



TRAFFIC AND SAFETY MANUAL

Chapter 4 – Signals 4B – Installation Justification

Installation Justification

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General

Traffic signals are a form of traffic control device requiring a high level of decision-making for drivers which can lead to increases in crash rates when installed at inappropriate locations. In addition, traffic signals can increase overall delays for traffic, particularly when traffic volumes are light. Marginally warranted traffic signals can increase delays by as much as 200% when replacing two-way stop control. Due to the possibility of increased crashes and delay, traffic signals and other alternatives should be analyzed before committing to installation. (See Section 4B.04 of MUTCD and [NCHRP Report 457](#))

Reviewing Warrants

Data collection will vary by location for review of traffic signal warrants. Since traffic signal warrants are a method of screening locations that justify further consideration of traffic signals from locations that do not justify traffic signals, it is recommended to collect data that correlates to the warrants related to the perceived problem that initiated the consideration of signalization. For example, if crashes are the reason for considering traffic signals, crash history should be gathered and the crash experience warrant reviewed.

If a traffic signal warrant is met, an in-depth engineering study of safety and operations of the existing conditions and several alternatives (including traffic signals) should be conducted. Data needs for the in-depth study include:

- Turning movement counts for the peak hours and the 8th highest volume hour when hourly volumes for the day are ranked reflecting a “typical” day. These counts should be in 15 minute intervals and include percent of heavy vehicles and pedestrian data if significant.
- Crash history (3 years). Copies of the actual reports are preferred since they may indicate why the crash occurred in addition to the general crash details such as direction, type, etc.
- Intersection layout details including number and width of lanes, approach speeds and grades, sight obstructions, intersection angle, length of turn bays, distance to adjacent railroads, etc.
- Location of existing and potential adjacent traffic control (stop signs or traffic signals) located within ½ mile on each approach.
- For adjacent traffic signals, timings and coordination plans should be provided.

Analyzing

The first step in analyzing a potential traffic signal location is to evaluate the existing traffic conditions versus the traffic signal warrant requirements of the Manual on Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA). The MUTCD provides minimum requirements for installation of traffic signals. The MUTCD warrants (Section 4C

of the MUTCD) were developed by reviewing crash data and operations at signalized and unsignalized intersections under a variety of traffic volumes. The signal warrants represent minimum conditions, which may result in improved safety or operations.

The traffic signal warrants identify threshold conditions that, if found to be satisfied as part of an engineering study, shall result in analysis of other traffic conditions or factors to determine whether a traffic control signal or other improvement is justified.

Locations not meeting the minimum warrant requirements of the MUTCD should not be considered for signalization.

Crash history should be analyzed for the previous three years at warranted (potential) traffic signal locations. The crash history analysis should include crash rate (collision/million entering vehicles), crash type (i.e.: rear end, right angle, etc.), time of day/day of week patterns, weather/surface condition patterns, and driver characteristic patterns. The crash history analysis will provide the basis for evaluating alternatives and projecting the impact of signalization on safety.

Capacity analysis should be provided for the normal daily peak hour traffic and the 8th highest hour traffic. Other peak hours should also be analyzed if traffic patterns (approach volumes, turning percentages) vary significantly during the day. Analysis should be provided with the existing traffic control, the proposed signalization, and any feasible traffic control or geometric modification alternatives.

For locations located within ½ mile of an existing or planned traffic signal, the capacity analysis should include capacity analysis of the effects of coordination on delay and progression at the signalized locations within ½ mile and on traffic signals, which would be part of the system.

Application for Approval for a Traffic Control Device

All traffic signals installed on roadways under the jurisdiction of the Iowa DOT shall have an approved [Application for Approval of a Traffic Control Device](#) (TCD Application) before construction. Additional applications, such as [Approval to Perform Work within DOT Right-of-Way](#), may also be necessary. Both of these documents are on the Iowa DOT Forms Page.

Before approval of the TCD application, the traffic signal must be deemed justified as described in the MUTCD. The TCD application must be accompanied by a preliminary set of legible 11" x 17" or 8 ½" x 11" scalable layout plans with pole, controller, detection, and signal head locations.

The TCD application will be approved without conditions, approved with conditions, or rejected with items to be addressed. Final plans and the application must be submitted to and approved by the Office of Traffic and Safety before construction.

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