



# TOWN OF BROOKLINE

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

Right Turn On Red Restriction

For

Newton Street at Clyde Street

The purpose of this study is to determine if the right turn restriction on the Clyde Street Southbound approach at the Newton Street at Clyde 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. It was upheld in 2008 for pedestrian protection.



**BROOKLINE ENGINEERING/TRANSPORTATION DIVISION**  
333 WASHINGTON ST 4TH FLOOR, BROOKLINE, MA  
TELEPHONE : (617) 730-2139 FAX: (617) 284-6490



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 Newton Street at Clyde Street: stopping sight distance (SSD) and intersection sight distance (ISD). Stopping sight distance pertains to roadway segments (i.e., Newton Street) and intersection sight distance, as the name implies, relates specifically to intersections. Sight lines for right turning vehicle movements at the intersection of Newton Street at Clyde 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

<u>Approach /Travel Direction</u>	<u>Available Sight Distance</u>	<u>AASHTO Recommended<sup>1</sup> Posted Speed (30 mph)</u>
Stopping Sight Distance Newton Street Westbound	>400'	190'
Intersection Sight Distance - Stop Control		
	Behind Crosswalk	Beyond Crosswalk
Clyde Street Looking East	280'	>400'
		290'

<sup>1</sup>Recommended sight distance based on A Policy on Geometric Design of Highways and Streets, AASHTO, 4<sup>th</sup> 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. Intersection sight distance is acceptable for a right turn on red movement however cars may need to pull beyond the crosswalk to see around adjacent right turning vehicles in the left lane. The potential for vehicle pedestrian conflict in this area is low if vehicles need to pull beyond the crosswalk.

## INTERSECTION GEOMETRY AND SKEW

Newton Street meets Clyde Street at 90 degrees to form a T signalized intersection. The Clyde Street southbound approach provides one left turn lane and two right turn lanes. The Newton Street eastbound approach provides a through lane, left-thru lane and left turn lane. The Newton Street westbound approach provides a through lane and a general purpose travel lane. Land use at the intersection consists of residential housing. When dual right turn lanes are used the U.S. Department of Transportation Federal Highway Administration advises only allowing the outermost right turn lane allowed right turn on red movements.

## PEDESTRIAN CONFLICTS AND SIGNAL OPERATION

Pedestrian activity at the Newton Street at Clyde Street intersection is not significant. The signal operates with an exclusive pedestrian phase. The MUTCD recommends no turn on red when an exclusive ("Barn Dance") 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**.

<u>Data Category</u>	<u>Harvard Street at Babcock Street</u>
Year:	
2006	3
2007	1
<u>2008</u>	<u>2</u>
Total	6
Type:	
Angle	0
Rear-End	4
Sidewipe	1
Right-Turn	0
Head-On	0
Pedestrian	0
Unknown/Other	1
Severity:	
P. Damage Only	3
Personal Injury	3
Fatality	0
Unknown/Other	0
Conditions:	
Dry	4
Wet	2
Snow/Ice	0
Other/Unreported	0
Time:	
7:00 AM to 9 AM	1
4:00 AM to 6 PM	0
Rest of Day	5

As summarized in **Table 2**, a total of six crashes occurred at the intersection of Newton Street at Clyde 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 for the Clyde Street southbound 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 Newton Street southbound approach at the Newton Street at Clyde Street intersection has a (“barn dance”) exclusive pedestrian phase however pedestrian activity is low and sight lines are sufficient for a right turn on red maneuver. With dual right turn lanes the U.S. Department of Transportation Federal Highway Administration advises only allowing the outermost right turn lane have permitted right turn on red movements. It is recommended removing the existing No Turn On Red sign (R10-11a) and replacing it with a No Turn On Red Except From Right Lane sign (R10-11c) and mounting overhead No Turn On Red From This Lane(R10-11d) for the inside right turn lane.

## Appendix

- Sight Line Calculations
- Accident Data

### Sight Line Calculations

Intersection Sight Distance	Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>
Stop Control Right Turning/Crossing	287		

Stopping Sight Distance	Speed		
	<u>Posted</u>	<u>Average</u>	<u>85th</u>
Westbound Stopping Sight Distance	197		

	WestBound					
<u>Inputs</u>	Posted	Average	85th	Posted	Average	85th
Speed:	30					
Grade:						

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/sec<sup>2</sup>) = 11.2 ft/s<sup>2</sup>

- 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
2049019	BROOKLINE	08-Jun-2006	2:00 PM	Non-fatal injury	3	1	0	Rear-end	V1:Westbound / V2:Westbound / V3:Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic	Wet	Daylight	Rain	NEWTON STREET / CLYDE STREET					
2061588	BROOKLINE	20-Jul-2006	9:15 AM	Non-fatal injury	2	1	0	Rear-end	V1:Southbound / V2:Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Cloudy	CLYDE STREET / NEWTON STREET					
2118771	BROOKLINE	09-Aug-2006	8:45 AM	Property damage only (none injured)	2	0	0	Sideswipe, same direction	V1:Eastbound / V2:Eastbound	V1: Not reported / V2: Not reported	Dry	Daylight	Clear	NEWTON STREET / CLYDE STREET					



### MassHighway Crash Report for Brookline in the year 2007

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
2183879	BROOKLINE	02-May-2007	1:35 AM	Non-fatal injury	1	1	0	Single vehicle crash	V1: Turning left	V1:Southbound	V1: Collision with other fixed object (wall, building, tunnel, etc.)	V1: Passenger car	Dry	Dark - lighted roadway	Clear	NEWTON STREET / CLYDE 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
2487264	BROOKLINE	08-Feb-2008	4:25 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1: Southbound / V2: Not reported	V1: Not reported / V2: Not reported	V1: Passenger car / V2: Passenger car	Wet	Dusk	Rain	CLYDE STREET / NEWTON STREET					
2294848	BROOKLINE	07-Mar-2008	9:10 AM	Property damage only (none injured)	2	0	0	Rear-end	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1: Westbound / V2: Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires / V2: Light truck(van, mini-van, panel, pickup, sport utility) with only four tires	Dry	Daylight	Clear		100 feet W from Intersection 191 NEWTON STREET / CLYDE STREET				