

Operational Effects of 2+1 Roadways Summary

Capacity

It has been found that 2+1 roads improve the traffic operational level of service for two-lane roads without increasing their capacity. A 2+1 road will generally operate at least two levels of service higher than a conventional two-lane highway serving the same traffic volume. Under ideal or near ideal conditions, 2+1 roads can operate at level of service C or better for any traffic volume that does not exceed the capacity of a two-lane road. Capacity for a two-lane roadway under ideal conditions is 1,700 vehicles per hour (vph) in one direction, with total bi-directional volume not to exceed 3,200 vph (Highway Capacity Manual, 2010). However, the Green Book recommends 2+1 roads be used for traffic flow rates up to 1,200 vph in one direction of travel.

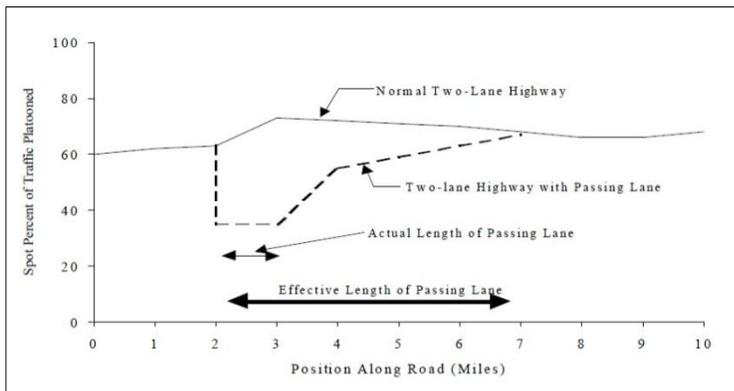
Passing Lane Length

The optimum length of the passing lane (without tapers) should be 0.5 to 1.0 miles, lengths of less than 0.5 miles should not be used as they are not effective in reducing vehicle platooning. Beyond a 1.0-mile length, the downstream portion of a passing lane may be underused for passing maneuvers. However, on roads with flow rates of 700 vph or more in one direction, passing lanes 2.0 mile in length may remain operationally effective.

The Table to the right presents optimum passing lane length as a function of directional traffic volume.

It should be noted that passing lanes can have an effective length greater than their physical length, where platoons are reduced up to 6 miles beyond the passing lanes (see Figure below). This allows sections of 2+1 roadways to reduce the overall number of lanes to two for extended lengths to fit site constraints, without significantly impacting the level of service of the roadway.

One-Way Flow Rate (veh/h)	Passing Lane Length (mi)
100-200	0.5
201-400	0.50-0.75
401-700	0.75-1.00
701-1200	1.00-2.00



2+1 roads can operate safely and effectively in areas where minor intersections and driveways provide direct access to the roadway. Major intersections should generally be located in the buffer areas between passing lanes in opposing directions of travel and should have left-turn lanes provided.

Safety Performance

Comprehensive safety evaluation of 2+1 designs have not been completed within the United States. However, NCHRP Project 20-7 evaluating the performance of 2+1 roadways in Europe and found the following results.

- In Germany, 2+1 roads have been found to operate with accident rates 36 percent lower than conventional two-lane highways.
- Finland has estimated that 2+1 roads operate with accident rates 22–46 percent lower than conventional two-lane highways.
- Sweden observed a 55 percent reduction in fatal and injury accidents with the implementation of 2+1 roads using the cable barrier median design (which is not recommended in the US).