

Highway Design Speed (mph)	Ratio of Length on Grade to Length on Level for Ramp Curve Design Speed (mph)				
	20	30	40	50	All Speeds
40 45 50 55 60 65 70	3% ≤ Upgrade < 4%				3% ≤ Downgrade < 4%
	1.30	1.30	--	--	0.700
	1.30	1.35	--	--	0.675
	1.30	1.40	1.40	--	0.650
	1.35	1.45	1.45	--	0.625
	1.40	1.50	1.50	1.60	0.600
	1.45	1.55	1.60	1.70	0.600
	1.50	1.60	1.70	1.80	0.600
40 45 50 55 60 65 70	4% ≤ Upgrade ≤ 6%				4% ≤ Downgrade ≤ 6%
	1.50	1.50	--	--	0.600
	1.50	1.60	--	--	0.575
	1.50	1.70	1.90	--	0.550
	1.60	1.80	2.05	--	0.525
	1.70	1.90	2.20	2.50	0.500
	1.85	2.05	2.40	2.75	0.500
	2.00	2.20	2.60	3.00	0.500

- Notes: 1. No adjustment is needed on grades of less than 3%.
2. The "grade" in the table is the average grade measured over the distance for which the acceleration length applies.

Example

Given: Highway Design Speed - 70 mph
Entrance Ramp Curve Design Speed - 45 mph
Average Grade - 4.5% upgrade

Problem: Determine length of acceleration lane.

Solution: Figure 48-4D yields an acceleration length of 820 ft on the level. According to the table shown above, this should be increased by the average of the increases shown for 40 mph (2.60) and 50 mph (3.00), or 2.80.

Therefore: $L = (820 \text{ ft})(2.80)$
 $L = 2300 \text{ ft}$

An additional 2150 ft (2300 ft – 150 ft) should be added to the ramp prior to the entrance taper. See Figure 48-4C, Typical Entrance Types.

GRADE ADJUSTMENTS FOR ACCELERATION (Passenger Cars)

Figure 48-4E