

Traffic Signal Warrant Analysis

Traffic signal warrant analyses were completed at selected intersections along Dewey Street from S. 35th Street to S. 10th Street. The signal warrant analyses were performed to review the possible need for traffic signals at the following six non-signalized intersections along Dewey Street, from west to east:

- S. 35th Street
- S. 26th Street
- S. 23rd Street
- S. 18th Street
- S. 14th Street
- S. 10th Street

Vehicular turning movement counts and pedestrian counts were collected by the City of Manitowoc Department of Public Works in January and February 2009. The raw count data can be found in **Appendix A**.

The vehicular turning movement data was used for traffic signal warrant analyses for three separate years: existing year 2009, future year 2020, and future year 2030. The May 2009 Traffic Forecast Report for Dewey Street, provided by WisDOT, was used to derive the appropriate annual growth rate for the future years. Where traffic forecast information was not provided a 1.4% growth rate was applied to forecast 2020 traffic volumes and a 1.2% growth rate to forecast from 2020 to 2030 traffic volumes.

For warrant analysis all minor street approaches were considered as one left-through-right lane, even if pavement width observed in the field may allow a right turning vehicle to bypass a left or through vehicle. Due to this lane configuration, the right turn volumes have been included in analysis, per the WisDOT Traffic Signal Design Manual.

Dewey Street is a four lane roadway from west of S. 35th Street to S. 18th Street. East of S. 18th Street, Dewey is driven as two lanes with a parking lane. Dewey Street was considered the major street at all intersections except at S. 10th Street, where Dewey Street was the minor street approach.

The following summarizes the eight signal warrants used for analysis as described in the Manual on Uniform Traffic Control Devices (MUTCD).

Warrant 1 – Eight-hour Vehicular Volume

Warrant 1 is met when traffic volumes on the major street and higher volume minor street during any eight or more hours of a day concurrently exceed established threshold volumes. Warrant 1 includes Warrant 1A – Minimum Vehicular Volume, and Warrant 1B – Interruption of Continuous Traffic.

The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Warrant 2 – Four-hour Vehicular Volume

Warrant 2 is met when traffic volumes on the major street and higher volume minor street for each of any four or more hour of an average day concurrently exceed established threshold volumes. To meet this warrant, the plotted points representing the major and minor street volumes must fall above the applicable curve in Figure 4C-1 or 4C-2 of the MUTCD.

Warrant 3 – Peak Hour

Warrant 3 is met when traffic volumes on the major street and higher volume minor street during the peak traffic hour of the day concurrently exceed established threshold volumes. To meet this warrant, the plotted points representing the peak hour major and minor street volumes must fall above the

applicable curve in Figure 4C-3 or 4C-4 of the MUTCD. The peak hour signal warrant alone shall be applied only in unusual cases, such as office complexes, manufacturing plants, or industrial complexes that attract or discharge large numbers of vehicles in a short time.

Warrant 4 – Pedestrian Volume

Warrant 4 is met when pedestrian volumes crossing the major street during an average day are 100 or more during any 4 hours or 190 or more during any 1 hour, and if fewer than 60 traffic gaps per hour occur that are adequate for pedestrians to cross.

Warrant 5 – School Crossing

Warrant 5 is met when a traffic engineering study shows that a sufficiently large number of school-aged pedestrians cross the major street without an adequate number of traffic gaps to accommodate these pedestrians.

Warrant 6 – Coordinated Signal System

Warrant 6 is considered when installing a traffic signal may benefit traffic progression along the major route.

Warrant 7 – Crash Experience

Warrant 7 is met when high traffic crash rates exist at an intersection that may be correctable with the installation of a traffic signal, and when traffic volumes meet 80% of the volume thresholds set for Warrant 1A and Warrant 1B.

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Warrant 8 – Roadway Network

Warrant 8 is considered when the intersection of two or more major routes meets certain volume thresholds, and is expected to meet Warrants 1, 2, and/or 3 within the next 5 years.

Warrant Analyses Notes

The following summary applies to all six of the warrant analysis intersections.

Warrant 1, Warrant 2, and Warrant 3 were analyzed based on existing traffic volumes and calculated future volumes at each intersection. Detailed calculation sheets can be found in the **Appendix D**.

Warrant 4 – Pedestrian volumes were collected along with traffic volumes at the intersections. The pedestrian volumes did not exceed 6 pedestrians per hour per approach at any of the six intersections. Although these counts were collected in winter when there may be less pedestrian traffic, Warrant 4 is not expected to be met for any of the selected intersections.

Warrant 5 – Schools do exist within one-half mile of the intersections of 23rd Street, 18th Street and 14th Street; however, a separate traffic engineering study was not conducted at these intersections due to the number of pedestrians observed as indicated in Warrant 4.

Although school-aged pedestrian activity may exist along Dewey Street, traffic signals are not warranted as a school crossing solution today. If there is concern of school-aged pedestrians at these locations, school crossing guards could be used before and after school to assist children crossing Dewey Street.

Warrant 6 – A coordinated signal system is not applicable to Dewey Street at this time. Adding a traffic signal at any of the intersections solely on the basis to promote traffic progression along Dewey Street is unwarranted with current traffic volumes.

Warrant 7 – Traffic crashes were reviewed as described previously in this report. Warrant 7 is met when an intersection has five (5) or more crashes per year of types that are susceptible to correction by a traffic control signal in place. Angle collisions typically can be minimized with a traffic signal.

The intersections of Dewey Street and S. 35th Street, S. 23rd Street, and S. 10th Street had a high percentage of angle collisions; however, the number of crashes was less than the threshold value. None of the intersections along Dewey Street should have a traffic signal installed exclusively based on traffic crashes.

Warrant 8 – No cross street of Dewey Street is regarded as a major transportation route. Warrant 8 was not considered for this analysis.

Warrant 1, Warrant 2, and Warrant 3 summaries for each intersection follows.

S. 35th Street Warrant Analysis Summary

Warrant		Year			
		2009	2010	2020	2030
1A	8-hour minimum volume	NO	NO	NO	NO
1B	8-hour interruption of traffic	NO	NO	NO	NO
1C	80% combination of 1A & 1B	NO	NO	NO	NO
2	4-hour minimum volume	NO	NO	NO	NO
3	Peak hour volume	NO	NO	NO	YES
4	Pedestrian crossing	NO	--	--	--
5	School crossing	NO	--	--	--
6	Coordinated signal system	NO	--	--	--
7	Crash experience	NO	--	--	--
8	Roadway network	NO	--	--	--

Note: "--" indicates warrant not evaluated

Table 3.1 – 35th Street Warrant Analysis Summary

Warrant 1 – Eight-hour Vehicular Volume

Warrant 1A – Minimum Vehicular Volume is not expected to be met in year 2009, 2020, or 2030.

Warrant 1B – Interruption of Continuous Traffic is not met in year 2009 or 2020. In 2030, Warrant 1B is not met, although seven hours meet the threshold volume and one additional hour is within 10% of the threshold volume.

Warrant 2 – Four-hour Vehicular Volume

Warrant threshold volumes are not met in year 2009, 2020, or 2030. It is noted that in year 2030 three hours exceed the threshold volumes.

Warrant 3 – Peak Hour

The peak hour threshold volume at S. 35th Street is not met in year 2009 or 2020. The threshold volume is met by 2030.

Intersection Recommendation

Based on the signal warrants alone a traffic signal could be considered by year 2030.