



TOWN OF BROOKLINE

Department of Public Works
333 Washington Street
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Right Turn On Red Restriction
For
Centre Street at Williams Street

Date: March 11, 2011
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The purpose of this study is to determine if the right turn restriction on the Williams Street at Centre Street is warranted. Currently the restriction is in place for the Williams Street north-east approach onto Centre Street. The study location can be seen in **Figure 1**. Recommendations will be based on the guidelines found in the latest version of the Manual of Uniform Traffic Control Devices (MUTCD). The MUTCD suggests the following factors should be considered for the implementation of a NO TURN ON RED restriction:

1. Sight distance of vehicles approaching from the Left;
2. Geometric or operational characteristics of the intersection that might result in unexpected conflicts;
3. An exclusive (“Barn Dance”) pedestrian phase;
4. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities;
5. More than three (3) right-turn-on-red accidents reported in a 12 month period for the particular approach.

According to our files the Transportation Board, or it’s predecessor the Traffic Council, implemented the NO TURN ON RED restriction based on the fact that there was an exclusive “barn dance” pedestrian phase.



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Figure 1

Study Location

SIGHT DISTANCE

The American Association of State and Transportation Officials (AASHTO) standards reference two types of sight distances which are relevant for the intersection at Williams Street and Centre Street: stopping sight distance (SSD) and intersection sight distance (ISD). Stopping sight distance pertains to roadway segments (i.e., Centre Street) and intersection sight distance, as the name implies, relates specifically to intersections. Sight lines for right turning vehicle movements at the intersection of Williams Street at Centre Street are compared to minimum safe stopping sight distance (SSD) and intersection sight distance (ISD) guidelines for the regulatory speed limit below in **Table 1**. Sight line calculations are provided in the **Appendix**.

Table 1
Sight Distance

| Approach /Travel Direction | Available Sight Distance | AASHTO Recommended ¹ Posted Speed (30 mph) |
|--|--------------------------------|---|
| Stopping Sight Distance | | |
| Williams St South-westbound | >500' | 200' |
| Intersection Sight Distance - Stop Control | | |
| Williams St Looking Looking South-east | <100' | 290' |

¹Recommended sight distance based on A Policy on Geometric Design of Highways and Streets, AASHTO, 4th edition 2001. Based on driver height of eye of 3.5 feet to object height of 2.0 feet for SSD or 3.5 feet for ISD and adjustments for roadway grade.

The existing stopping sight distance is adequate. However intersection sight distance is deficient for a right turn on red movement. Looking south-east from Williams Street Intersection sight triangles are obstructed by trees and parked cars on Centre Street. The MUTCD recommends no turn on red when there are restricted sight lines.

INTERSECTION GEOMETRY AND SKEW

Williams Street meets Centre Street at 90 degrees to form a four way signalized intersection. The Williams Street approach provides one general purpose travel lane in the south-west direction. Land use at the intersection consists of residential housing. No Geometric or operational Characteristics would restrict a right turn on red.

PEDESTRIAN CONFLICTS AND SIGNAL OPERATION

Pedestrian activity at the Williams Street at Centre Street intersection is significant. There is elderly housing in close proximity to the intersection. The signal timing provides an exclusive pedestrian phase. The MUTCD recommends no turn on red when an exclusive pedestrian phase is used and when there are large percentage of older pedestrians.

CRASH ANALYSIS

In order to identify accident trends and safety characteristics for the study intersection accident reports were obtained from MassDOT Highway Crash Database for a three-year period covering 2006 through 2008. No crashes were reported for Williams Street at Centre Street intersection for the three-year period studied from 2006 to 2008. The MUTCD warrants a right-turn-on-red restriction if three (3) or more accidents were caused by right turn on red maneuvers within three years.

CONCLUSION

The Williams Street approach to Centre St has restricted sight lines, an exclusive pedestrian phase and significant pedestrian use with a large percentage of elderly pedestrians. Using the MUTCD guidelines 1, 3, & 4 from above the removal of the NO TURN ON RED restriction would not be recommended.

Appendix

- Sight Line Calculations

Sight Line Calculations

| Intersection Sight Distance | | Speed | | |
|---|---------------|----------------|-------------|--|
| | <u>Posted</u> | <u>Average</u> | <u>85th</u> | |
| Stop Control Left Turning | 331 | | | |
| Stop Control Right Turning/Crossing | 287 | | | |
| Yield Control Left Turning | 353 | | | |
| Yield Control Right Turning/Crossing | 309 | | | |
| Stopping Sight Distance | | Speed | | |
| | <u>Posted</u> | <u>Average</u> | <u>85th</u> | |
| Northeast bound Stopping Sight Distance | 197 | | | |
| Southwest bound Stopping Sight Distance | 197 | | | |

| <u>Inputs</u> | Northwest Bound | | | Southeast Bound | | |
|---------------|-----------------|---------|------|-----------------|---------|------|
| | Posted | Average | 85th | Posted | Average | 85th |
| Speed: | 30 | | | 30 | | |
| Grade: | 0 | | | 0 | | |

Sight Distance Formulas - Source: AASHTO

$$\text{Intersection Sight Distance} = 1.47 \times V \times t$$

$$\text{Stopping Sight Distance} = (1.47 \times V \times s) + \frac{V^2}{(30 \times ((a/32.2) + (G/100)))}$$

Where:

s = Reaction Time (sec) = 2.5 s

V = Travel Speed (mph)

G = Roadway Grade

a = Deceleration Rate (ft/sec²) = 11.2 ft/s²

- t = Time Gap (sec) =
- Stop Control Left Turning = 7.5 s
 - Stop Control Right Turning = 6.5 s
 - Yield Control Left Turning = 8 s
 - Yield Control Right Turning = 7 s