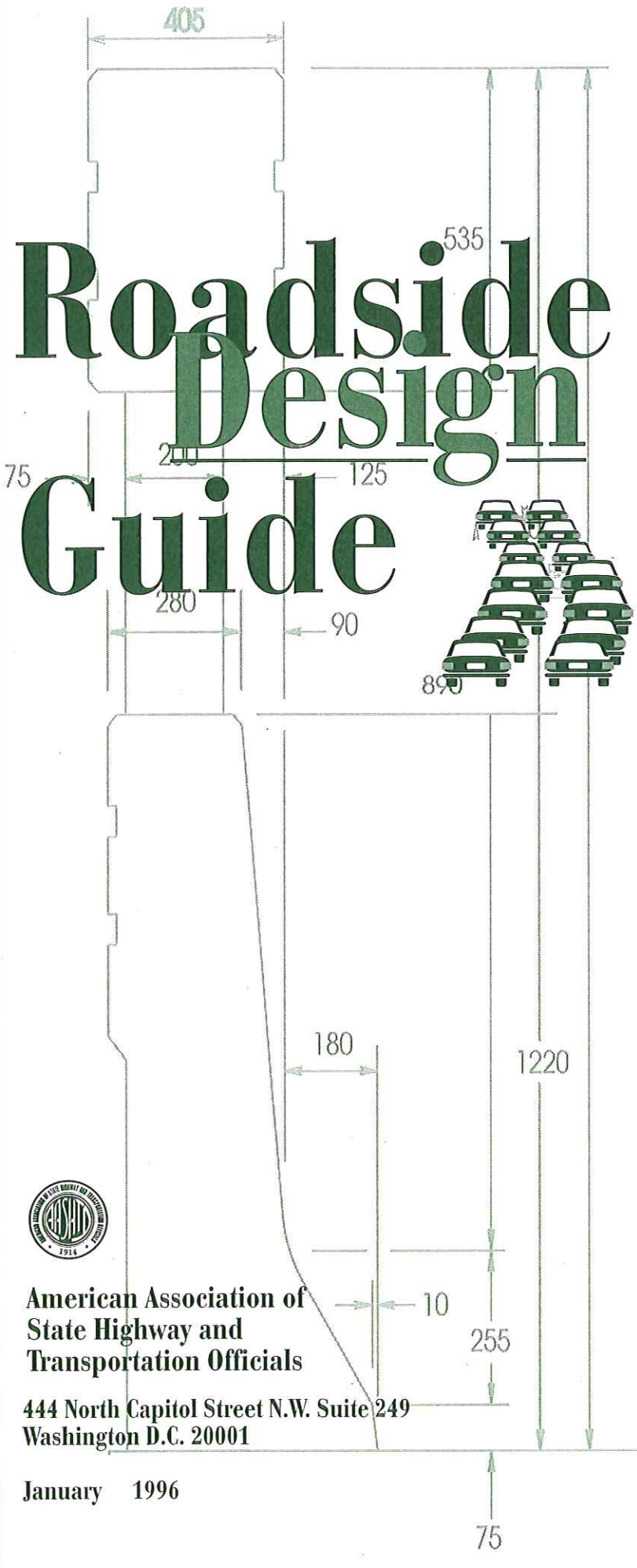
Roadside Design Guide



American Association of
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444 North Capitol Street N.W. Suite 249
Washington D.C. 20001

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vehicle conveyor system and the segment is lifted from the road. Continuous lengths of the barrier are transported on conveyor wheels through an elongated "S" curve, moved across the roadway and set down to form a new parallel lane. Transfer speeds of 8 to 16 km/h are obtained depending on the lateral distance of movement.

The system has been successfully crash tested with a 2300-kg vehicle at 90 km/h and 25 degrees. This test resulted in a deflection of approximately 1.5 m.

The system may be used in construction zones on high-volume freeways, where due to construction operations and a desire to maintain traffic capacity, traffic lanes are opened and closed frequently. The system requires cost, energy, and time to set up the barriers initially; however, it allows a work zone to be quickly created and protected during periods of low traffic flow, and be changed back to full lane utilization during the busy daytime period.

The system may also be used to advantage on roadways with unbalanced directional traffic, such as commuter or tourist routes. Once set up the barrier can be moved rapidly to provide additional capacity in the direction of heavy traffic flow.

6.4.1.9 Earth Berm

An earth berm or redirectional land form can be used to mitigate obstructions located in medians. Figures 6.7 and 6.8 show a schematic drawing of this feature and an actual installation, respectively. The heights and slope rates are not fixed and slopes should be flatter wherever practical. Heights over 3 m are not recommended and slope rates should not exceed 1:2, although steeper slopes can be used if they are smooth and liberally rounded at the base. Earth berms are typically used in lieu of a roadside or median barrier to shield bridge piers. It is critical that the berm be gradually introduced so it does not become an obstacle to an errant vehicle. The designer must also recognize that the redirectional capabilities of the berm are minimal throughout much of its length and it should not be used where high angle impacts are likely (such as on the outside of horizontal curves) or where vehicle encroachments beyond the berm may have severe consequences.

Grate inlets or median drains required to drain the roadway shoulder and median ditch areas should be designed to blend with the smooth contours of the earth berm.

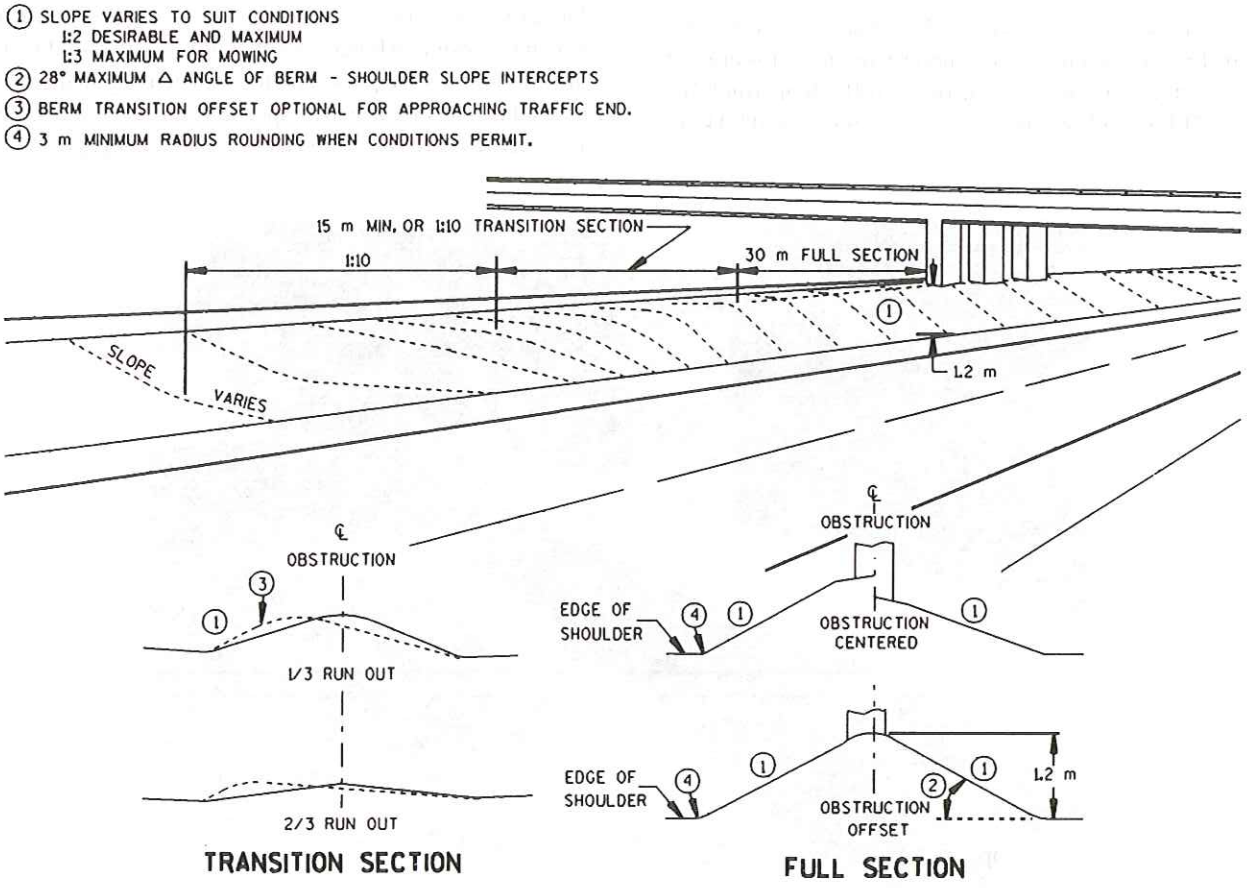

FIGURE 6.7 Schematic Drawing of a Median Berm

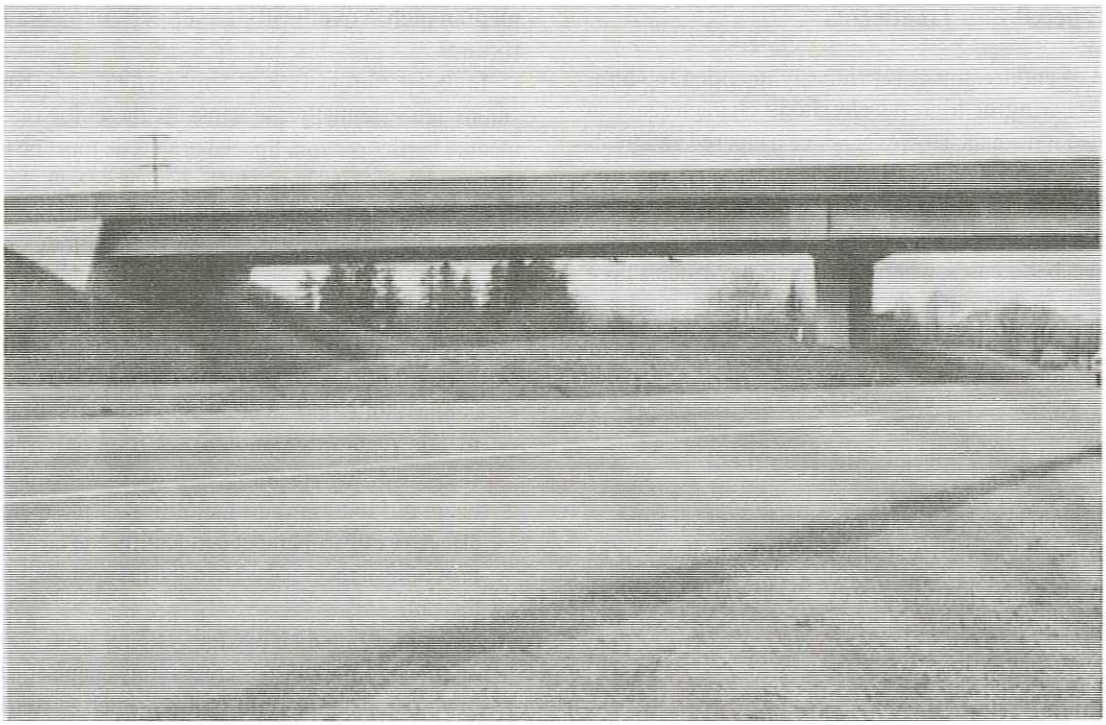

FIGURE 6.8 Median Earth Berm in Place

6.4.2 End Treatments

The end of a median barrier is a concern. Impact with the untreated end of a metal beam type system may result in the beam penetrating the passenger compartment or stopping the vehicle abruptly. Impact with the untreated end of a concrete median barrier will result in intolerable impact forces. A crashworthy end treatment for a median barrier is essential if the barrier is terminated where it is vulnerable to high-speed, head-on impacts.

To be crashworthy, the end treatment should not spear, vault, snag, or roll the vehicle. Vehicle decelerations should not exceed the recommended limits. For impacts at or near the end of the terminal yet within the required length of need, the end treatment should have the same redirectional characteristics as the standard median barrier. Thus, the end must be properly anchored and capable of developing the full tensile strength of the standard rail element, whether a crashworthy end treatment is warranted or not. This is particularly true for flexible and semi-rigid systems.

Median barriers used on non-freeways normally result in an increased number of exposed barrier ends at median crossovers. Because of the problems with these ends, openings in median barriers are to be avoided if possible. A gate may be placed across the openings on highways with fully controlled access if problems arise with unauthorized crossings. Other designs have been used for emergency openings. These have included w-beam barriers with quick release fasteners, load binder cable release mechanisms for the cable barrier and sliding steel gates for concrete systems. Each application should be evaluated considering site specific conditions and accident history.

Specific median barrier end treatments described in this section are:

- Flared
- Tapered
- Flared and Tapered
- Earth Beam
- Anchored in Backslope
- Shielded with Appropriate Crash Cushion

6.4.2.1 Flared End Treatment

In variable width medians, a barrier can sometimes be introduced far enough from approaching traffic that it can be considered non-hazardous and no additional safety treatment is required. The flare rate should meet the minimum criteria shown in Table 5.6, and a semi-flexible system must have a positive end anchorage to preclude penetration of the barrier within the design length of need. In some instances, flaring the barrier away from the road at an acceptable rate will require significantly more barrier.