



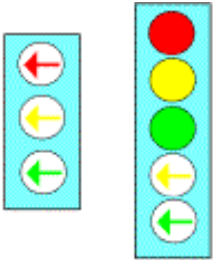
Street Department

901 N. Nelson
Spokane, WA 99202

Informational Handouts

Left Turn Signals

Left-Turn Signal Phasing



Left-turn signal phases facilitate left-turning traffic and may improve the safety of the intersection for left-turning vehicles. However, this is done at the expense of the amount of green time available for through traffic and will usually reduce the capacity of the intersection. Left-turn arrows also result in longer cycle lengths, which in turn have a detrimental effect by increasing stops and delays. Pedestrian delays may be increased and due to the increased delay, pedestrians may elect to ignore the pedestrian signals.

While phases for protected left-turning vehicles are popular and commonly requested, other methods of handling left-turn conflicts also need to be considered. Potential solutions may include prohibiting left-turns and geometric improvements.

Left-Turn Phase Criteria

The three left-turn phase criteria presented below are the result of considerable research and study. These three criteria are used in numerous States, including Washington, as warrants for the installation of separate left-turn phases at a signalized intersection.

1. **Traffic Volumes:** Separate left-turn phasing may be considered when:
 - The product of the left-turning and opposing through volumes during the peak hour exceed 100,000 on a four-lane street (2 approach lanes), or 50,000 on a two-lane street (1 approach lane)
 - The left-turn volume is greater than two vehicles per cycle during the same peak hour period.

Volumes meeting these levels are only an indication that a left-turn phase may be justified. Further study of the intersection is recommended, including review of other potential solutions.

2. **Delay:** Separate left-turn phasing may be considered if:
 - The total delay to all the left-turning vehicles on a crucial approach equals or exceeds two vehicle hours during a peak hour.
 - There is a minimum left-turn volume on the approach of greater than two vehicles per cycle during the same peak hour.



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- The average delay for all left-turning vehicles on the approach is at least 35 seconds during that same peak hour.
3. **Collision Experience:** Separate left-turn phasing may be considered if the critical number of reportable left-turn collisions has occurred. These are:
 - For one approach to the intersection, the critical number is five left-turn collisions in one year, or seven in two years.
 - For both approaches to an intersection, the critical number is seven left-turn collisions in one year, or eleven in two years.
 4. **Air Quality:** Vehicle delay is increased when protected left turn movements are implemented. As the left turning vehicles are protected with a green arrow, all other vehicles are idling in front of a red ball signal indication. Due to the increased idling, air quality can be severely compromised. Because of this, even if an intersection meets the other criteria, if an air quality analysis shows unacceptable degradation, a protected left turn may not be approved.

Protected/Permitted Left-Turn Phasing

Protected/Permitted left-turn phasing is a left-turn movement of traffic at a signalized intersection having a separate left-turn phase in the signal cycle to provide a protected green arrow interval, as well as a non-protected circular green interval. Use of the protected/permitted left-turn phasing technique is based on the assumption that the need for a protected left-turn interval has been established. One of the basic precepts of the protected/ permitted left-turn phasing is that the protected arrow is displayed only when needed in a traffic demand condition. The protected/permitted left-turn phasing technique is an efficient concept opposed to a collision reduction concept; it will probably offer safer operation than permissive operation only.

Protected Only Left-Turn Phasing

When a separate interval is provided to accommodate a left-turn without allowing any conflicting traffic, a protected only left-turn phasing occurs. With a protected only left-turn, vehicles are only permitted to turn left when the left-turn green arrow is activated and turns are prohibited on the circular green indication.

Unprotected Left-Turn Phasing

Unprotected (permissive) left-turn phasing occurs when there is no exclusive phase provided for left-turn vehicles. Left-turns are permitted during a circular green when there are sufficient gaps in opposing traffic flow to allow a left-turning vehicle to safely make the turn. Exceptions would be at those locations where turns are restricted by signs or other devices. Separate left-turn lanes may or may not be provided.