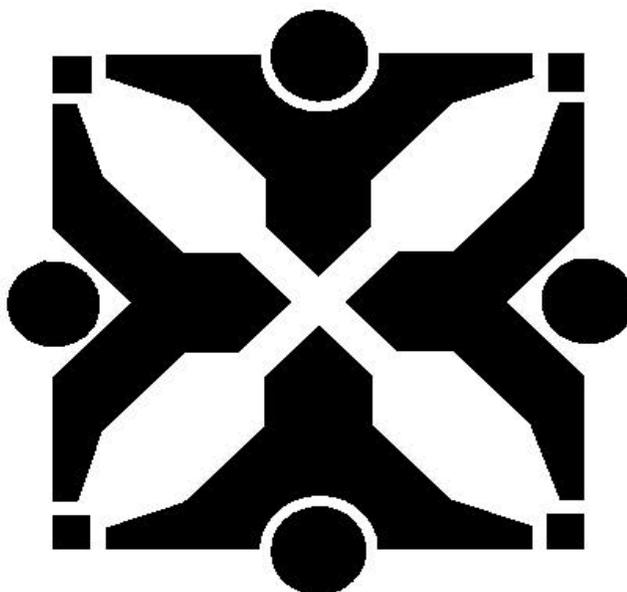


POLICY AND STANDARDS FOR PEDESTRIAN CROSSINGS



City of Columbia, Missouri

Policy and Standards for Pedestrian Crossings

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I. Mission Statement

Public Works Department Pedestrian Crossing Mission:

It shall be the mission of the Public Works Department to provide for pedestrian crossings of public streets in such manner to increase the safety of pedestrian users and encourage pedestrian traffic in accordance with the concepts of a walkable community.

II. General

A. Residential Streets

Speeds and volumes on residential streets should be lower than on higher classification streets and should not normally require pavement markings or signs to indicate crosswalks. Requests for crosswalks on these streets may be an indication of other traffic concerns which can be determined by a traffic study. Based on a traffic study, crosswalk markings or other appropriate measures such as traffic calming may be implemented.

B. Mid-block Crossings

A mid-block crosswalk is defined as a crosswalk at a location other than an intersection. State and City laws require motorists to yield to pedestrians in crosswalks. Mid-block crosswalks can be used to improve safety for pedestrians crossing at a specific location. To be effective at improving safety, a mid-block crosswalk should be installed at specific locations where pedestrians would be expected to need to cross the street. If the pedestrian crossings are occurring at random locations within a block and if vehicle volumes are low or moderate (adequate gaps are available) it is likely that most pedestrians will not alter their route by more than a few yards to use the crosswalk. Consideration should be given to the safety of all pedestrians (younger and older pedestrians) who may use a proposed mid-block crosswalk.

Crosswalk locations must allow motorists to safely yield for pedestrians. Sight distance, roadway geometrics and the potential for rear-end type accidents should be evaluated. Streets with two traffic lanes in the same direction present a potential hazard when a vehicle in one lane yields to a pedestrian and obstructs the sight line of the pedestrian for a motorist in the other lane.

The safety of mid-block crosswalks is dependent on the judgement of the pedestrian and the motorist. Engineering standards can help by making crosswalks more visible. Warrant criteria can help by making sure that crosswalks are installed at safe locations. Enforcement of crosswalk laws is very important to improve safety.

C. Major Intersections

A major intersection is defined as an intersection of two streets of collector or higher classification, and intersections within the Central Business District. Intersections of minor streets with streets on the Major Thoroughfare Plan may be studied like major intersections if the Bicycle and Pedestrian Commission

identifies them as desirable crossing locations. Pedestrian exposure to vehicles is increased when vehicle volumes increase. Collector streets and higher classification streets generally carry higher volumes than local residential streets. Chapter 14, Article X of the Columbia Code indicates that pedestrians have the right of way within marked crosswalks and at unmarked crosswalks at intersections. At major intersections, crosswalk markings can provide increased awareness of the presence of pedestrians. Major intersections with all-way stop control and signalized intersections will generally be provided with marked crosswalks. There are three levels of crosswalk markings, standard, enhanced standard, and special emphasis. The highest levels of marking, should be reserved for situations where the pedestrian exposure is the greatest. The level of markings used should be similar for similar conditions to encourage driver familiarity.

D. Traffic Engineering Study

A traffic engineering study is required to determine if the criteria and warrants are met for a marked crosswalk at a particular location, and to determine the level of marking justified. The level of detail required for a traffic engineering study will vary with the location under consideration.

The engineering study includes consideration of:

1. Speed and traffic volume data on streets being crossed
2. Pedestrian volume, age, and level of mobility
3. Location of pedestrian origin and destination points and crossing pattern
4. Existing sidewalk network and sidewalk ramps
5. Sight distances and sight obstructions
6. Street characteristics including grades, curvature, pavement widths, and number of vehicle and bicycle lanes
7. Location of adjacent driveways
8. On-street parking
9. Street lighting
10. Location of drainage structures
11. Distance to nearest protected or marked crossing
12. Traffic signal progression
13. Potential for rear end accidents

E. Maintenance

Crosswalks markings and signs shall be maintained in a high state of visibility and must meet reflectivity standards. All crosswalk markings and signs must be inspected at least twice a year and replaced as needed.

School zone markings and signs must be inspected prior to the beginning of the school year in late summer and re-painted as needed.

III. Warrants and Guidelines for Pedestrian Crossings

A. General

Marked crosswalks are intended to provide pedestrians with a feeling of confidence that it is safe to cross a street at the marked location and to give motorists adequate warning to expect pedestrians to be in the roadway. They are also to encourage pedestrians to cross roadways where there are adequate facilities to accomplish these purposes. Care should be taken to insure that marking crosswalks at some locations does not detract from other similar locations without markings. A Traffic Engineering Study as described in section II. D. is required when evaluating a location for marked crosswalks.

The following are general criteria to be satisfied in addition to the warrant criteria when considering installation of marked crosswalks:

1. Marked crosswalks must connect to established sidewalks at both ends.
2. ADA accessible ramps shall be included at both ends of crosswalk installations unless there are engineering reasons they cannot be provided.
3. Adequate street lighting must be provided for the safety of pedestrians.
4. Street parking must be restricted adjacent to crosswalks to allow for adequate sight lines for both the motorists and the pedestrians. The length of the parking restriction shall be based on an engineering study.

B. Residential Streets

Marked crosswalks will generally not be installed on residential streets. Marked crosswalks will be evaluated for use on residential streets when indicated by one or more of the following:

1. The street intersects with a collector or higher classification street and the average daily traffic volume on the minor street exceeds 1000 vehicles per day.
2. The crossing location is within a designated school zone or is a key element of a designated school walking route plan.

3. A traffic engineering study indicates a safety problem that can be addressed by a marked crosswalk.

Evaluation of marking a crosswalk on a residential street requires an engineering traffic study and satisfying the requirements of III. A.

C. Mid-block Crossings

1. Warrant Criteria

A crosswalk at a mid-block location may be installed when the location satisfies the general criteria of III. A. and meets all of the warrant criteria for a mid-block crosswalk listed below:

- a. The crossing volume is not caused by a correctable gap in the sidewalk system.
- b. There is minimum distance of 300 feet to nearest protected crossing. A protected crossing is a crossing controlled by stop signs or signals or at a grade separation.
- c. Engineering study indicates no unsafe visibility or site conditions would be created.
- d. Posted speed is 35 mph or less.
- e. On an average day, a minimum of 50 pedestrians cross the street within 50 feet of the proposed crossing, during any one hour.
- f. The average daily two-way traffic volume on the street is above 3500 vehicles per day or there are insufficient normal gaps in traffic to allow pedestrian crossing at an average walking speed of 3.5 mph within a three minute interval more than twice during any peak hour period.

When a mid-block crosswalk is warranted the following guidelines shall be used:

- Level 3 markings shall be used
- “Yield to pedestrians” signs shall be placed in advance
- Crossing treatments as shown in Section IV. C. should be considered

2. Exceptions to Warrant Criteria

The pedestrian volume and vehicle volume warrants may be waived for any of the following situations:

- a. The crossing location is a key element of a designated school walking route plan
- b. A traffic engineering study indicates a safety problem that can be addressed by a marked mid-block crosswalk.
- c. The Bicycle and Pedestrian Commission has identified the location as a desirable location to

encourage crossing. Such locations can include, across collector and arterial streets where the distance to the nearest protected crossing or marked crossing is great enough that pedestrians would not logically be expected to use the protected or marked crossing, near transit stops, bike corridors, greenbelt and multi-use path crossings. The presence of pedestrians helps safety by reminding motorists of the crossing. Therefore, when the pedestrian volume is waived, additional emphasis should be given to installing crossing treatments as shown in Section IV. C.

D. Major Intersections

1. Un-signalized Intersections

a. All-way stop-controlled intersection

Provided the general criteria in Section III. A. is satisfied, all-way stop-controlled intersections shall use the following guidelines:

- At a minimum, crosswalks shall have Level 1 markings.
- Level 2 or 3 markings may be used based on crossing length, speed, and volumes.
- “Yield to pedestrians” signs may be placed in advance of all-way stop-controlled intersections.
- When crossing lengths are greater than 36 feet, pedestrian refuge islands shall be evaluated.

b. Partial stop-controlled intersection

Each approach at a partial stop-controlled intersection will be either **stop-controlled** or **uncontrolled**. Crosswalk markings at partial stop-controlled intersections will be evaluated based on the control of the approach being considered as indicated below. **Tee intersections** with heavy turning volumes and highly skewed intersections may require additional consideration.

i. Stop-controlled approaches

Provided the general criteria in Section III. A is satisfied, stop-controlled approaches shall use the following guidelines:

- ? At a minimum, crosswalks shall have Level 1 markings.
- ? Level 2 or 3 markings may be used based on crossing length, speed, and volumes
- ? “Yield to pedestrians” signs may be placed in advance of stop-controlled approaches at intersections.
- ? When crossing lengths are greater than 36 feet, pedestrian refuge islands shall be evaluated.

ii. Uncontrolled approach to intersection

This section applies to the uncontrolled approaches of partial stop-controlled intersections which are similar to a mid-block crosswalk in that the pedestrian is crossing uncontrolled traffic. The warrants for mid-block crosswalks, as stated in section III. C. 1 shall be used

when evaluating crosswalks across the uncontrolled approaches at an intersection, except that a 50% reduction pedestrian and vehicle volumes is permissible. The Pedestrian and vehicle volumes may be waived as indicated in Section III. C. 2. Provided the general criteria in Section III. A. is satisfied, and the modified mid-block warrants are satisfied, uncontrolled approaches shall use the following guidelines:

- ? Marked crosswalks on uncontrolled approaches of intersections shall be Level 3 markings.
- ? “Yield to pedestrians” signs should be placed in advance of crosswalks across uncontrolled approaches at intersections.
- ? Crossing treatments as shown in Section IV. C. should be considered.

2. Signalized Intersections

Provided the criteria in Section III. A. are satisfied, signalized intersections shall use the following guidelines:

- ? At a minimum, crosswalks shall have Level 1 markings.
- ? Level 2 or 3 markings may be used based on crossing length, vehicle speed and volumes.
- ? Signals shall provide enough time to allow pedestrians to cross the street safely based on a walking speed of 3.5 feet per second, this rate may be reduced at locations where the predominate walking speed is slower.
- ? Actuated signals should have pedestrian signals (WALK, DON'T WALK) activated by push buttons.
- ? When crossing lengths are greater than 36 feet, pedestrian refuge islands are to be evaluated.
- ? Pedestrian signals (WALK, DON'T WALK) shall be installed when the crosswalk crosses more than two lanes of same direction traffic or when the average daily entering traffic volume exceeds 10,000 vpd.

IV. STANDARDS

A. Pavement Markings

Crosswalks shall be a minimum of 6 feet or the same width as the approach walkway if the walkway is wider than 6 feet. When the guidelines and warrants section of this policy indicate the use of crosswalk markings, one of the following three levels of marking shall be used:

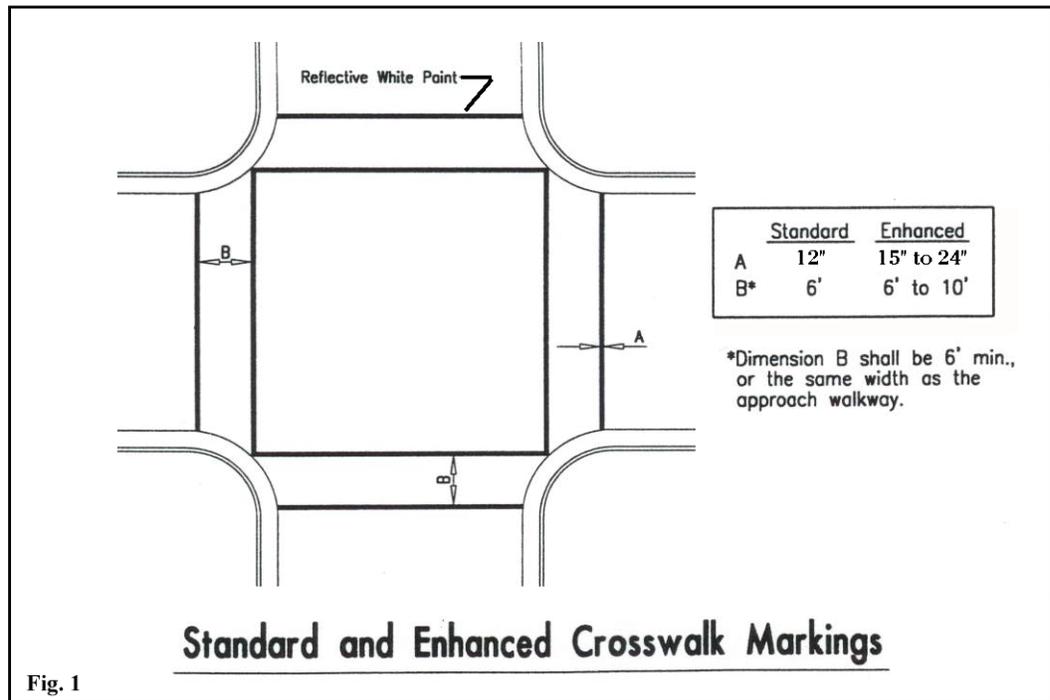


Figure 1 shows standard and enhanced crosswalk markings.

Level 1 - *Standard* crosswalk markings are two 12-inch white lines, 6 feet apart. (Fig. 1)

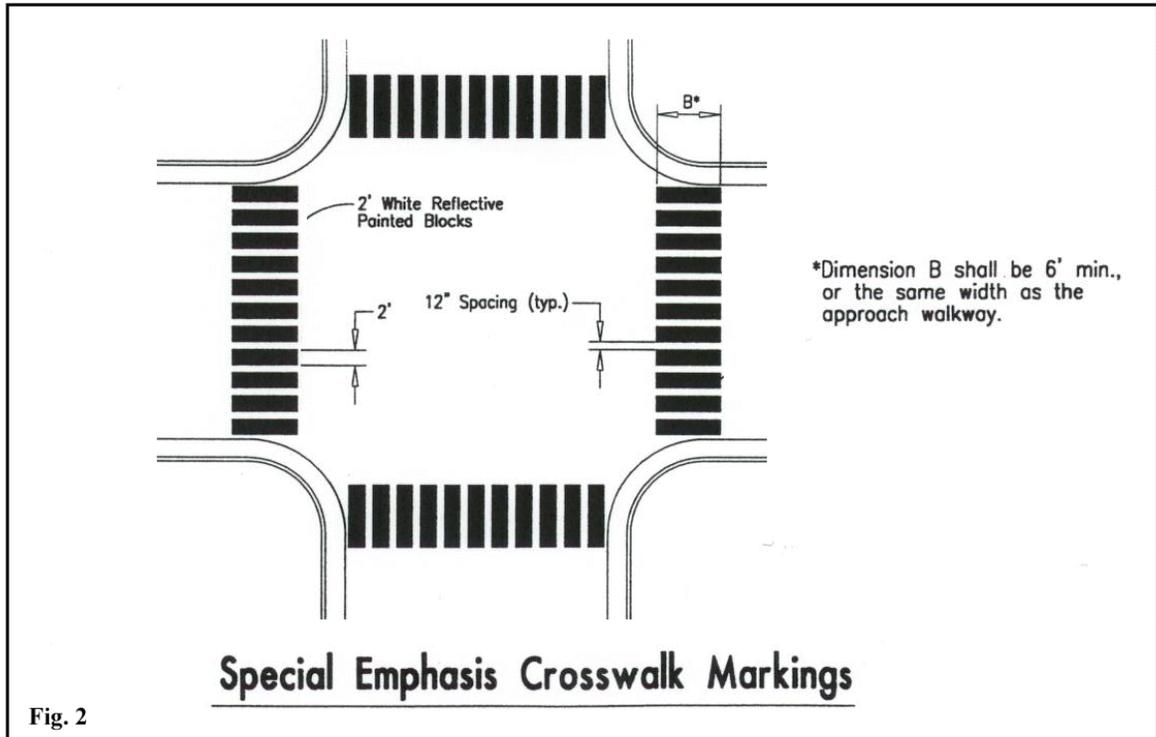
Level 2 - *Enhanced standard* crosswalk markings are similar to standard crosswalk markings except the width of the white lines is anywhere from 15 inches wide to 24 inches wide. (Fig. 1)

Enhanced standard markings may be used when any one of the following apply:

- ? Crosswalk is wider than 6 feet
- ? Crossing more than 2 lanes of traffic
- ? Intersection entering volume exceeds 900 vehicles per hour for any one hour
- ? "Yield to pedestrians" sign is placed in advance of crosswalk
- ? Across minor street at two-way stop controlled when major street speed limit exceeds 35 mph

Level 3 - Special emphasis crosswalk markings consist of white 2-foot wide bars with a 1-foot space at 90 degrees to the crosswalk. (Fig. 2) The width of the bars and spaces may be increased up to 36 inches at some locations to allow the tires of vehicles to track through the spaces.

Figure 2 shows special emphasis crosswalk markings.



Special Emphasis Markings **may** be used at any of the following locations:

- ? Within school zones or as shown on a school walking route plan
- ? When an engineering study indicates the need for additional visibility
- ? Where crosswalk treatments are used that result in raised pavements

Special Emphasis Markings **shall** be used at the following locations:

- ? Where mid-block crossings are installed
- ? Across un-controlled traffic at partial stop-controlled intersections
- ? Where crossings are installed on streets having an average daily traffic volume of 4000 vehicles per day or more.

High Pedestrian Areas - In business districts, campuses, commercial areas and other high pedestrian areas where pedestrian activity is to be encouraged and where significant distractions to motorists and pedestrians are likely to occur, engineering judgement can be used to implement a higher level of pavement marking than would be indicated by the crosswalk marking standards. Care should be taken to insure that special emphasis markings at some locations do not weaken or detract from other crosswalks where lower level markings are used.

B. Signs

1. **Crosswalk Signs - W11A-2** (Fig. 3)

The W11A-2 sign shall be used at marked mid-block crosswalks. When a W11A-2 crosswalk sign is used, an M6-2 sign (Fig. 3) with an arrow pointing down at a 45 degree shall be used with the sign. This sign group shall be installed so that a motorist will see the signs on the left side as well as the right side of the crosswalk. Crosswalk signs (W11A-2) may also be mounted over traffic lanes on mast arms to increase awareness of the crossing location.

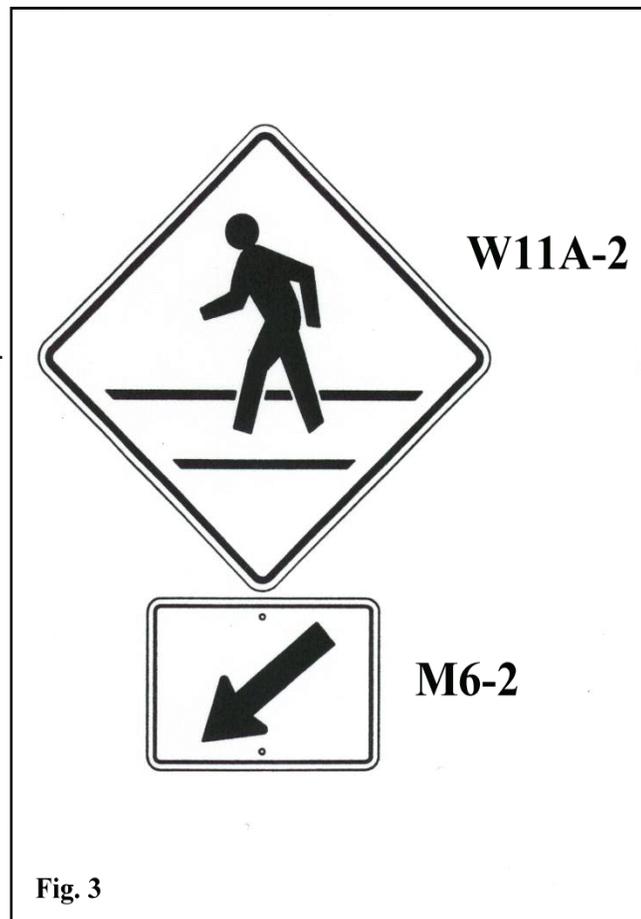


Figure 3 shows the standard sign group for marking crosswalks.

2. **“Yield to Pedestrian” Signs (YTP)** (Fig. 4)

To increase public awareness of the law requiring motorists to yield to pedestrians, a “Yield to Pedestrians - It’s the Law” sign may be utilized in any of the following situations:

- ? In advance of high pedestrian intersections
- ? In advance of mid-block crossings
- ? In advance of school zones

When the YTP sign is used, crosswalk markings shall be Level 2 or Level 3.

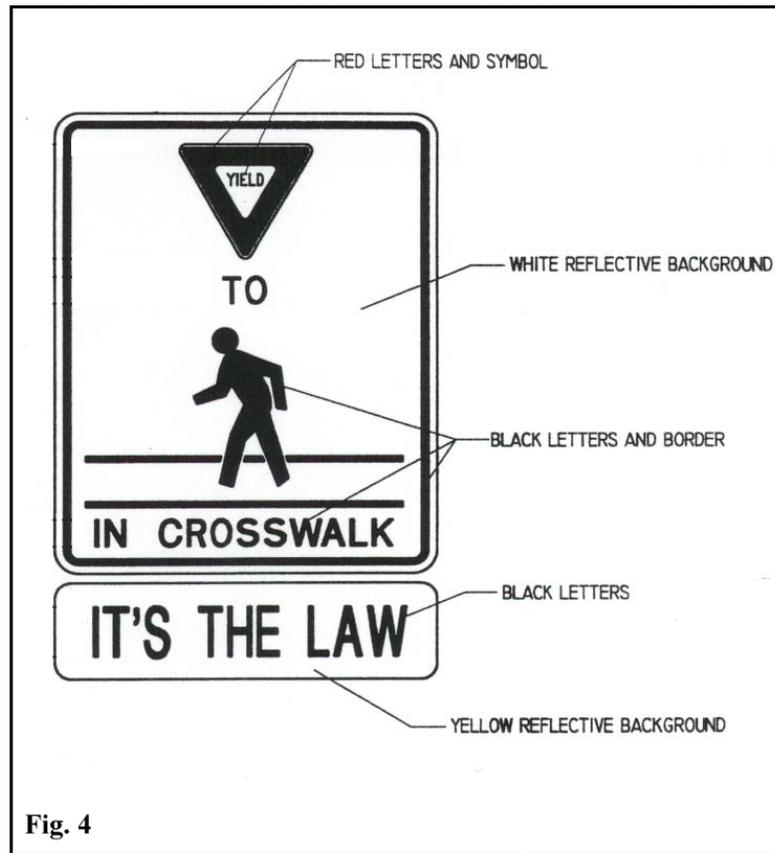


Figure 4 shows the standard "Yield to Pedestrian Sign"

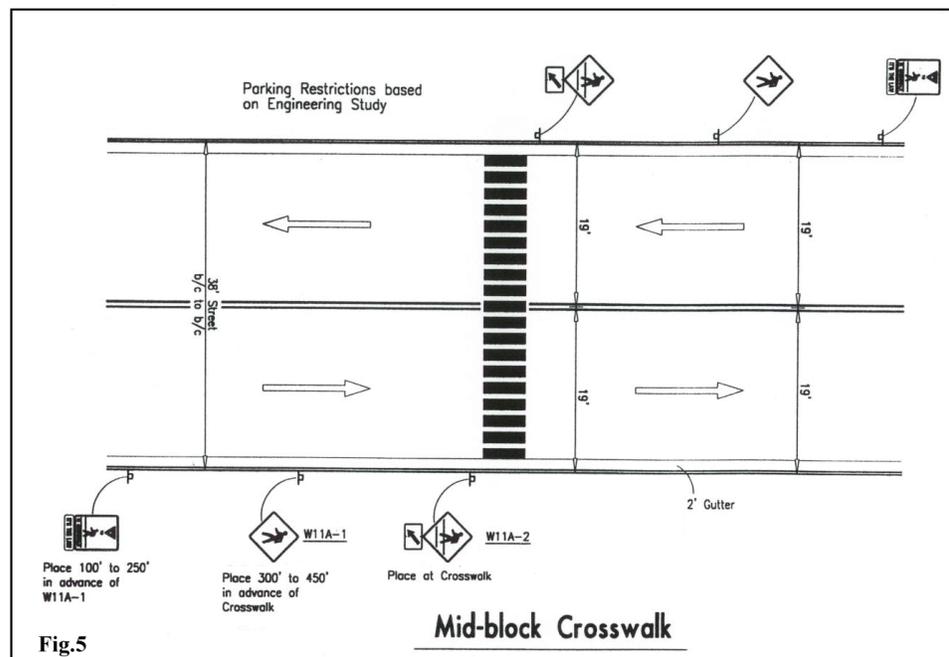


Figure 5 shows a typical mid-block crossing and the relationship of signs.

C. Crosswalk Treatments

The purpose of crosswalk treatments is to improve safety by:

- ? Reducing vehicle speed at the crosswalk
- ? Reducing exposure of the pedestrian to vehicles
- ? Increasing awareness of the presence of pedestrians
- ? Increasing visibility of the crosswalk

1. Bulb-Outs - Bulb-outs for pedestrians should be considered when warrants exist for pedestrian crossings at mid-block or major intersections and the pavement width is greater than 32 feet. Bulb-outs for traffic calming purposes may be installed on streets of lesser widths but are not considered necessary solely for pedestrian purposes. A typical mid-block crossing with bulb-outs is shown on Fig. 6. The illustration also indicates the location of signing.

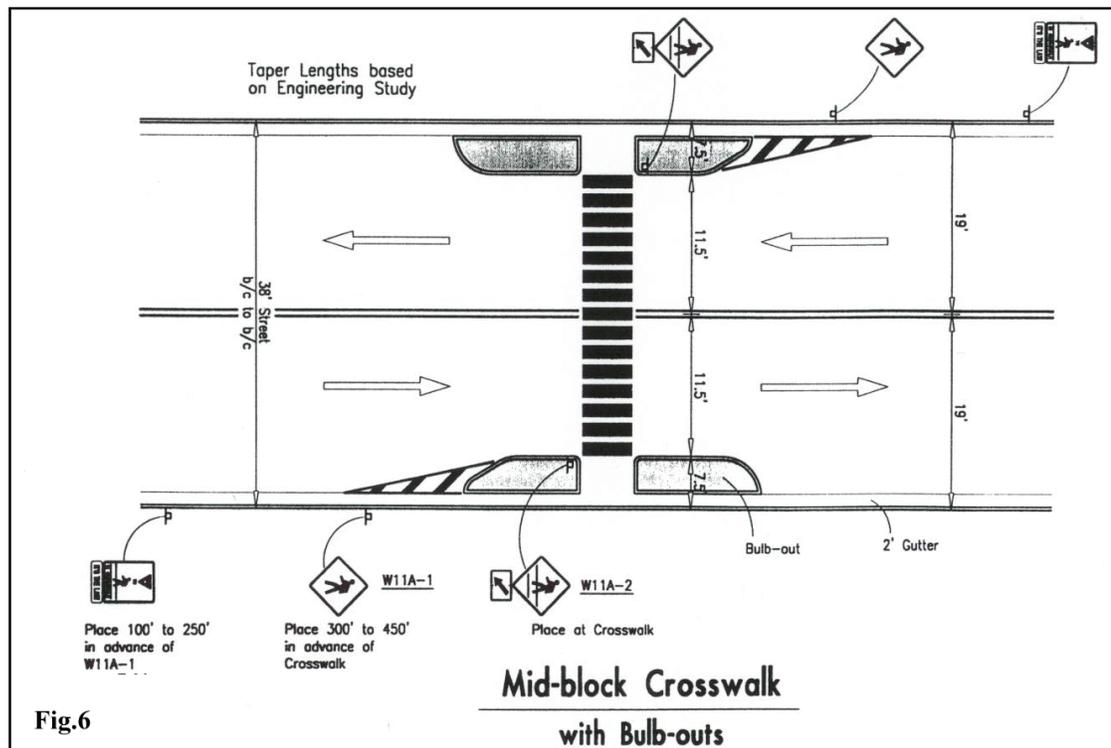


Figure 6 shows a typical mid-block crosswalk with bulb outs.

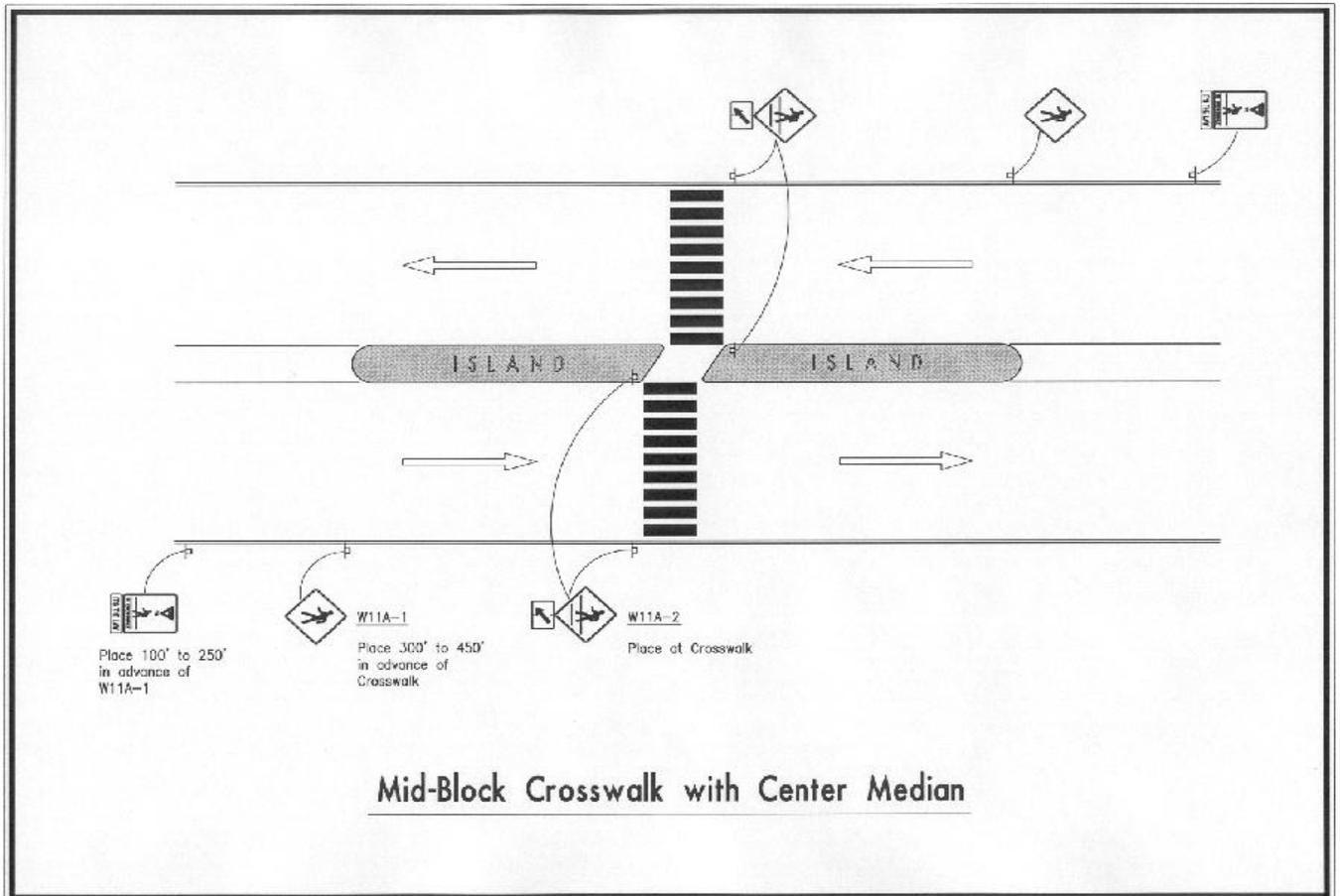


Figure 7 shows a typical mid-block crossing with a center median.

2. **Center Medians** - Center medians can improve crossing safety by providing a pedestrian refuge which will allow the pedestrian to cross each direction of traffic separately. Center medians shall only be installed where pavement widths are sufficient to allow for the safe clearance of pedestrians from moving traffic and the resulting traffic lanes are sufficient in width for the posted speed limit. Crosswalks leading to the center median will be offset to place emphasis on the median as a stopping place for pedestrians. A typical mid-block crossing with a pedestrian median and sign location is shown in Fig. 7. When a center median is used and there is also on street parking, bulb-outs may be considered in conjunction with the center median.
3. **Raised Crosswalks** - The intent of raised crosswalks is to increase visibility of the crosswalk and to decrease the vehicle speeds. Raised crosswalks are to be implemented as shown in the traffic calming policy.
4. **Flashing Yellow Crosswalk Lights** - Flashing yellow lights may be used at mid-block crosswalks if an engineering study indicates a need to increase awareness of the crosswalk location or the presence of pedestrians. Flashing yellow lights do not assign right-of-way. Improper interpretations of the purpose or meaning of flashing lights can lead to conflicting movements and should be considered when evaluating the use of flashing yellow lights.

For flashing yellow lights to be effective, they must command respect from motorists. If the lights flashed continually, a motorist would lose respect and ignore the installation after being “falsely warned” several times. Therefore, when flashing yellow lights are used at crosswalks, they should be activated by pedestrians.

Pedestrian actuated lights flash when a pedestrian pushes a button or passes a sensor. These lights indicate the presence of a pedestrian. The lights can be mounted with the crosswalk signs at the side of the road, over the driving lanes on mast arms, or in the pavement with airport taxiway style lights. For crossing multi-lane same direction traffic, overhead or in pavement lights are recommended.

- 5. Pedestrian Warranted Traffic Signals** - Traffic signals can be installed at an intersection or mid-block based on pedestrian volumes if warranted by the Manual on Uniform Traffic Control Devices. (MUTCD) When traffic signals are installed based on pedestrian volumes, pedestrian signals must be used. (WALK, DON'T WALK)
- 6. Grade Separation Structure** - Where it is not possible to accommodate pedestrians with at-grade crossings, grade separation may be considered. These facilities are expensive and can add out-of-direction travel. Therefore, grade separation should only be located where their use would be maximized. To ensure proper use, these facilities must be open, with good visibility and easily accessible.
- 7. Supplemental Pedestrian Crossing Channelizing Devices (SPCCD)** - SPCCD are portable devices consisting of a standard “yield to pedestrians” sign attached to a light weight frame and stand. These devices are not currently contained in the MUTCD but can be effective for temporary use during peak pedestrian hours. The SPCCD must be manually set up on the street centerline and removed after the peak period. They are most useful at crossings with a crossing guard and typically are used at school crossings, campuses, and special events. The SPCCD should only be used at existing marked crosswalks.