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This guide describes the **Traffic Calming Process**. Users should utilize this guide for an understanding of the steps and responsibilities in the effort to modify driving behavior associated with pedestrian and cyclists' safety.

BACKGROUND

On occasion, the County is contacted to request that traffic is slowed down on streets within a subdivision, a particular street or specific segments of a street. All such requests are addressed by the Engineering Department and should be forwarded to Engineering. Engineering's procedure is that a traffic calming request is submitted by the proper authority representing the community at the area of concern. For example, a proper authority would be a Home Owners Association or Metro District. The Engineering Department will work with the authority for an appropriate solution. Quite often, the initial request is to have a speed hump installed. The placement of a speed hump is a drastic measure to calm traffic and may only be used if other actions do not remedy the problem. Procedures and standards dictate that other steps are taken toward remedy before physical alteration of a road is given any consideration.

OVERVIEW

- 1. The HOA, POA, (Association) or District representing the community is responsible for the request, identifying the problem and locations, to the Engineering Department.
- 2. Upon Engineering's investigation that pedestrian safety may be compromised, the established Process will be followed. A speed/volume study will be conducted to determine the prevalence and severity of the matter. Based on the study, a suitable traffic calming method following a hierarchy of alternatives shall be recommended and decided upon. Once measures are installed, a trial period will be conducted. All public comment will be directed to the Association.
- 3. Given that the trial period to calm traffic does not prove to resolve the safety matter, certain geometric feature changes as defined in Process may be necessary.

PROCESS

- 1. **Site visit and observation** Engineering will evaluate the situation.
 - During initial evaluation, Engineering shall consider: Road classification & posted speed per classification LUR 4-620 D. 1 – D.8, investigate police accident & incident reports. And, determine if the speed problem is perceived or real.
 - Examine pedestrian and driver conflicts When is the problem most critical? Suggest that a representative of the party making the request be present for observation at a time the party has observed the dangerous pedestrian/traffic pattern. Note if pedestrian ways are available or used, pedestrian presence/volume, access to play areas, dog parks, bus stops, community centers etc. Check blind spots, sight distances and school bus stops at peak pedestrian & traffic hours.
- 2. **Observation indicates a potential problem** there is a degree of concern that a speed and safety condition exists, a speed/volume study shall be conducted as warranted.
 - Examine study results to determine severity of speeding and traffic/pedestrian characteristics.
 Traffic and pedestrian characteristics serve as guidelines for the appropriate solution.
- 3. **Evaluation and recommendation** traffic calming and safety measures will be determined by Engineering following the hierarchy as outlined below. A recommendation will be reported and discussed with the Association toward agreement on the appropriate calming method.

The hierarchy of calming method alternatives

- A. Revise, enforce laws, ordinances regarding speed limits contact the sheriff/ enforcement.
- B. Community education Announce the issue through bulletins to residents. With positive reminders and re-enforcement, this could be the most effective means to protect pedestrians for the long duration. Discuss potential solutions, the advantages & disadvantages of specific calming measures. Engineering can supply information to the Association.
- C. The installation of traffic control devices signs, variable speed limit devices, crosswalks.
 - Signs and crosswalks will conform to MUTCD (Manual on Uniform Traffic Control Devices) standards and the placement/location requirements of CDOT M & S Standards.
 - Trial Period for traffic control devices method upon the agreed method, the association will solicit and account for residents' comment during a trial period of the traffic control devices to evaluate whether to continue permanently or withdraw the request for the installation.
- D. **Geometric design features** used when the above methods prove ineffective. Pedestrian and traffic characteristics or circumstances as studied earlier are used to determine the least intrusive yet effective solution typically in the following recommended order.

Note: Certain geometric features changes are not afforded a trial period due to the permanence of the change.

- Trails-sidewalks
- Pavement width reductions
- Medians
- Diverters
- Rumble strips
- Speed humps
- Raised intersections
- 4. Once a method is agreed upon, any required control devices, excluding certain geometric changes, will be installed and monitored during a trial period. A Construction in Public Way permit and/or an Encroachment Agreement may be required based upon the method to be used. Continued observation and a follow-up speed study are necessary to prove the method's effectiveness.
 - The Public Way Permit is used for any activity or construction in the right of way. This offers safety and performance measures.
 - The Encroachment Agreement is predominantly used when geometric feature construction is necessary and establishes the maintenance and liability responsibilities.
- 5. All public comment about the calming measures will be directed to the Association for consideration and response.
- 6. The community is responsible for the cost of the calming devices and the removal of any traffic calming devices should removal be requested by the community or required by the county for safety or maintenance reasons.

GEOMETRIC DESIGN FEATURES

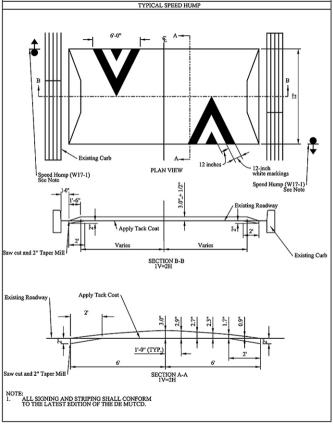
Geometric modification of a street will only be considered if the safety matter remains critical while using the traffic control device method and the Association has the financial means to construct the features.

If deemed necessary, designs from a Professional Engineer will be required, right of ways or easements verified and/or created. Endorsement from the Road & Bridge Department must be obtained to ensure no operational and maintenance impacts. A Public Way Permit, Grading Permit, Encroachment Agreement or a Public

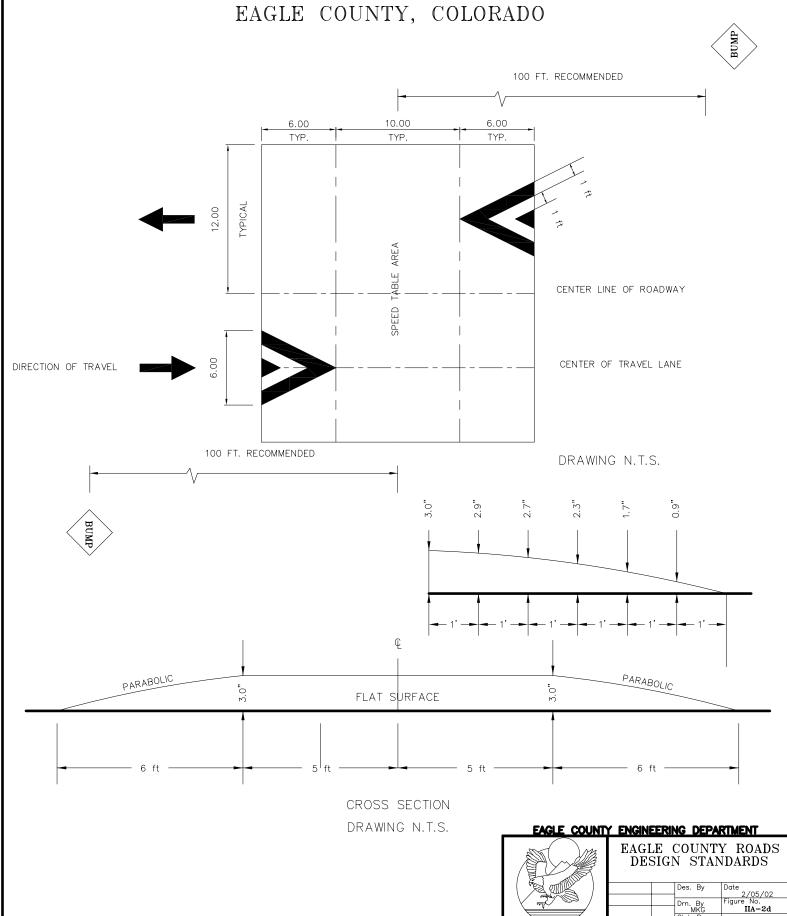
SPEED HUMP PROCEDURE

The following is a brief narrative of the steps required to evaluate the need and an outline of the procedures in regards to a speed hump request.

- The Home Owners Association (HOA) is responsible for all aspects of initiating and the substantial follow through to formalize and consummate a request with Eagle County for speed humps.
- The HOA should garner subdivision (the home owners) support of the installation of speed humps. This would be facilitated by deciding where you want to slow the traffic down, keeping in mind that in most cases a single hump is not effective, prepare a diagram to present to the HOA at an open meeting and/or mailing.
- Be aware that not all members of the community will be in support of the installation of speed humps which could lead to neighborhood contention.
- The HOA board should vote on the implementation of speed humps based on input from the HOA.
- If the HOA is in favor of the installation of speed humps and is part of a larger metro district, written approval from the metro district will be required as the metro district is representative of the community at large.
- If both the HOA and associated metro district are in favor of the installation of speed humps, present the documentation indicating such to the Eagle County Engineering Department.
- Once documentation of the HOA and metro district's desire to install speed humps has been submitted to the Eagle County Engineering Department, a speed study will be conducted to confirm the presence of a speeding issue.
- If the study warrants a speeding problem and/or accident incidents; that humps are warranted, the HOA
 may submit plans for the installation of speed humps with their application for an Eagle County Right of
 Way permit.
- At a minimum, two (2) speed humps are required. Historically, one (1) hump has not proven effective.
- Certain design and placement characteristics will be evaluated to establish effective speed control and maintenance issues while reviewing the Right of Way permit. It is crucial to advise the property owners that the configurations proposed could be modified to insure effective speed control and address safety matters.
- An encroachment agreement with Eagle County is required to be signed before installation of speed humps may proceed. This agreement generally places the cost of and/or removal of the humps on the HOA, establishes the HOA responsibilities, and indemnifies Eagle County. A draft of the agreement is sent to the HOA. Depending on the HOA's review with their legal council, a final draft may be negotiated – some matters cannot be modified.
- Signage identifying each bump from both directions is required. The signage is also an HOA cost along with the appropriate striping.
- The HOA must notify the School District, Sheriff and emergency responders of the locations.
- The HOA will be responsible for all costs associated with the installation of the requested speed humps, including signage and pavement markings. Furthermore, in the event the County deems it necessary, the removal of the speed humps will also fall upon the HOA.
- During construction, the contractor must mill down 2 inches into the existing roadway as indicated on the typical drawings to prevent long term maintenance issues.



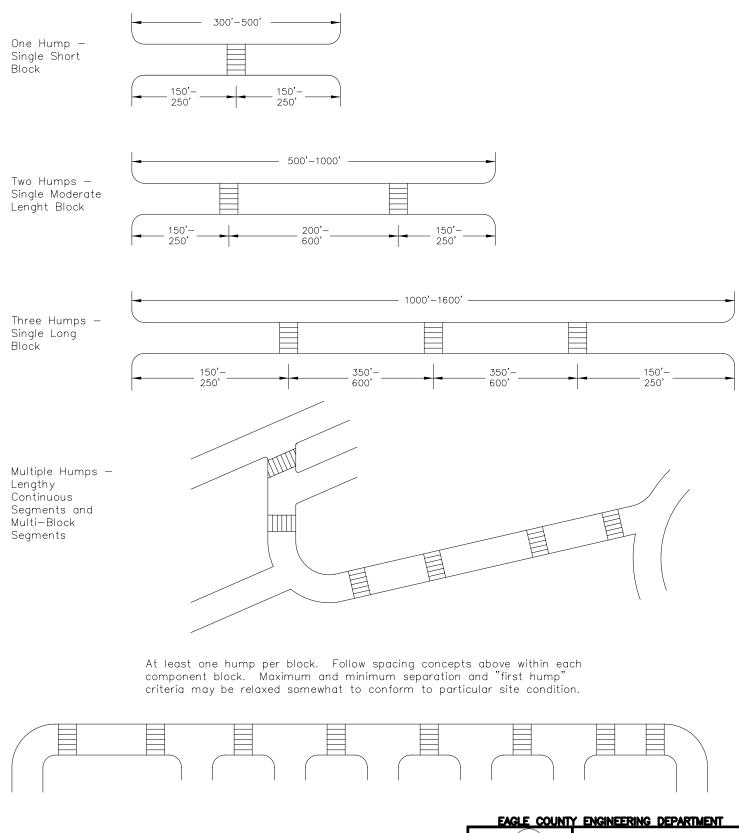
TYPICAL 22' SPEED HUMP DETAILS



Drn. By MKG Ckd. By PTS

Sheet 1 of 1

TYPICAL HUMP SPACING CONCEPTS EAGLE COUNTY, COLORADO



DRAWING N.T.S.

SOURCE: Western ITE September—October 1993

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When the W14-1 or W14-2 sign is used, the sign shall be posted as near as practical to the entry point or at a sufficient advance distance to permit the road user to avoid the dead end or no outlet condition by turning at the nearest intersecting street.

The DEAD END (W14-1a) or NO OUTLET (W14-2a) signs shall not be used instead of the W14-1 or W14-2 signs where traffic can proceed straight through the intersection into the dead end street or no outlet area.

Section 2C.27 Low Clearance Signs (W12-2 and W12-2a)

Standard:

The Low Clearance (W12-2) sign (see Figure 2C-5) shall be used to warn road users of clearances less than 12 inches above the statutory maximum vehicle height.

Guidance:

- The actual clearance should be displayed on the Low Clearance sign to the nearest 1 inch not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition.
- Where the clearance is less than the legal maximum vehicle height, the W12-2 sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.
- In the case of an arch or other structure under which the clearance varies greatly, two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway.
- Clearances should be evaluated periodically, particularly when resurfacing operations have occurred. Option:
- The Low Clearance sign may be installed on or in advance of the structure. If a sign is placed on the structure, it may be a rectangular shape (W12-2a) with the appropriate legend (see Figure 2C-5).

Section 2C.28 BUMP and DIP Signs (W8-1, W8-2)

Guidance:

BUMP (W8-1) and DIP (W8-2) signs (see Figure 2C-6) should be used to give warning of a sharp rise or depression in the profile of the road.

Option:

These signs may be supplemented with an Advisory Speed plaque (see Section 2C.08).

Standard:

The DIP sign shall not be used at a short stretch of depressed alignment that might momentarily hide a vehicle.

Guidance:

A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when center line striping is provided on a two-lane or three-lane road (see Section 3B.02).

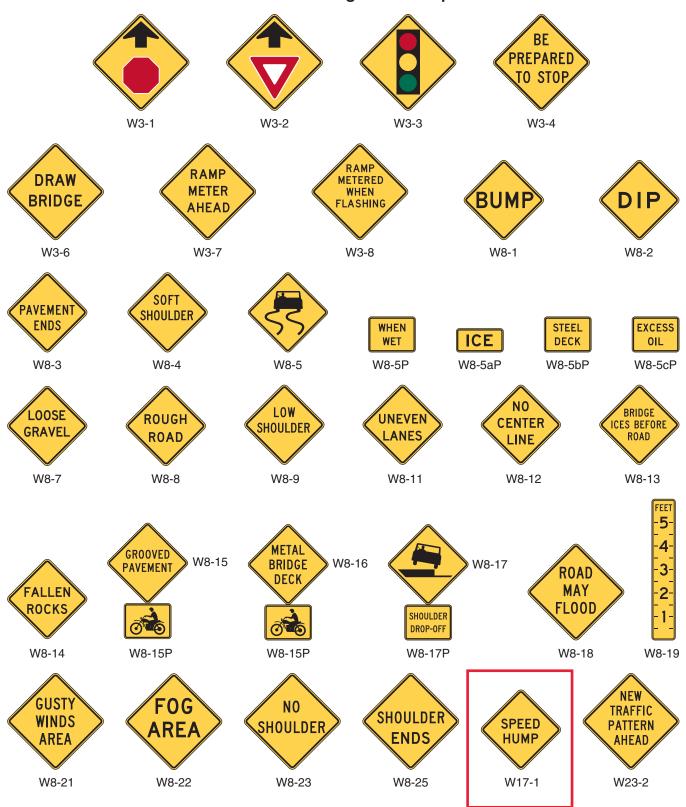
Section 2C.29 SPEED HUMP Sign (W17-1)

Guidance:

- The SPEED HUMP (W17-1) sign (see Figure 2C-6) should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic.
- 12 If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Section 2C.08). Option:
- If a series of speed humps exists in close proximity, an Advisory Speed plaque may be eliminated on all but the first SPEED HUMP sign in the series.
- The legend SPEED BUMP may be used instead of the legend SPEED HUMP on the W17-1 sign. Support:
- Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed of traffic more severely than speed humps. Other forms of speed humps include speed tables and raised intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

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Figure 2C-6. Roadway and Weather Condition and Advance
Traffic Control Signs and Plaques



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Section 2C.08 Advisory Speed Plaque (W13-1P)

Option:

The Advisory Speed (W13-1P) plaque (see Figure 2C-1) may be used to supplement any warning sign to indicate the advisory speed for a condition.

Standard:

- The use of the Advisory Speed plaque for horizontal curves shall be in accordance with the information shown in Table 2C-5. The Advisory Speed plaque shall also be used where an engineering study indicates a need to advise road users of the advisory speed for other roadway conditions.
- If used, the Advisory Speed plaque shall carry the message XX MPH. The speed displayed shall be a multiple of 5 mph.
- Except in emergencies or when the condition is temporary, an Advisory Speed plaque shall not be installed until the advisory speed has been determined by an engineering study.
- The Advisory Speed plaque shall only be used to supplement a warning sign and shall not be installed as a separate sign installation.
- The advisory speed shall be determined by an engineering study that follows established engineering practices.

Support:

- Among the established engineering practices that are appropriate for the determination of the recommended advisory speed for a horizontal curve are the following:
 - A. An accelerometer that provides a direct determination of side friction factors
 - B. A design speed equation
 - C. A traditional ball-bank indicator using the following criteria:
 - 1. 16 degrees of ball-bank for speeds of 20 mph or less
 - 2. 14 degrees of ball-bank for speeds of 25 to 30 mph
 - 3. 12 degrees of ball-bank for speeds of 35 mph and higher
- The 16, 14, and 12 degrees of ball-bank criteria are comparable to the current AASHTO horizontal curve design guidance. Research has shown that drivers often exceed existing posted advisory curve speeds by 7 to 10 mph.

Guidance:

- The advisory speed should be determined based on free-flowing traffic conditions.
- Because changes in conditions, such as roadway geometrics, surface characteristics, or sight distance, might affect the advisory speed, each location should be evaluated periodically or when conditions change.

Section 2C.09 Chevron Alignment Sign (W1-8)

Standard:

The use of the Chevron Alignment (W1-8) sign (see Figures 2C-1 and 2C-2) to provide additional emphasis and guidance for a change in horizontal alignment shall be in accordance with the information shown in Table 2C-5.

Option:

When used, Chevron Alignment signs may be used instead of or in addition to standard delineators.

Standard:

- The Chevron Alignment sign shall be a vertical rectangle. No border shall be used on the Chevron Alignment sign.
- If used, Chevron Alignment signs shall be installed on the outside of a turn or curve, in line with and at approximately a right angle to approaching traffic. Chevron Alignment signs shall be installed at a minimum height of 4 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way.

Guidance:

- The approximate spacing of Chevron Alignment signs on the turn or curve measured from the point of curvature (PC) should be as shown in Table 2C-6.
- If used, Chevron Alignment signs should be visible for a sufficient distance to provide the road user with adequate time to react to the change in alignment.

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Minimum spacing between warning signs with different messages should be based on the estimated PRT for driver comprehension of and reaction to the second sign.

The effectiveness of the placement of warning signs should be periodically evaluated under both day and night conditions.

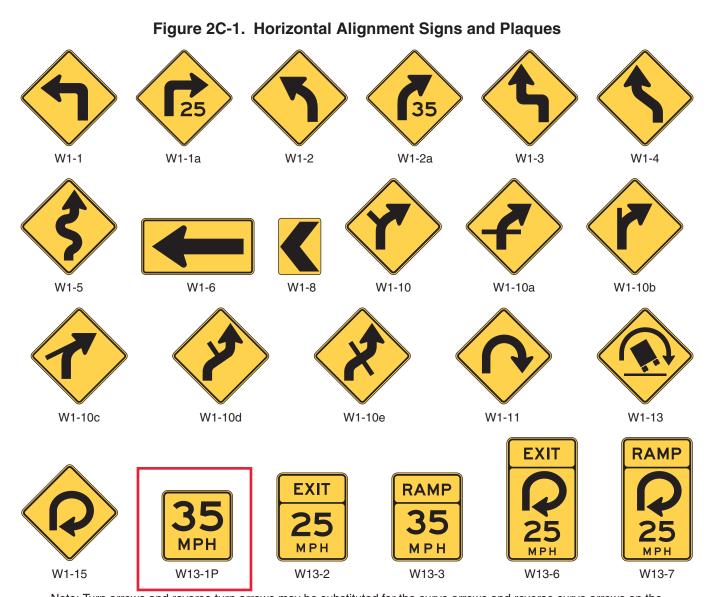
Option:

Warning signs that advise road users about conditions that are not related to a specific location, such as Deer Crossing or SOFT SHOULDER, may be installed in an appropriate location, based on engineering judgment, since they are not covered in Table 2C-4.

Section 2C.06 Horizontal Alignment Warning Signs

Support:

A variety of horizontal alignment warning signs (see Figure 2C-1), pavement markings (see Chapter 3B), and delineation (see Chapter 3F) can be used to advise motorists of a change in the roadway alignment. Uniform application of these traffic control devices with respect to the amount of change in the roadway alignment conveys a consistent message establishing driver expectancy and promoting effective roadway operations. The design and application of horizontal alignment warning signs to meet those requirements are addressed in Sections 2C.06 through 2C.15.



Note: Turn arrows and reverse turn arrows may be substituted for the curve arrows and reverse curve arrows on the W1-10 series signs where appropriate.

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Signs and plaques larger than those shown in Tables 2C-2 and 2C-3 may be used (see Section 2A.11). *Guidance:*

The minimum size for all diamond-shaped warning signs facing traffic on exit and entrance ramps should be the size identified in Table 2C-2 for the mainline roadway classification (Expressway or Freeway). If a minimum size is not provided in the Freeway Column, the Expressway size should be used. If a minimum size is not provided in the Freeway or the Expressway Column, the Oversized size should be used.

Section 2C.05 Placement of Warning Signs

Support:

Guidance:

- For information on placement of warning signs, see Sections 2A.16 to 2A.21.
- The time needed for detection, recognition, decision, and reaction is called the Perception-Response Time (PRT). Table 2C-4 is provided as an aid for determining warning sign location. The distances shown in Table 2C-4 can be adjusted for roadway features, other signing, and to improve visibility.
- Warning signs should be placed so that they provide an adequate PRT. The distances contained in Table 2C-4 are for guidance purposes and should be applied with engineering judgment. Warning signs should not be placed too far in advance of the condition, such that drivers might tend to forget the warning because of other driving distractions, especially in urban areas.

Table 2C-4. Guidelines for Advance Placement of Warning Signs

Posted or 85th- Percentile Speed	Advance Placement Distance ¹								
	Condition A: Speed reduction and lane changing in heavy traffic ²	Condition B: Deceleration to the listed advisory speed (mph) for the condition							
		0 ³	104	204	304	404	50 ⁴	604	704
20 mph	225 ft	100 ft ⁶	N/A ⁵	_	_	_	_	_	_
25 mph	325 ft	100 ft ⁶	N/A ⁵	N/A ⁵	_	_	_	_	_
30 mph	460 ft	100 ft ⁶	N/A ⁵	N/A ⁵	_	_	_	_	_
35 mph	565 ft	100 ft ⁶	N/A ⁵	N/A ⁵	N/A ⁵	_	_	_	_
40 mph	670 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	_	_	_	_
45 mph	775 ft	175 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	_	_	_
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft ⁶	_	_	_
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A ⁵	_	_
60 mph	1,100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft ⁶	_	_
65 mph	1,200 ft	475 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft ⁶	_
70 mph	1,250 ft	550 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	_
75 mph	1,350 ft	650 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft ⁶

¹The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

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² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

⁵ No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

⁶ The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

11 Curbs at openings in a continuous median island need not be marked unless an engineering study indicates the need for this type of marking.

Option:

Retroreflective or internally illuminated raised pavement markers of the appropriate color may be placed on the pavement in front of the curb and/or on the top of curbed as of raised medians and curbs of islands, as a supplement to or substitute for retroreflective curb markings used for delineation.

Section 3B.24 Chevron and Diagonal Crosshatch Markings

Option:

Chevron and diagonal crosshatch markings may be used to discourage travel on certain paved areas, such as shoulders, gore areas, flush median areas between solid double yellow center line markings or between white channelizing lines approaching obstructions in the roadway (see Section 3B.10 and Figure 3B-15), between solid double yellow center line markings forming flush medians or channelized travel paths at intersections (see Figures 3B-2 and 3B-5), buffer spaces between preferential lanes and general-purpose lanes (see Figures 3D-2 and 3D-4), and at grade crossings (see Part 8).

Standard:

- When crosshatch markings are used in paved areas that separate traffic flows in the same general direction, they shall be white and they shall be shaped as chevron markings, with the point of each chevron facing toward approaching traffic, as shown in Figure 3B-8, Drawing A of Figure 3B-9, Figure 3B-10, and Drawing C of Figure 3B-15.
- When crosshatch markings are used in paved areas that separate opposing directions of traffic, they shall be yellow diagonal markings that slant away from traffic in the adjacent travel lanes, as shown in Figures 3B-2 and 3B-5 and Drawings A and B of Figure 3B-15.
- When crosshatch markings are used on paved shoulders, they shall be diagonal markings that slant away from traffic in the adjacent travel lane. The diagonal markings shall be yellow when used on the left-hand shoulders of the roadways of divided highways and on the left-hand shoulders of one-way streets or ramps. The diagonal markings shall be white when used on right-hand shoulders. *Guidance:*
- The chevrons and diagonal lines used for crosshatch markings should be at least 12 inches wide for roadways having a posted or statutory speed limit of 45 mph or greater, and at least 8 inches wide for roadways having posted or statutory speed limit of less than 45 mph. The longitudinal spacing of the chevrons or diagonal lines should be determined by engineering judgment considering factors such as speeds and desired visual impacts. The chevrons and diagonal lines should form an angle of approximately 30 to 45 degrees with the longitudinal lines that they intersect.

Section 3B.25 Speed Hump Markings

Standard:

If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location. If markings are used for a speed hump that does not also function as a crosswalk or speed Table, the markings shall comply with Option A, B, or C shown in Figure 3B-29. If markings are used for a speed hump that also functions as a crosswalk or speed Table, the markings shall comply with Option A or B shown in Figure 3B-30.

Section 3B.26 Advance Speed Hump Markings

Option:

- Advance speed hump markings (see Figure 3B-31) may be used in advance of speed humps or other engineered vertical roadway deflections such as dips where added visibility is desired or where such deflection is not expected.
- Advance pavement wording such as BUMP or HUMP (see Section 3B.20) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings. Appropriate advance warning signs may be used in compliance with Section 2C.29.

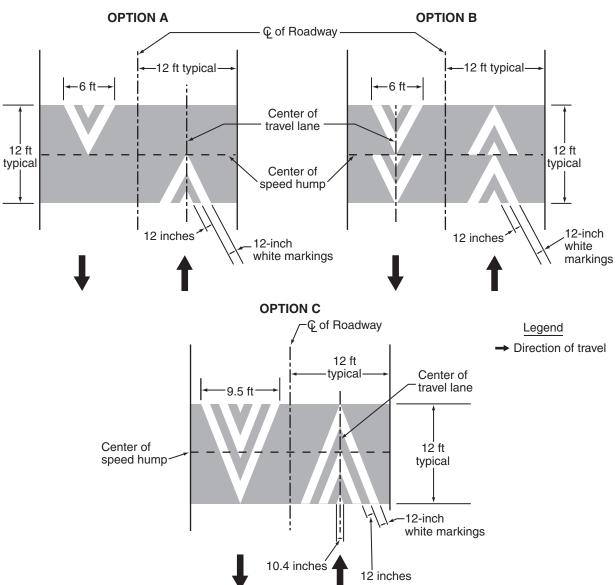
Standard:

- If advance speed hump markings are used, they shall be a series of eight white 12-inch transverse lines that become longer and are spaced closer together as the vehicle approaches the speed hump or other deflection. If advance markings are used, they shall comply with the detailed design shown in Figure 3B-31. Guidance:
- If used, advance speed hump markings should be installed in each approach lane.

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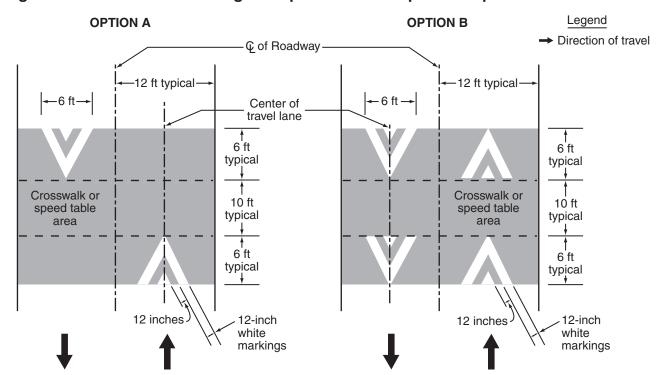
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Figure 3B-29. Pavement Markings for Speed Humps without Crosswalks



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Figure 3B-30. Pavement Markings for Speed Tables or Speed Humps with Crosswalks

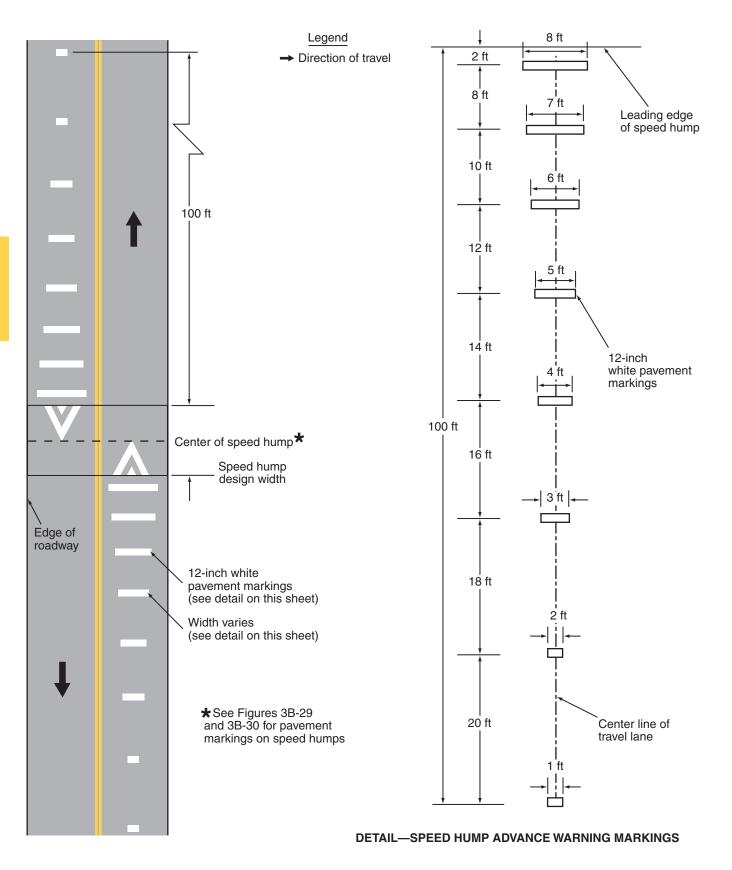


Note: Optional crosswalk lines are not shown in this figure

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Figure 3B-31. Advance Warning Markings for Speed Humps



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