



TOWN OF BROOKLINE

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

Right Turn On Red Restriction

For

Aspinwall Avenue at Kent Street

The purpose of this study is to determine if the right turn restrictions on the four approaches for the Kent Street and Aspinwall Avenue 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 it’s predecessor the Traffic Council, implemented the NO TURN ON RED restriction based on restricted sight lines.



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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 Kent Street at Aspinwall Avenue: stopping sight distance (SSD) and intersection sight distance (ISD). Stopping sight distance pertains to roadway segments (i.e., Kent Street and Aspinwall Avenue) and intersection sight distance, as the name implies, relates specifically to intersections. Sight lines for right turning vehicle movements at the intersection of Kent Street at Longwood Avenue 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			
Kent Street North Bound	>500'		190'
Kent Street South Bound	>500'		190'
Aspinwall Avenue East Bound	>500'		200'
Aspinwall Avenue West bound	>295'		205'
Intersection Sight Distance - Stop Control			
	From Behind Stop Line	At Crosswalk	
Aspinwall Avenue Looking South	<100'	<100'	290'
Aspinwall Avenue Looking North	<100'	>100'	290'
Kent Street Looking West	<100'	>170'	290'
Kent Street Looking East	<100'	>250'	290'

¹Recommended sight distance based on A Policy on Geometric Design of Highways and Streets, AASHTO, 4th edition 2001. Based on driver eye height 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 at all four approaches at the Kent Street and Aspinwall Avenue Intersection. Sight lines are obstructed by a shrubbery which is located on private property.

INTERSECTION GEOMETRY AND SKEW

Aspinwall Avenue meets Kent Street at 90 degrees to form a four way signalized intersection. The four intersection approaches all provide one general purpose travel lane. Land use at the intersection consists of residential housing and retail uses. The intersection skew or geometry would not restrict a right turn on red.

PEDESTRIAN CONFLICTS AND SIGNAL OPERATION

Pedestrian activity at the Aspinwall Avenue and Kent Street intersection is heavy. In close proximity to the intersection is the Brookline Village T station, Murphy Playground, Brookline Avenue Playground and Parsons Field. 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 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>Kent Street at Aspinwall Avenue</u>
Year:	
2006	2
2007	2
<u>2008</u>	<u>3</u>
Total	7
Type:	
Angle	4
Rear-End	0
Sidewipe	2
Right-Turn	0
Head-On	0
Pedestrian	0
Unknown/Other	1
Severity:	
P. Damage Only	1
Personal Injury	3
Fatality	0
Unknown/Other	3
Conditions:	
Dry	6
Wet	1
Snow/Ice	0
Other/Unreported	0
Time:	
7:00 AM to 9 AM	0
4:00 AM to 6 PM	2
Rest of Day	5

As summarized in **Table 2**, a total of seven crashes occurred at the intersection of Aspinwall Avenue and Kent 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 all intersection 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 Aspinwall Avenue and Kent Street intersection has heavy pedestrian activity with a significant portion being children. Intersection Sight Distance is restricted for all right turn on red movements. The traffic signal uses an exclusive pedestrian phase. Using the MUTCD guidelines 1, 3 and 4 from above the removal of the no turn on red restrictions would not 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>	
North & South bound Stopping Sight Distance	190			
West bound Stopping Sight Distance	205			
East bound Stopping Sight Distance	200			

<u>Inputs</u>	North & South Bound			East Bound		
	Posted	Average	85th	Posted	Average	85th
Speed:	30			30		
Grade:	3			-3		

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



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
2113932	BROOKLINE	09-Nov-2006	9:10 AM	Not Reported	2	0	0	Angle	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Daylight	Clear	KENT STREET / ASPINWALL AVENUE					
2127613	BROOKLINE	20-Dec-2006	5:30 PM	Property damage only (none injured)	2	0	0	Angle	V1:Southbound / V2:Northbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	Dry	Dark - lighted roadway	Clear	KENT STREET / ASPINWALL AVENUE					

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
2172338	BROOKLINE	24-Mar-2007	9:40 AM	Non-fatal injury	2	2	0	Angle	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Northbound / V2: Southbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car	Dry	Daylight	Clear	KENT STREET / ASPINWALL AVENUE					
2246305	BROOKLINE	27-Oct-2007	6:25 PM	Not Reported	4	0	0	Sideswipe, opposite direction	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Travelling straight ahead / V4: Travelling straight ahead	V1: Southbound / V2: Southbound / V3: Northbound / V4: Westbound	V1: Collision with motor vehicle in traffic / V2: Collision with motor vehicle in traffic / V3: Collision with motor vehicle in traffic / V4: Collision with motor vehicle in traffic	V1: Passenger car / V2: Passenger car / V3: Light truck (van, mini-van, panel, pickup, sport utility) with only four tires / V4: Light truck (van, mini-van, panel, pickup, sport utility) with only four tires	Wet	Dark - lighted roadway	Rain/Unknown	KENT STREET / ASPINWALL AVENUE					

**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	
2311387	BROOKLINE	10-Apr-2008	10:30 AM	Non-fatal injury	2	1	0	Unknown	V1: Travelling straight ahead / V2: Not reported	V1: Not reported / V2: Not reported	V1: Collision with light pole or other post/support / V2: Not reported	V1: Passenger car / V2: Light truck(van, mini-van, panel pickup, sport utility) with only four tires	Dry	Daylight	Clear	KENT STREET / ASPINWALL AVENUE						
2610576	BROOKLINE	19-May-2008	12:15 PM	Not Reported	2	0	0	Sideways, opposite direction	V1: Travelling straight ahead / V2: Travelling straight ahead	V1: Northbound / V2: Westbound	V1: Not reported / V2: Not reported	V1: Not reported / V2: Passenger car	Dry	Daylight	Clear	KENT STREET / ASPINWALL AVENUE						
2477117	BROOKLINE	02-Dec-2008	5:06 PM	Non-fatal injury	2	1	0	Angle	V1: Turning left / V2: Travelling straight ahead	V1: Eastbound / V2: Eastbound	V1: Not reported / V2: Not reported	V1: Not reported / V2: Passenger car	Dry	Dark - lighted roadway	Clear	ASPINWALL AVENUE / KENT STREET						