

TOWN OF BROOKLINE

Department of Public Works
333 Washington Street
Brookline, MA 02445

Right Turn On Red Restriction

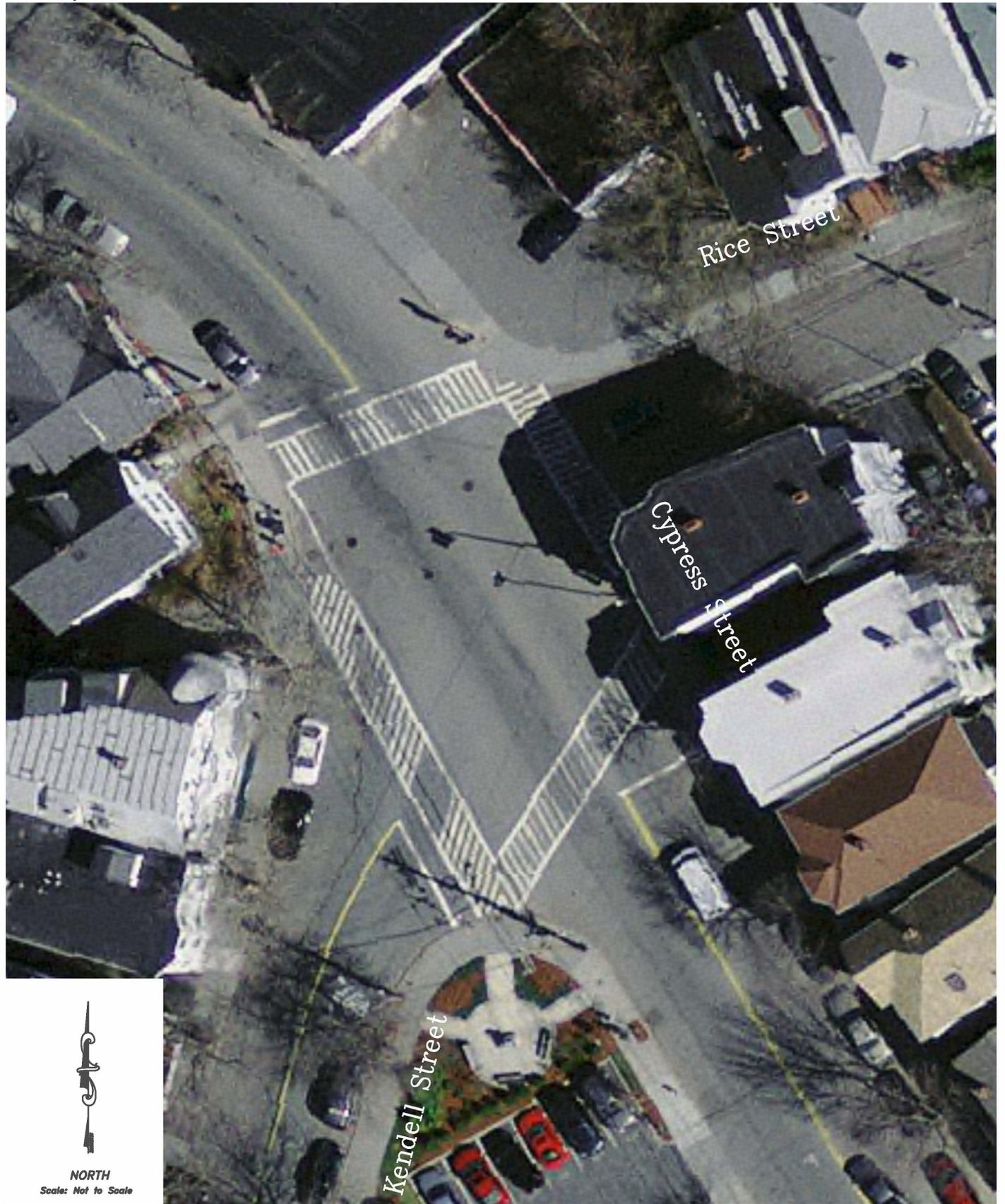
For

Cypress Street at Rice Street and Kendall Street

The purpose of this study is to determine if the right turn restrictions on the Cypress Street Southbound approach and Kendall Street Eastbound approach at Cypress Street at Rice Street and Kendall Street intersection are 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 its 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 Cypress Street at Rice Street and Kendall 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 Kendall Street at Washington 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			
Cypress Street Southbound	Not Applicable (n/a)		200'
Kendall Street Eastbound	160'		200'
Intersection Sight Distance - Stop Control			
	Behind Stop line	At Crosswalk	
Cypress Street Looking eastbound	n/a	n/a	290'
Kendall Street Looking Northbound	<100'	<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 cypress Street Southbound approach does not have applicable right turning sight lines because Rice Street is one-way eastbound no cars are approaching from the left. The Kendall Street Eastbound approach has stopping sight distance and intersection sight distance that are deficient. Sight lines are obstructed by parked cars and a building. The MUTCD recommends no turn on red when the sight lines are restricted.

GEOMETRIC AND OPERATIONAL CHARACTERISTICS

Kendall Street meets Cypress Street at 50 degrees and Rice Street meets Cypress Street at 90 degrees to form a four way signalized intersection. The Kendall Street westbound approach provides one general purpose lane. Cypress Street Southbound and Northbound provide one general purpose lane. Rice Street is a one-way street in the eastbound direction. Land use at the intersection is primarily commercial and residential.

PEDESTRIAN CONFLICTS AND SIGNAL PHASING

Pedestrian activity at the Cypress Street at Kendall Street and Rice Street intersection is moderate. The MBTA has bus stops at the intersection. The signal timing provides an exclusive pedestrian phase during this phase all vehicles should be stopped so pedestrians can cross. 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 2007 through 2009. No crashes were reported for this intersection during the study period. 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.

CONCLUSIONS

The Cypress Street southbound approach at the Cypress Street and Kendall Street and Rice Street signalized intersection does not have restricted sight lines. Based on this it is recommended that the right turn on red restriction be removed.

The Kendall Street eastbound approach at the Cypress Street and Kendall Street and Rice Street signalized intersection has restricted sight lines; Moderate pedestrian usage with an exclusive pedestrian interval at which time all vehicles should be stopped and pedestrians allowed to cross. Using the MUTCD guidelines 1, 2, 3, and 4 the removal of the right turn on red restrictions would not be recommended for the eastbound approach.

Appendix

- Sight Line Calculations

Sight Line Calculations

Cypress Street Southbound approach and Kendall Street Eastbound approach

Intersection Sight Distance	Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>
<u>Looking East</u>			
Stop Control Left Turning	331	0	0
Stop Control Right Turning/Crossing	287	0	0
Yield Control Left Turning	353	0	0
Yield Control Right Turning/Crossing	309	0	0
<u>Looking North</u>			
Stop Control Left Turning	331	0	0
Stop Control Right Turning/Crossing	287	0	0
Yield Control Left Turning	353	0	0
Yield Control Right Turning/Crossing	309	0	0
Stopping Sight Distance	Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>
Southbound Stopping Sight Distance	197	0	0
Westbound Stopping Sight Distance	197	0	0

Inputs	Eastbound			Southbound		
	Posted	Average	85th	Posted	Average	85th
Speed:	30			30		
Grade:	0	0	0	0	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