



## POLICY AND PROCEDURE MEMORANDUM

### E. ENGINEERING AND DESIGN

#### NO 7. MULTI-WAY STOP CONTROL

##### 1. PURPOSE

The purpose of this memorandum is to establish a comprehensive policy for the installation of multi-way stop control. Multi-way stop control is a higher level of traffic control where all approaches to an intersection are required to stop before proceeding. Although the Manual on Uniform Traffic Control Devices (M.U.T.C.D) has already established a set of quantitative criteria under which multi-way stop control may be used, many intersections require qualitative engineering analysis because of their particular design or unusual physical characteristics. This memorandum identifies the conditions under which multi-way stop control can be supported and/or recommended. Also, in order to avoid the potential overuse of multi-way stop control, conditions under which installation is not recommended are also identified.

##### 2. M.U.T.C.D. - Multi-way Stop Control

Section 2B.07 of the Manual on Uniform Traffic Control Devices (2003 Edition) identifies the following criteria that should be considered in an engineering study for a multi-way STOP sign installation:

- A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
- B. A crash problem, as indicated by 5 or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.
- C. Minimum volumes:
  1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day, and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but
3. If the 85th-percentile approach speed of the major-street traffic exceeds 65 km/h or exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

### 3. Other Criteria for Multi-way Stop Control

To supplement the quantitative criteria established by the M.U.T.C.D., the following special conditions have been identified based on past traffic engineering experience that also may be used when evaluating an intersection for a multi-way stop:

#### A. Intersections Adjacent to Schools

Intersections on collector and local streets that are immediately adjacent to elementary schools, K-8 schools, middle schools, and high schools may be controlled by a multi-way stop in order to provide additional pedestrian safety for school children. In general, marked crosswalks will be also be installed and maintained at these intersections to supplement the multi-way stop control.

#### B. Intersections of Two Collector Streets

A multi-way stop may be considered at the intersection of two residential neighborhood collector streets that are of similar design and operating characteristics where multi-way stop control would improve the operational characteristics of the intersection.

Note: The “Traffic Control and Street Classification Map” prepared under the authority of the City Traffic Engineer by Denver Traffic Engineering Services designates which streets are classified as “collectors”.

#### C. Sight Distance

The intersection of a collector street and a local street where a permanent physical obstruction (i.e., the obstruction cannot be trimmed, removed, or relocated) creates a sight distance problem may be controlled by a multi-way stop. Intersections of two local streets may be controlled with a multi-way stop only if a sight distance problem exists for both street approaches and changing the direction of traffic that is stopped will not eliminate the sight distance problem.

#### D. High Pedestrian Activity Areas

A multi-way stop may be installed on a collector or local street intersection that is immediately adjacent to a park, recreation center, community center, or neighborhood retail area where there is significantly higher than normal pedestrian activity for at least 8 hours a day. However, a new multi-way stop controlled pedestrian crossing should not be installed if an existing stop controlled or signalized pedestrian crossing already exists within reasonable walking distance (1 to 2 typical length blocks).

#### E. Interruption of Through Traffic

A multi-way stop may be installed at the intersection of a collector street and a local street to interrupt the continuous flow of traffic on the collector street if the resulting spacing between stop signs on the collector street is not less than one quarter mile (typically 3 to 4 blocks).

#### F. Intersections with Storm Drainage Cross Pans

Intersections where storm drainage cross pans extend across one of the street approaches and are of sufficient depth to potentially damage vehicles may be controlled by a multi-way stop if advance warning signs to reduce speed have proven ineffective and reversing the direction of traffic that is stopped is not a viable option.

### 4. Conditions Where Multi-way Stop Control Should Not Be Considered

Overuse of multi-way stops can result in a loss of respect for the significance of multi-way stop control. Multi-way stops should be reserved only for those intersections where this higher level of traffic control is truly justified in terms of public safety. Overuse of multi-way stops can cause driver frustration and reduce overall compliance with stop signs. There are other negative impacts associated with the overuse of multi-way stop control which include noise pollution, air pollution, and wasted fuel. Therefore, the following conditions have been identified which, in general, would not support the installation of a multi-way stop.

#### A. Speed Control

Installing multi-way stops for no other public safety purpose than to control speeding has been determined by several national studies to be an ineffective strategy. Studies done in other urban areas have concluded that multi-way stop control, when installed for no other purpose than speed control did not effectively reduce the overall speed of traffic. The studies showed that unnecessary multi-way stops had a high violation rate and vehicle speeds were only reduced in the immediate vicinity of the stop signs. Once past a multi-way stop that was installed for no other purpose than speed control, vehicles were recorded at speeds higher than previously measured, presumably as drivers tried to make up for lost time and/or to protest the inappropriate use of multi-way stop control.

#### B. "T" Intersections

Multi-way stops are not recommended at “T” intersections because drivers generally do not expect to encounter a stop sign that is located at the top of a “T” intersection. The expected violation rate for a stop sign placed at the top of a “T” intersection would be significantly higher than for a standard 4 approach intersection since there would be no cross street to the driver’s right and on-street parking would limit the visibility of the stop sign. Therefore, in order to install a multi-way stop at a “T” intersection, on-street parking would need to be removed a minimum of 40’ in advance of and 20’ beyond where the stop sign at the top of the “T” intersection would have to be placed. The elimination of approximately 60’ of on-street parking would negatively impact adjacent homes and/or businesses so, in most situations, the use of multi-way stop control at a “T” intersection is not recommended.

### C. Local Street Intersections

A multi-way stop should not be installed at a standard 4 approach intersection of two local streets unless the intersection meets one of the criteria listed in Section 3 of this P.P.M. Most of the residential neighborhoods in Denver have a grid system of streets where traffic can generally be controlled effectively through the use of an alternating pattern of stop signs. The purpose behind the alternating pattern of stop signs is to equally disperse traffic across the neighborhood grid of streets so that one local street does not bear a significantly greater traffic burden than another. Most local street intersections are unlikely to experience the type of operational problems that would justify the use of multi-way stop control. Concerns over stop sign compliance can generally be addressed by prohibiting parking in 20 to 30 feet in advance of a stop sign or by installing back to back stop signs on the opposite corners of a 2-way stop controlled intersection. Concerns over inequity in the stop sign pattern for local streets within a residential area can generally be addressed by simply shifting the stop signs at an intersection from one street to the other. This strategy is commonly referred to as a stop reversal.

### D. Signalized and/or Higher Volume Collector Streets

It is generally not recommended to install a multi-way stop on a collector street that is otherwise controlled exclusively by traffic signals. If stop signs were installed on a collector street in close proximity (1 to 2 typical length blocks) to an existing traffic signal, accidents would likely increase because a driver’s attention would be drawn ahead to the traffic signal resulting in a high stop sign violation rate. The stop sign violation rate would likely be highest at night since an overhead traffic signal display is much brighter and more easily seen than a stop sign under nighttime driving conditions. Multi-way stops are also not recommended for collector streets where the average daily volume of traffic is higher than what can reasonably be controlled by stop signs. This volume threshold is approximately 7000 vehicles/day.

## 5. Hardware

In general, multi-way stop control shall use standard size stop signs (R1-1, 30" x 30") with supplementary "4 WAY" or "ALL WAY" plates placed below the stop signs on all intersection approaches. 30" wide signs are the minimum size stop signs that are to be used on public streets but larger signs (36" or 48" wide) may be used under special circumstances if approved by the City Traffic Engineer. All newly installed stop signs and supplemental plates shall use ASTM Type 9 or 11 micro-prismatic retro-reflective sheeting material. Multi-way stops on collector streets will generally have double posted stop signs near right and far left to enhance driver awareness of the stop. In addition, "STOP AHEAD" signs (W3-1, 36" x 36") may be installed for street approaches where driver expectancy of the multi-way stop is observed to be low, or for a temporary period of time after a new multi-way stop is installed to increase driver awareness of the change in traffic control. Temporary flags attached to the street side edge of the stop sign may also be used to alert drivers that a recent traffic control change has been made.

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APPROVED BY:

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DATE

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