



TOWN OF BROOKLINE

Department of Public Works
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Right Turn On Red Restriction
For
Cypress Street at Walnut Street

Date: May 17, 2011
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The purpose of this study is to determine if the right turn restriction for the Cypress Street at Walnut Street is warranted for each approach. The study location can be seen in **Figure 1**. Recommendations will be based on the guidelines found in the latest edition 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.



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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 Cypress Street and Walnut 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 intersection of Cypress Street at Walnut 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** below. 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			
Cypress Street Southbound	>400'	200'	
Cypress Street Northbound	>400'	200'	
Walnut Street Eastbound	>400'	205'	
Walnut Street Westbound	>400'	200'	
Intersection Sight Distance - Stop Control			
	Behind Stop line	At Crosswalk	
Walnut Street Looking Northbound	>400'	>400'	290'
Walnut Street Looking Southbound	100'	240'	290'
Cypress Street Looking Westbound	110'	300'	290'
Cypress Street Looking Eastbound	160'	>400'	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 on all approaches. The intersection sight distance exceeds recommended guidelines for the Walnut Street eastbound approach. The walnut street westbound approach has restricted sight lines which are obstructed by a wooden fence, mail box, utility pole and parked cars. The Cypress Street southbound approach has restricted sight lines obstructed by existing shrubbery. The Cypress Street northbound approach has restricted sight lines obstructed by a rock wall vegetation and a utility pole. If vehicles pull beyond the stop bar into the crosswalk sight lines improve. Because of the pedestrian use especially by children it would not be desirable to have vehicles pulling beyond the stop line into the crosswalk.

INTERSECTION GEOMETRY AND SKEW

Cypress Street meets Walnut Street at 90 degrees to form a signalized four way intersection. The intersection approaches all provide one general purpose travel lane. The intersection skew or geometry would not restrict a right turn on red.

PEDESTRIAN CONFLICTS AND SIGNAL OPERATION

Pedestrian activity at the Cypress Street at Walnut Street intersection is high with significant portion of children. The signal operates with an (“Barn Dance”) exclusive pedestrian phase. The MUTCD recommends no turn on red when an exclusive (“Barn Dance”) pedestrian phase is used. An MBTA Bus stop, Lincoln Elementary School and Clark Playground are in close proximity to the intersection. The MUTCD recommends no turn on red when an unacceptable number of pedestrian vehicle conflicts occur, especially involving children, older pedestrians, or persons with disabilities.

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**.

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

As summarized in **Table 2**, a total of two crashes occurred at the intersection of Cypress Street at Walnut Street for the three-year period studied from 2006 to 2008. None of the reported crashes involved right turning vehicles. However right turn on red maneuvers are currently restricted on all approaches. 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 Cypress Street at Walnut Street intersection has heavy pedestrian activity with a significant portion of children. The Walnut Street eastbound approach has clear sight lines from behind the crosswalk. The other three approaches have restricted sight lines. Using the MUTCD guidelines 1, 3, and 4 from above the removal of the no turn on red restrictions would not be recommended for the northbound southbound and eastbound approaches. Based on sight lines that exceed the recommended guidelines the removal of the westbound no turn on red restriction would be recommended.

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>
Northbound, Westbound & Southbound Stopping Sight D		197		
Eastbound Stopping Sight Distance		205		

<u>Inputs</u>	Northbound, Southbound and Eastbound			Eastbound		
	Posted	Average	85th	Posted	Average	85th
Speed:	30			30		
Grade:	0			-3		

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
2064991	BROOKLINE	12-Mar-2006	2:00 AM	Property damage only (none injured)	2	0	0	Not reported		V1:Not reported / V2:Not reported	Dry	Daylight	Clear		WALNUT STREET / CYPRESS STREET				



MassHighway Crash Report for Brookline in the year 2008

Crash Number	City/Town Name	Crash Date	Crash Time	Crash Severity	Number of Vehicles	Total Nonfatal Injuries	Total Fatal Injuries	Manner of Collision	Vehicle Action Prior to Crash	Vehicle Travel Directions	Most Harmful Events	Vehicle Configuration	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
2406221	BROOKLINE	29-Apr-2008	1:50 AM	Property damage only (none injured)	2	0	0	Sideswipe, opposite direction	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Westbound / V2: Southbound	V1: Not reported / V2: Not reported	V1: Light truck (van, mini-van, panel, pickup, sport utility) with only four tires / V2: Not reported	Wet	Daylight	Rain	WALNUT STREET / CYPRESS STREET					