E often corresponding to capacity operations.

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The six levels of service are generally described as follows.

- ❑ Level of Service A: This is a condition of free flow, accompanied by low volumes and high speeds. Traffic density will be low, with uninterrupted flow speeds controlled by driver desires, speed limits, and physical roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.

- ❑ Level of Service B: This occurs in the zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation. Reductions in speed are not unreasonable, with a low probability of traffic flow being restricted. The lower limit (lowest speed, highest volume) of this level of service has been used in the design of rural highways.
- ❑ Level of Service C: This is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained, with service volumes suitable for urban design practice.
- ❑ Level of Service D: This level of service approaches unstable flow, with tolerable operating speeds being maintained, though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low. These conditions can be tolerated, however, for short periods of time.
- ❑ Level of Service E: This cannot be described by speed alone, but represents operations at lower operating speeds, typically, but not always, in the neighborhood of 30 miles per hour, with volumes at or near the capacity of the highway. Flow is unstable, and there may be stoppages of momentary duration. This level of service is associated with operation of a facility at capacity flows.
- ❑ Level of Service F: This describes a forced-flow operation at low speeds, where volumes are below capacity. In the extreme, both speed and volume can drop to zero. These conditions usually result from queues of vehicles backing up for a restriction downstream. The section under study will be

serving as a storage area during parts or all of the peak hour. Speeds are reduced substantially and stoppages may occur for short or long periods of time because of the downstream congestion.

The above information was taken directly from Traffic Engineering, by William R. McShane and Roger P. Roess 1990, and Traffic Engineering Theory and Practice, by Louis J. Pignataro 1973.