APPROACH LENGTH OF NEED ON EMBANKMENT (FILL) SLOPE

FIGURE: 8–E

BDC13MR–04

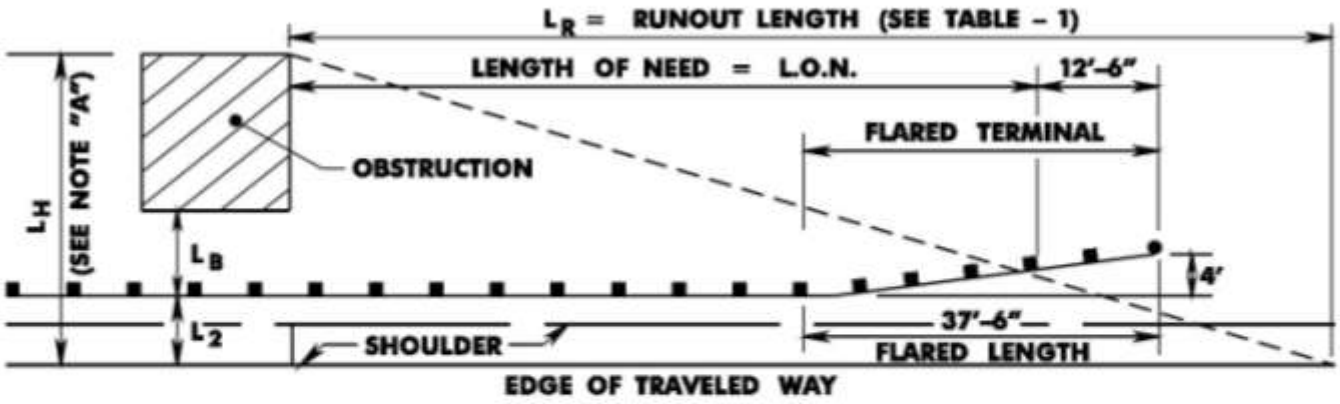

TABLE – 1

DESIGN SPEED (M.P.H.)	TRAFFIC VOLUME (A.D.T.) OVER 10,000 L_R	5,000–10,000 L_R	1,000–5,000 L_R	UNDER 1,000 L_R	SHY LINE OFFSET (FEET)	STRAIGHT FLARE RATE
70	360	330	290	250	9	15:1
60	300	250	210	200	8	14:1
55	265	220	185	175	7	12:1
50	230	190	160	150	6.5	11:1
45	195	160	135	125	6	10:1
40	160	130	110	100	5	8:1
30	110	90	80	70	4	7:1

STEP 1. DETERMINE THE REQUIRED L.O.N. FOR

37' 6" FLARED TERMINAL AT 4' OFFSET

$$L.O.N. = \frac{L_R\,(L_H - L_2 - 2.7)}{L_H}$$

NO FLARE (TANGENT TERMINAL)

$$L.O.N. = \frac{L_H - L_2}{L_H / L_R}$$

NOTE A: If obstruction extends beyond clear zone, make L_H equal to clear zone, except if obstruction is critical slope, See Figure 8–H.

NOTE B: If roadway is curved, draw layout to scale and obtain L.O.N. directly by scaling from drawing.

STEP 2. Increase L.O.N. to nearest multiple of 12'–6", which is the length of one rail element.

STEP 3. Add an additional 12'–6" to get required L.O.N. including the flared or tangent terminal.

STEP 4. Compare the required length in Step 3 to the minimum functional length shown in Table 2 and to the suggested recovery area (A) in Table 1 Figure 8–D. Use the greater of the three lengths.

TABLE – 2

DISTANCE FROM BACK OF RAIL ELEMENT TO OBSTRUCTION (L_B)	MINIMUM FUNCTIONAL LENGTH	
	FLARED TERMINAL	TANGENT TERMINAL
$L_B \geq 4'$	50'–0"	50'–0"
$2' \leq L_B < 4'$	50'–0"	62'–6"
$L_B < 2'$	62'–6"	75'–0"
THRIE BEAM ATTACHMENT	56'–3"	68'–9"
W–BEAM ATTACHMENT	62'–6"	75'–0"

NOTE C: The total length of a freestanding guide rail installation including approach and trailing end treatments should not be less than 62'–6".

EXAMPLE OF APPROACH LENGTH OF NEED ON EMBANKMENT (FILL) SLOPES

FIGURE: 8–G

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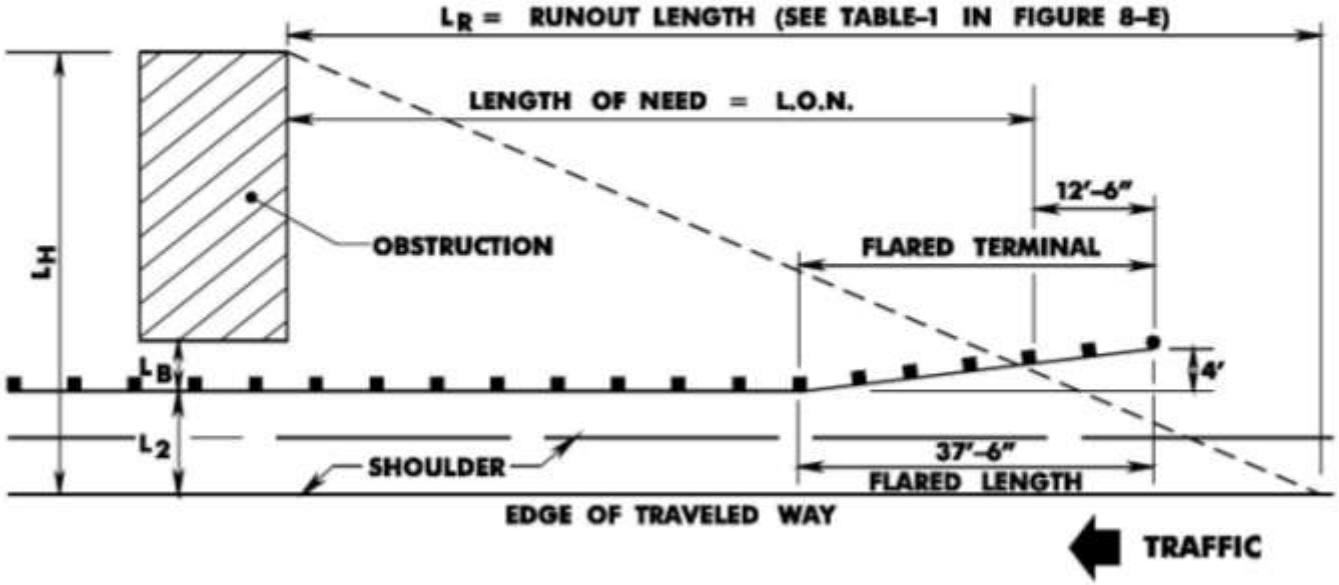

EXAMPLE

DESIGN SPEED = 70 M.P.H.
TANGENT ROADWAY
A.D.T. = 7000
L_B = 4'
L_H = 22'
L_R = 330'
L_2 = 16'

STEP 1. $$L.O.N. = \frac{L_R\,(L_H - L_2 - 2.7')}{L_H}$$

$$L.O.N. = \frac{330'\,(22' - 16' - 2.7')}{22'}$$

L.O.N. = 49.5'

STEP 2. Increase 49.5' to nearest multiple of 12'–6", L.O.N. = 50'.

STEP 3. Add an additional 12'–6" to get required L.O.N. including flare terminal, use L.O.N.–plus–flare terminal = 62.5'.

STEP 4. From Table 1, Figure 8–D and Table 2, Figure 8–E, the minimum length = 75'. Since L.O.N.–plus–flare terminal is less than 75', use 75'.

APPROACH LENGTH OF NEED IN CUT SECTIONS

FIGURE: 8–M

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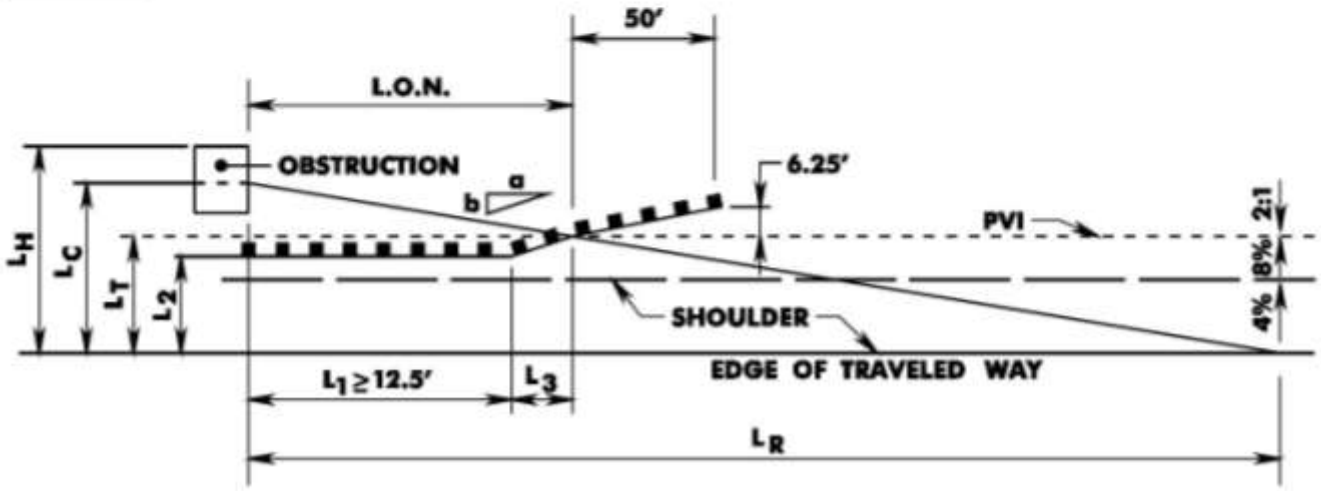
Where an obstruction is encountered in a cut section and it is to be shielded with guide rail, it is desirable that the length of need (L.O.N.) end at the PVI, See Figure 8–N. In order to accomplish this, the length of guide rail (L_1) parallel to the PVI must be obtained. The following example shows how the L.O.N. is computed:

EXAMPLE



V = 60 M.P.H.

A.D.T. = 6,000

L_2 = 16 FEET

L_H = 32 FEET

L_R = 250' (FROM FIGURE 8–E, TABLE–1)

L_T = 19 FEET

a/b = 14:1 STRAIGHT FLARE (FROM FIGURE 8–E, TABLE–1)

L_C = 30 FEET (FROM FIGURE 8–A, L_C = 26' TO 30') FOR 8% FILL SLOPE

IF $L_H > L_C$ USE L_C IN FORMULA BELOW, IF $L_H < L_C$, REPLACE L_C WITH L_H IN FORMULA BELOW

$L_1 = L_R - (L_R L_T / L_C) - a/b\ (L_T - L_2)$

L_1 = 250 – (250 X 19/30) – 14/1 (19 – 16) = 49.7'

49.7'/6.25' POST SPACING = 7.95 POSTS, THEREFORE, USE 8 POSTS AT 6.25' = 50.0 FT. = L_1

FLARE LENGTH $L_3 = (L_T - L_2)\ a/b$ = (19 – 16) 14/1 = 42 FT.

42'/6.25' POST SPACING = 6.72 POSTS, THEREFORE, USE 7 POSTS AT 6.25' = 43.75 FT. = L_3

L.O.N. = 50.0 FEET + 43.75 FEET = 93.75 FEET

FROM TABLE 1, FIGURE 8–D MINIMUM RECOVERY AREA = 75'

SINCE L.O.N. IS GREATER THAN 75', USE L.O.N. = 93.75'