VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: RAMP TERMINAL DESIGN	NUMBER: IIM-LD-20.6
SPECIFIC SUBJECT: RAMP TERMINAL AND SPEED CHANGE LANE DESIGNS	Date: OCTOBER 5, 2006
	SUPERSEDES: IIM-LD-20.5
DIVISION ADMINISTRATOR APPROVAL:	Mohammad Mirshahi, P.E. State Location and Design Engineer Approved October 5, 2006

Changes are shaded.

CURRENT REVISION

- Revised to add instructions for including Gore Area Design Details in the plan assembly. Design criteria has been updated.

EFFECTIVE DATE

- This memorandum is effective upon receipt on all projects that have not progressed beyond Field Inspection Stage.

POLICY

- The rate of accidents in gore areas is typically greater than that for run-off-the road accidents at other locations. For this reason, the gore area and the unpaved area beyond should be kept as free of obstructions as practicable to provide a clear recovery area. The unpaved area beyond the nose should be graded as nearly level with the roadways as is practicable so that vehicles inadvertently entering will not be upset or abruptly stopped by steep slopes. Heavy sign supports, street light standards, and roadway structure supports should be kept well out of the graded gore area. Yielding or breakaway-type supports should be employed for the standard exit sign, and concrete footings, where used, should be kept flush with adjoining ground level.

- There will be situations where placement of a major obstruction in a gore is unavoidable. Gores that occur at exit ramp terminals on elevated structures are a prime example. There are occasions when a bridge pier in a gore cannot be avoided. Guardrails and bridge rails are designed to handle angular impacts but are not effective in handling the kind of near head-on impacts that occur at these gores.

- Cushioning or energy-dissipating devices shall be provided in front of hazardous fixed objects. Several types and models of crash cushions are being used. These devices substantially reduce the severity of fixed-object accidents. In view of this reduction, adequate space should be provided for the installation of a crash-cushion device whenever it is found necessary to construct a major obstruction in a gore on a high-speed highway.

- Tables in this memorandum show **MINIMUM** designs for one lane of traffic and lengths may need to be increased based upon the traffic operational analysis. For two lanes or for other conditions see AASHTO's A Policy on Geometric Design of Highways and Streets. A design exception is required when design values are less than AASHTO minimums.

PROCEDURES

- Gore Area Design Details are to be furnished and included in the "2 series" plan detail sheets of the plan assembly at a recommended scale of approximately twice the plan scale. Gore Area design details shall show actual dimensions in accordance with sheets 4-7 of this memorandum.

Exit Ramps

- Interchange exit ramps are to be designed in accordance with sheets 4-7 of this memorandum. (Ref: AASHTO's A Policy on Geometric Design of Highways and Streets)

- Grading of the exit ramp gore area will be required to provide a recovery area for out-of-control vehicles. Unusual situations may require special handling of the slopes or the installation of an impact attenuation device; however, in no case will an earth berm be located in this area. All questions concerning individual designs should be discussed with the appropriate Assistant L&D Engineer.

Entrance Ramps

- Entrance ramps are to be designed in accordance with the detail shown on sheet 7 of this memorandum. Ref: AASHTO's A Policy on Geometric Design of Highways and Streets)

Acceleration/Deceleration Lane Lengths and Grade Adjustments

- For lengths of Ramp Terminal Acceleration Lanes on flat grades (2 percent or less), see 2011 AASHTO Green Book, Table 10-3, page 10-110. Acceleration lane lengths on grades $\geq$ 3% must be adjusted in accordance with adjustment factors shown in the 2011 AASHTO Green Book, Table 10-4, page 10-112.

- For lengths of Ramp Terminal Deceleration Lanes on flat grades (2 percent or less), see 2011 AASHTO Green Book, Table 10-5, page 10-115. Deceleration lane lengths on grades $\geq$ 3% must be adjusted in accordance with adjustment factors shown in the 2011 AASHTO Green Book, Table 10-4, page 10-112.

- Lengths shown in the 2011 AASHTO Green Book are for single lane traffic. For two-lane ramps, or other conditions, consult the AASHTO Green Book for additional instructions.

- For Taper Lengths, see table below:

(METRIC)

(T) **LENGTH OF TAPER FOR SPEED CHANGE LANES**		
Highway Design Speed, km/h	Under 80	80 and Over
Taper Length, meters	60	90

To be used in conjunction with full width speed change lanes.

(IMPERIAL)

(T) **LENGTH OF TAPER FOR SPEED CHANGE LANES**		
Highway Design Speed, mph	Under 50	50 and Over
Taper Length, feet	200	300

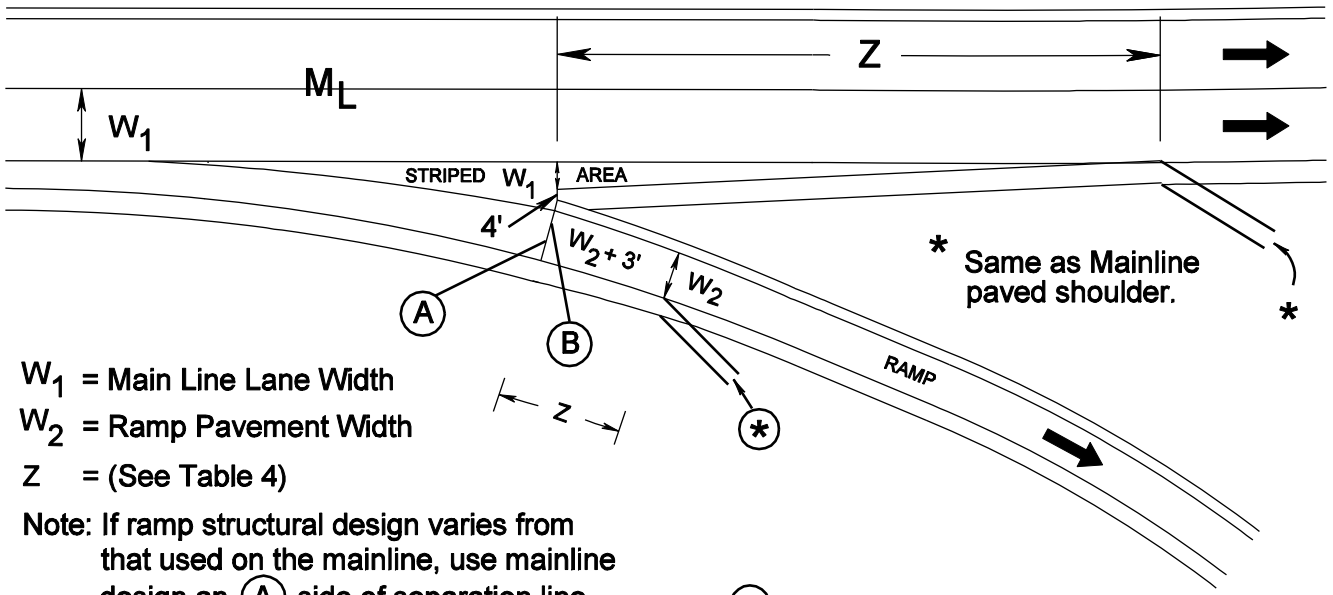
To be used in conjunction with full width speed change lanes.

For additional information, see 2011 AASHTO Green Book, page 10-112.

(IMPERIAL)

EXIT RAMP

(WIthout Curb)



W_1 = Main Line Lane Width

W_2 = Ramp Pavement Width

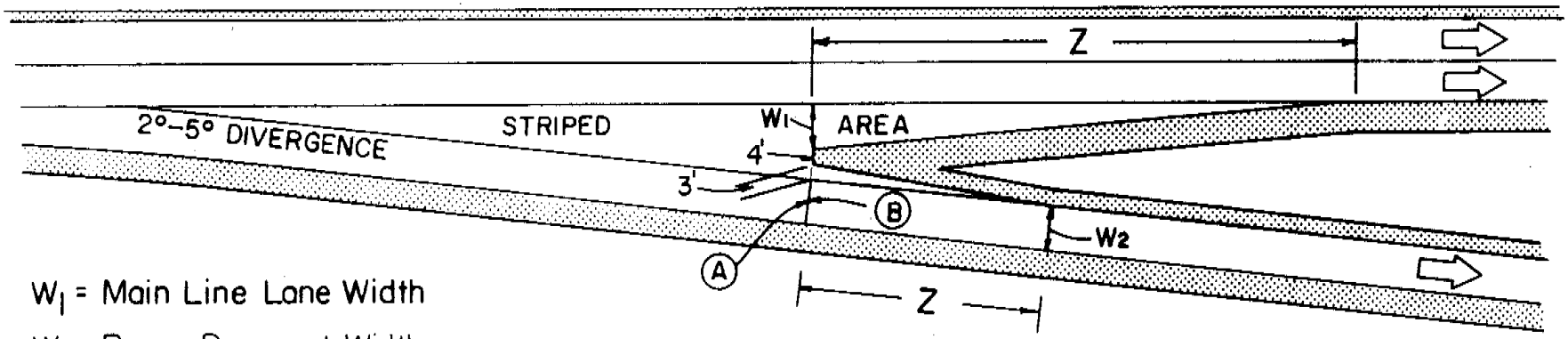
Z = (See Table 4)

Note: If ramp structural design varies from that used on the mainline, use mainline design an (A) side of separation line and Ramp design on (B) side

(*) Same as Ramp paved shoulder

(IMPERIAL)

EXIT RAMP – Taper Type
(Without Curb)



W_1 = Main Line Lane Width

W_2 = Ramp Pavement Width

Z = (See Table 4)

Note: If ramp structural design varies from that used on the mainline, use mainline design on (A) side of separation line and Ramp design on (B) side.

(IMPERIAL)

MAJOR FORK

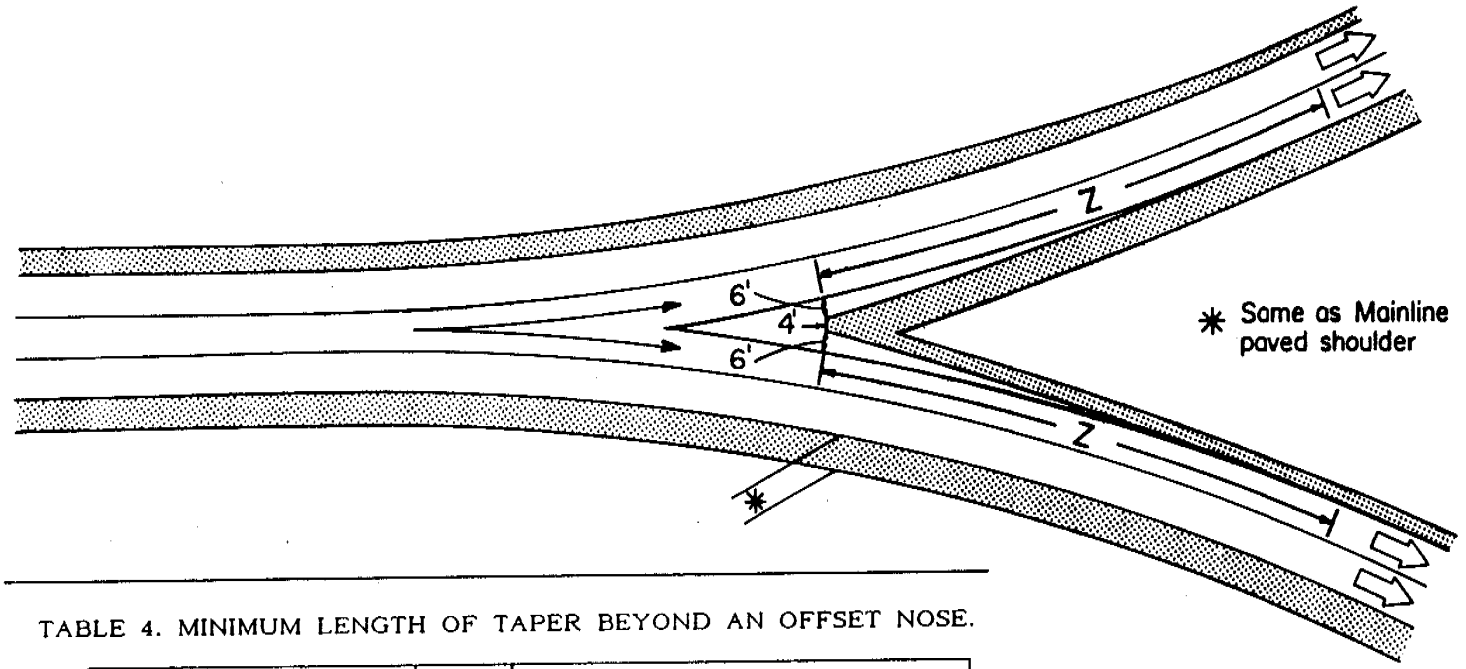


TABLE 4. MINIMUM LENGTH OF TAPER BEYOND AN OFFSET NOSE.

DESIGN SPEED OF APPROACH HIGHWAY (MPH)	*Z	NOSE OFFSETS				
		3'	6'	10'	11'	12'
30	15	45'	90'	150'	165'	180'
40	20	60'	120'	200'	220'	240'
50	25	75'	150'	250'	275'	300'
60	30	90'	180'	300'	330'	360'
70	35	105'	210'	350'	385'	420'

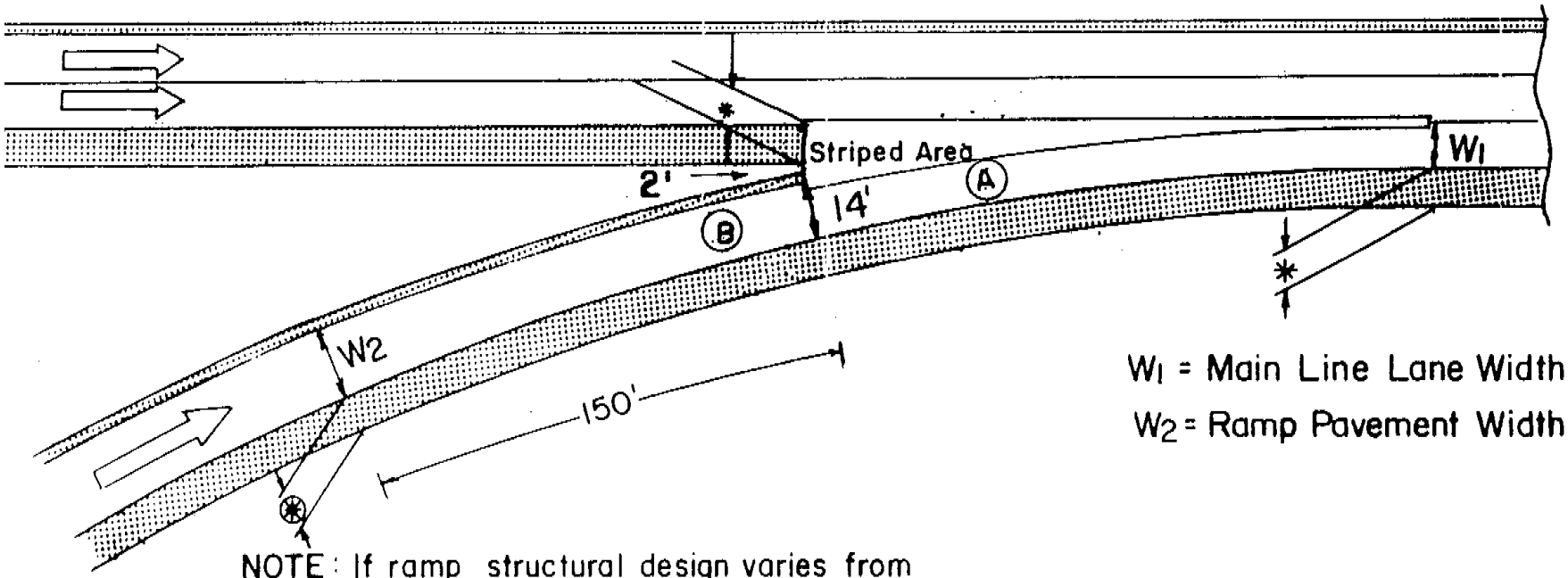
*Z- LENGTH IN FEET OF NOSE TAPER PER FOOT OF NOSE OFFSET

Z = (See Table 4)

For source of Length of Taper Factor "Z", see 2011 AASHTO Chapter 10, Table 10-2.

(IMPERIAL)

ENTRANCE RAMP



W_1 = Main Line Lane Width

W_2 = Ramp Pavement Width

NOTE: If ramp structural design varies from that used on the mainline, use mainline design on (A) side of separation line and Ramp design on (B) side.

* Same as Main Line paved shoulder

(*) Same as Ramp paved shoulder