



TOWN OF BROOKLINE

Department of Public Works
333 Washington Street
Brookline, MA 02445-6863

Right Turn On Red Restriction
For
High Street at Cypress Street

Date: April 26, 2011
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The purpose of this study is to determine if the right turn restriction on the High Street northbound approach at the High Street at Cypress Street intersection is warranted. 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 High Street and Cypress Street: stopping sight distance (SSD) and intersection sight distance (ISD). Stopping sight distance pertains to roadway segments and intersection sight distance, as the name implies, relates specifically to intersections. Sight lines for right turning vehicle movements at the northbound approach to the High Street at Cypress Street intersection are not applicable.

INTERSECTION GEOMETRY AND SKEW

High Street meets Cypress Street at 90 degrees to form a T intersection with High Street westbound operating under stop control. The pedestrian crossing is signalized. The intersection approaches all provide one general purpose travel lane. Land use at the intersection consists of residential housing. The intersection skew or geometry would not restrict a right turn on red.

PEDESTRIAN CONFLICTS AND SIGNAL OPERATION

The signal operates as a pedestrian signal only. Pedestrian activity at the High Street at Cypress Street intersection is significant. Robins Playground, Downes Field and the Brookline housing authority are in close proximity to the intersection. The MUTCD recommends a right turn on red restriction when an unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities. The signal timing provides an exclusive pedestrian phase and no vehicle phasing. The MUTCD recommends no turn on red when an exclusive pedestrian phase is used.

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. This data can be found in the **Appendix**. A summary of the crash data for the study intersection is detailed in **Table 2**.

Table 2
Accident Summary

<u>Data Category</u>	<u>High Street at Cypress Street</u>
Year:	
2006	3
2007	0
<u>2008</u>	<u>0</u>
Total	3
Type:	
Angle	1
Rear-End	2
Sidewipe	0
Right-Turn	0
Head-On	0
Pedestrian	0
Unknown/Other	0
Severity:	
P. Damage Only	2
Personal Injury	1
Fatality	0
Unknown/Other	0
Conditions:	
Dry	2
Wet	0
Snow/Ice	1
Other/Unreported	0
Time:	
7:00 AM to 9 AM	3
4:00 AM to 6 PM	0
Rest of Day	0

As summarized in **Table 2**, a total of three crashes occurred at the intersection of High Street and Cypress Street for the three-year period studied from 2006 to 2008. None of the reported crashes involved a right turning vehicles. However right turn on red maneuvers are currently restricted for the northbound approach. The MUTCD warrants a right-turn-on-red restriction if three (3) or more accidents were caused by right turn on red maneuvers within 12 months.

CONCLUSION

The High Street at cypress street intersection operates with an exclusive pedestrian phase and has significant pedestrian use; however there are no sight line restrictions for a right turn on red movement. Based on the northbound approach having clear sightlines, it is recommended removing the right turn on red restriction and removing the no turn on red sign (R10-11).

Appendix

- Sight Line Calculations
- Accident Data

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>	
South bound Stopping Sight Distance	197			
East bound Stopping Sight Distance	197			

<u>Inputs</u>	North Bound			West Bound		
	Posted	Average	85th	Posted	Average	85th
Speed:	30			30		
Grade:	0			0		

Sight Distance Formulas - Source: AASHTO

Intersection Sight Distance = $1.47 \times V \times t$

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

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



MassHighway Crash Report for Brookline in the year 2006

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicles Travel Directions	Most Harmful Events	Road Surface Condition	Ambient Light	Weather Condition	At Roadway Intersection	Distance from Nearest Roadway Intersection	Distance from Nearest Milemarker	Distance from Nearest Exit	Distance from Nearest Landmark	Non Motorist Type
2091229	BROOKLINE	23-Jan-2006	9:00 AM	Property damage only (none injured)	2	0	0	Rear-end	V1:Southbound / V2:Southbound	V1: Not reported / V2: Not reported	Snow	Daylight	Cloudy		25 HIGH STREET / CYPRESS STREET			BUS STOP	
2219165	BROOKLINE	08-Nov-2006	8:45 AM	Non-fatal injury	2	1	0	Rear-end	V1:Not reported / V2:Not reported	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	HIGH STREET / CYPRESS STREET					
2200897	BROOKLINE	04-Dec-2006	7:30 AM	Property damage only (none injured)	2	0	0	Angle	V1:Southbound / V2:Westbound	V1: Not reported / V2: Not reported	Dry	Daylight	Snow	CYPRESS STREET / HIGH STREET					