

# New Jersey Turnpike Authority

P.O. Box 5042, Woodbridge, NJ 07095



September 27, 2022

## Document Change Announcement

***2007 Design Manual  
Parallel Acceleration Lane  
DCA2022DM-04***

### **Subject: Revisions to**

**Section 1 New Jersey Turnpike Geometric Design, Subsection 1.4 Auxiliary Lanes  
Section 2 Garden State Parkway Geometric Design, Subsection 2.5 Auxiliary Lanes**

### **Description of Change:**

This DCA revises the design Ramp Acceleration Lane Geometry to be used for entrance ramps on the New Jersey Turnpike in Design Manual Section 1.4.1. – Acceleration Lanes and the associated Standard Drawings.

### **Notice to New Jersey Turnpike Authority Staff and Design Consultants**

Effective immediately, changes must be implemented in all applicable projects that have not entered Phase C development within one month following the date of this DCA and in which these changes do not result in any one of the following: (1) significant delay in the project delivery, (2) significant increase in the construction costs of the project, (3) acquisition of additional right-of-way, (4) significant environmental impacts, and (5) significant alteration of the construction staging. Contact your New Jersey Turnpike Authority Project Manager for instruction.

The revisions may be accessed on the Authority's webpage: <https://www.njta.com/doing-business/professional-services>

### **Recommended By:**

Handwritten signature of Lamis T. Malak in blue ink.

Lamis T. Malak, P.E.  
Deputy Chief Engineer - Design

### **Approved By:**

Handwritten signature of Michael Garofalo in blue ink.

Michael Garofalo, P.E.  
Chief Engineer

### 1.3.9. Detours

1. The design speed shall be 25 mph minimum.
2. Horizontal Alignment
  - a. Minimum radius curve shall be 150 feet.
  - b. Superelevation rates and transition lengths are to be consistent with the horizontal alignment and shall be reviewed on a case-by-case basis with objective of attaining the smoothest ride possible.
3. Vertical Alignment

Maximum profile grade shall be 7 percent. Minimum profile grade shall be sufficient to keep pavement free of ponding water.
4. Detour pavement shall be the same as mainline pavement. Any use of a substandard pavement section for a short period of time is subject to Authority's Engineering Department approval.
5. Typical detour section shall be similar to the normal ramp section. Variations to this shall be treated with standard maintenance and protection of traffic procedures.
6. Clearances shall be the same as for mainline roadways and interchange ramps. Refer to Subsection 1.1.1.
7. Refer to Section 10 of this manual for detour signing on ramps.
8. All detours must be striped as if they were a permanent ramp. Where necessary, temporary pavement stripes may be used.
9. All ramp detours shall be lighted; see Section 8 of this manual.
10. Temporary construction measures necessary for the protection of the environment (e.g. area of construction detours or temporary stream crossings) shall be adequately shown on plans and permit applications, and the payment therefore covered in the plans and specifications.

## 1.4. AUXILIARY LANES

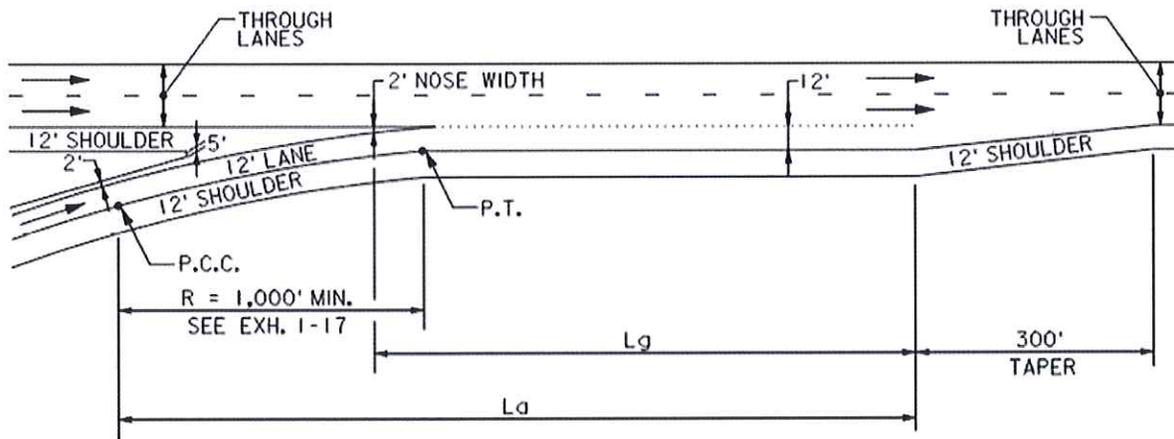
---

### 1.4.1. Entrance Ramp Acceleration Lanes

1. Single Lane and Two-Lane Entrance ramps:
  - a. A typical acceleration lane for a single lane entrance ramp is shown in Exhibit 1-26Exhibit 1-26.
  - b. A two-lane entrance ramp shall consist of the typical ramp acceleration geometry followed by a single lane drop. A typical two-lane entrance ramp is shown in Exhibit 1-29Exhibit 1-29.

2. If the mainline is curved, the acceleration lane shall be curved to fit the required lengths and dimensions shown.
3. Where the acceleration lane falls within a section of roadway with 3 percent or greater profile (upgrade or downgrade), the acceleration lengths from Exhibit 1-27Exhibit 1-27 shall be adjusted by the ratios indicated in Exhibit 1-28Exhibit 1-28 to determine minimum acceleration lane lengths.
4. See PM Standard Drawings for entrance ramp pavement markings.
5. The continuity of the through (mainline) roadway shall be maintained at all times.

**Exhibit 1-26 Single Lane Entrance Ramp**



**NOTES:**

1. " $L_a$ " SHALL BE OBTAINED FROM EXHIBITS 1-27 AND 1-28 FOR ACCELERATION LENGTH AND GRADE ADJUSTMENT FACTORS.
2. " $L_g$ " SHALL BE 300' MINIMUM, MEASURED FROM 2' NOSE WIDTH TO START OF TAPER.
3. THE VALUE OF " $L_a$ " OR " $L_g$ ", WHICHEVER RESULTS IN THE GREATER DISTANCE DOWNSTREAM FROM WHERE THE NOSE WIDTH EQUALS 2' SHALL DETERMINE THE LENGTH OF THE RAMP ACCELERATION LANE.

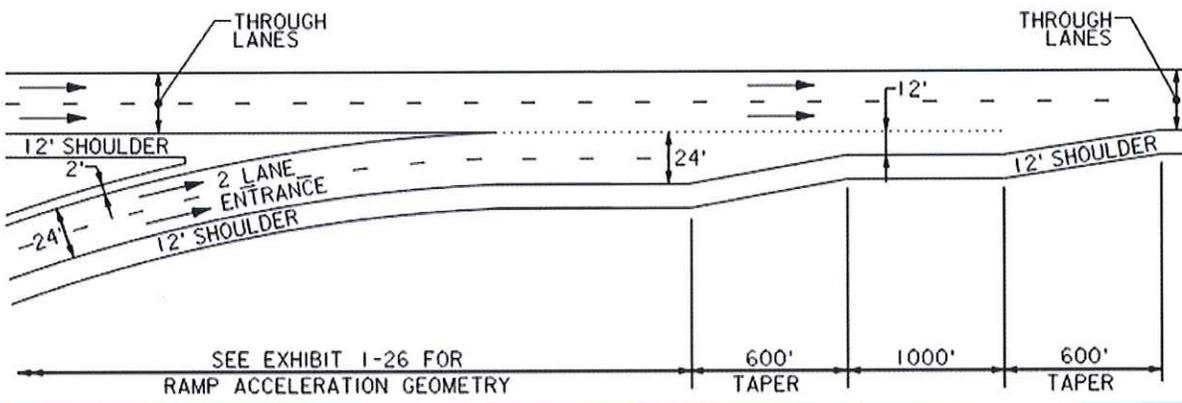
**Exhibit 1-27 Minimum Length of Acceleration Lane**

Highway Design Speed, V (mph)	Acceleration Length, $L_a$ (ft) for Entrance Curve Design Speed (mph)					
	25	30	35	40	45	50
60	1020	910	800	550	420	180
70	1420	1350	1230	1000	820	580

**Exhibit 1-28 Acceleration Lane Grade Adjustment Factors**

Highway Design Speed (mph)	Acceleration Lanes				
	Ratio of Length on Grade to Length of Level for Design Speed of Turning Curve (mph)				
	25	30	40	50	All Speeds
	3 to 4 percent upgrade				3 to 4 percent downgrade
60	1.4	1.5	1.5	1.6	0.6
70	1.5	1.6	1.7	1.8	0.6
	5 percent upgrade				5 percent downgrade
60	1.7	1.9	2.2	2.5	0.5
70	2.0	2.2	2.6	3.0	0.5

**Exhibit 1-29 Two-Lane Entrance Ramp**



**1.4.2. Exit Ramp Deceleration Lanes**

**1. Single Lane and Two-Lane Exit Ramps**

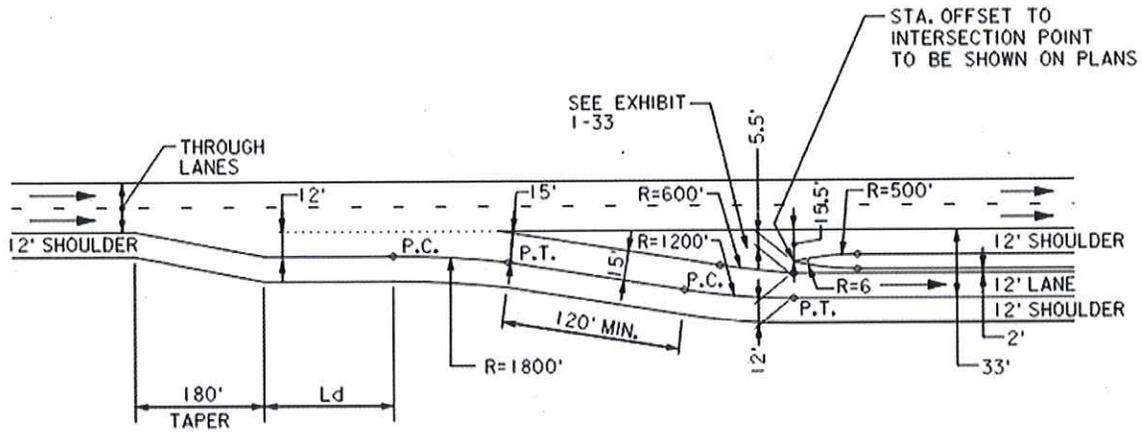
a. For Single Lane exit ramps there are two types of deceleration lanes as shown in [Exhibit 1-30](#)~~Exhibit 1-30~~. The application of these two types is dependent upon the overall geometry of the situation. The "Parallel Ramp Configuration" is generally used in conjunction with a dual-dual roadway for exit from the inner roadway.

b. A two-lane exit ramp shall consist of a single lane widening followed by the typical ramp deceleration. A typical two lane exit ramp is shown in [Exhibit 1-33](#)~~Exhibit 1-33~~[Exhibit 1-33](#).

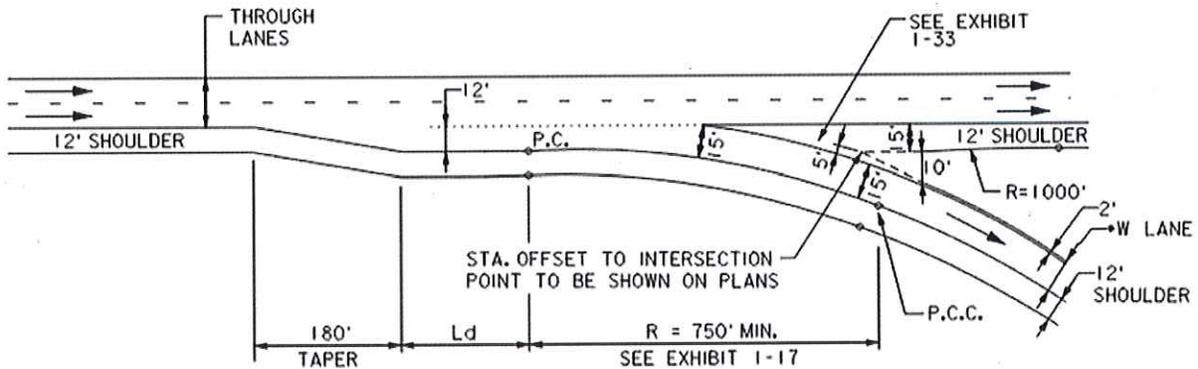
2. If the mainline is curved, the deceleration lane shall be curved to fit the required lengths and dimensions shown.

3. Where the deceleration lane falls within a section of roadway with 3 percent or greater profile (upgrade or downgrade), the deceleration lengths from— Exhibit 1-31~~Exhibit 1-31~~ shall be adjusted by the ratios indicated in Exhibit 1-32~~Exhibit 1-32~~ to determine minimum deceleration lane lengths.
4. See PM Standard Drawings for exit ramp pavement markings.
5. The continuity of the through (mainline) roadway shall be maintained at all times. Where directed by the Authority, the mainline through lanes may be reduced with a lane drop that maintains through lanes for 900 feet beyond the exit ramp followed by a 300-foot taper.

**Exhibit 1-30 Single Lane Exit Ramp**



PARALLEL RAMP CONFIGURATION



• SEE EXHIBIT 1-18

LOOP RAMP CONFIGURATION

**NOTES:**

- "Ld" SHALL BE DETERMINED FROM EXHIBITS 1-31 AND 1-32 FOR DECELERATION LANE LENGTH AND GRADE ADJUSTMENT FACTORS.

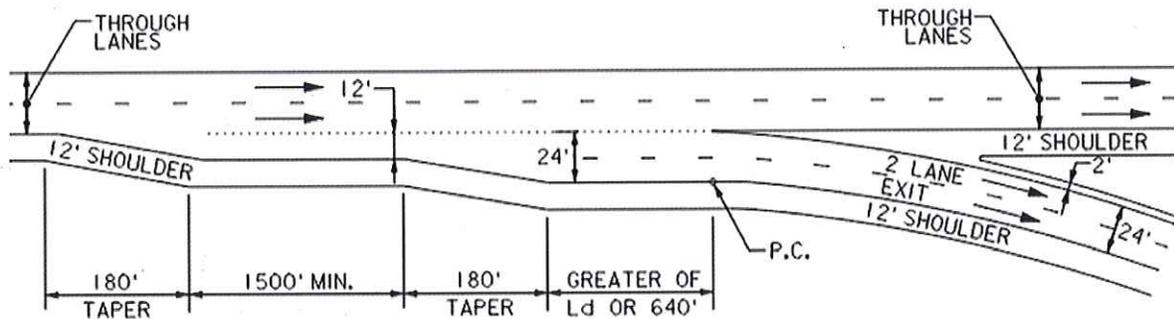
**Exhibit 1-31 Minimum Length of Deceleration Lane**

Highway Design Speed, $V$ (mph)	Deceleration Length, $L_d$ (ft) for Exit Curve Design Speed (mph)					
	25	30	35	40	45	50
60	460	430	405	350	300	240
70	550	520	490	440	390	340

**Exhibit 1-32 Deceleration Lane Grade Adjustment Factors**

Highway Design Speed (mph)	Deceleration Lanes Ratio of Length on Grade to Length of Level for Design Speed of Turning Curve (mph)	
	All Speeds	
	3 to 4 percent upgrade	3 to 4 percent downgrade
All Speeds	0.9	1.2
	5 percent upgrade	5 percent downgrade
All Speeds	0.8	1.35

**Exhibit 1-33 Two-Lane Exit Ramp**



**1.4.3. Major Roadway Merge and Diverge**

A merge of two major roadways of three lanes into one major roadway of three lanes shall require a total minimum length of 3,600 feet for three consecutive lane drops (each lane drop consisting of a 900-foot continued lane followed by a 300-foot taper), with the roadway lanes on the left having mainline priority.

A diverge of a major roadway of three lanes into two separate major roadways of three lanes each shall require a total minimum length of 3,600 feet from the

beginning of the diverge start to the nose of the separated roadways, with the left, right, and then center lane each expanding consecutively. The expansion of the left and right lane are each developed by a 180-foot taper followed by a 1,020-foot continued lane and the expansion of the center lane is developed by a continuous lane widening over 1,200 feet).

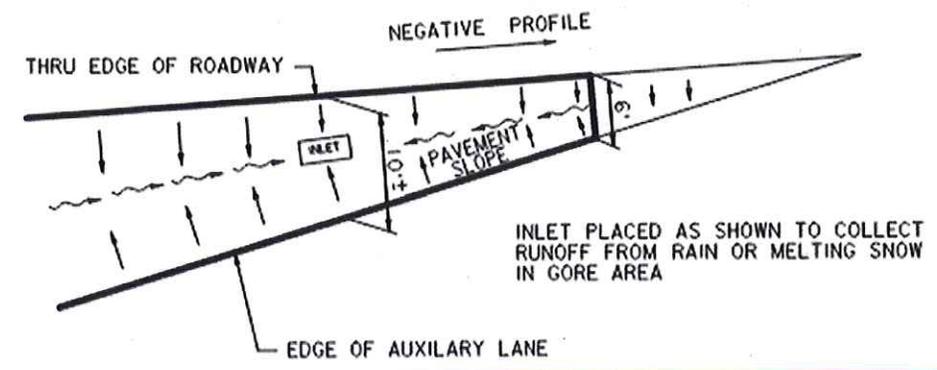
#### 1.4.4. Climbing Lanes

With a maximum of 3 percent grades, the Authority does not use truck climbing lanes. As indicated in Subsection 1.2.6, the absolute minimum length of vertical tangent shall be limited by a maximum permissible loss in truck speed of 10 mph.

#### 1.4.5. Nose Grading

Typical nose grading between a mainline roadway and an auxiliary lane(s) is shown in Exhibit 1-34Exhibit 1-34Exhibit 1-34.

**Exhibit 1-34 Typical Nose Grading**



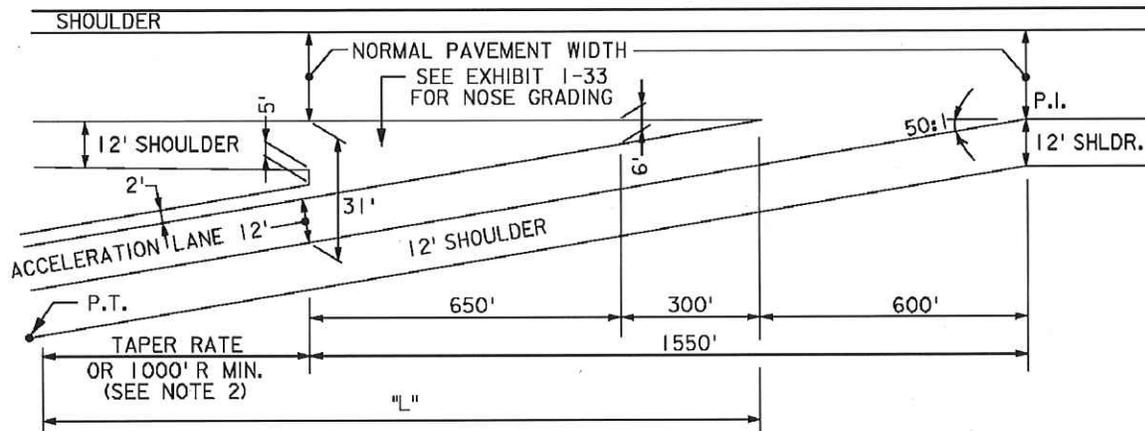
#### 1.4.1. Acceleration Lanes

A typical acceleration lane is shown in Exhibit 1-26.

- ~~1. Where the acceleration lane falls within a section of roadway with 3 percent or greater profile (upgrade or downgrade), the acceleration lengths from shall be adjusted by the ratios indicated in Exhibit 1-28 to determine minimum acceleration lane lengths.~~
- ~~2. It is intended that a two-lane entrance ramp shall consist of the typical ramp acceleration geometry as shown in Exhibit 1-26, followed by consecutive single-lane drops totaling 2,400 feet to merge the ramp lanes into the mainline roadway. The continuity of the through (mainline) roadway shall be maintained at all times. A typical two-lane entrance ramp is shown in Exhibit 1-29. This application can be further extended to the merge of two major roadways, requiring a total minimum~~

length of 3,600 feet for three consecutive lane drops with the roadway lanes on the left having mainline priority. In both instances, the minimum length shall be adjusted by the ratios in Exhibit 1-28 where the profile (upgrade or downgrade) is 3 percent or greater.

**Exhibit 1-26 Ramp Acceleration Lane Geometry**



**NOTES:**

1. "L" SHALL BE OBTAINED FROM EXHIBITS 1-27 AND 1-28 FOR ACCELERATION LENGTH AND GRADE ADJUSTMENT FACTORS.
2. THE RATIO OF A FLATTER RADIUS TO A SHARPER RADIUS SHALL NOT EXCEED 2.
3. IF THE MAINLINE IS CURVED, THE ACCELERATION LANE SHALL BE CURVED TO FIT THE DIMENSIONS SHOWN.

**Exhibit 1-27 Minimum Length of Acceleration Lane**

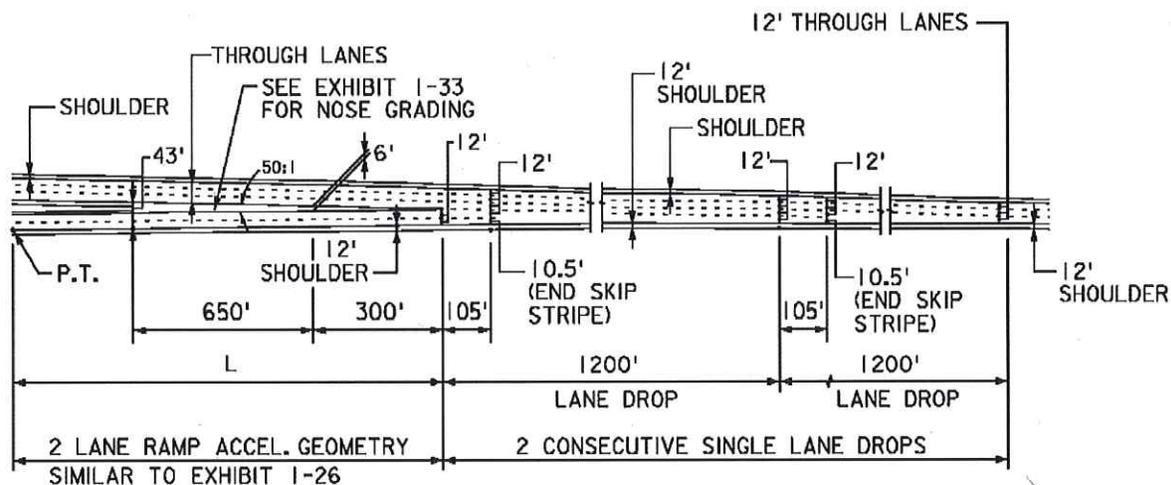
Highway-Design Speed, V (mph)	Acceleration Length, L (ft) for Entrance-Curve Design Speed (mph)					
	25	30	35	40	45	50
60	1020	910	800	550	420	180
70	1420	1350	1230	1000	820	580

**Exhibit 1-28 Acceleration Lane Grade Adjustment Factors**

Highway-Design Speed (mph)	Acceleration Lanes Ratio of Length on Grade to Length of Level for Design Speed of Turning Curve (mph)			
	30	40	50	All-Speeds
	3 to 4 percent upgrade			3 to 4 percent downgrade

60	1.5	1.5	1.6	0.6
70	1.6	1.7	1.8	0.6
	5-percent upgrade			5-percent downgrade
60	1.9	2.2	2.5	0.5
70	2.2	2.6	3.0	0.5

**Exhibit 1-29 Two-Lane Entrance Ramp**

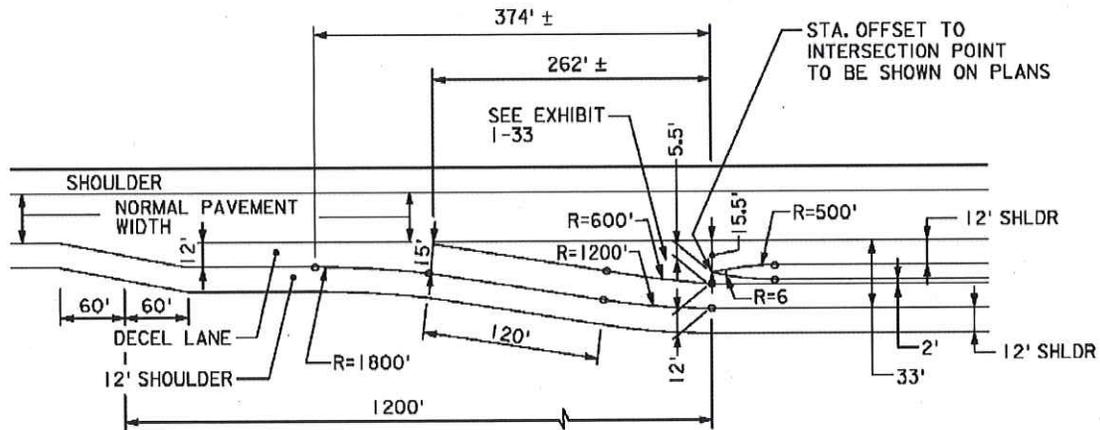


(3 LANE ROADWAY SHOWN,  
 4 LANE ROADWAY SIMILAR)

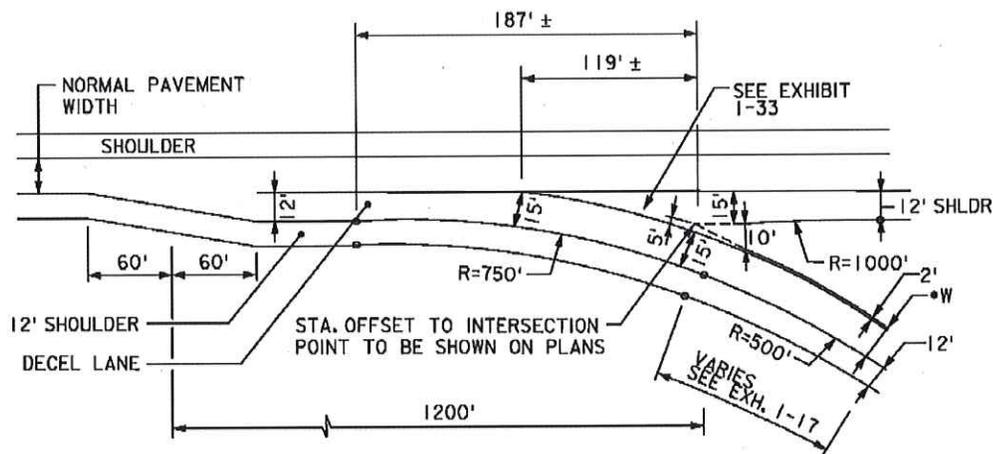
**1.4.2. Deceleration Lanes**

Two types of deceleration lanes are shown on Exhibit 1-30. The application of these two types is dependent upon the overall geometry of the situation. The "Parallel Ramp Configuration" is generally used in conjunction with a dual-dual roadway.

**Exhibit 1-30 Ramp Deceleration Lane Geometry**



**TYPICAL DECELERATION LANE FOR PARALLEL RAMP CONFIGURATION**



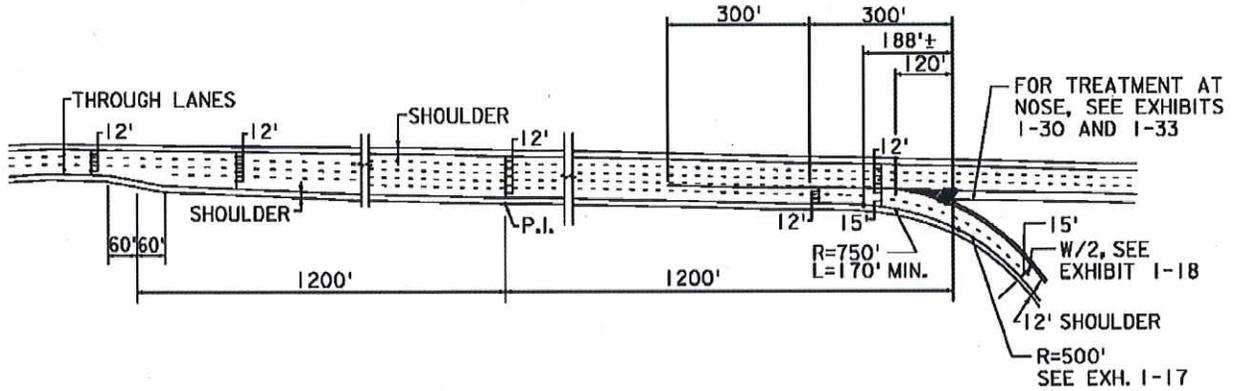
**TYPICAL DECELERATION LANE FOR LOOP RAMP CONFIGURATION**

• SEE EXHIBIT 1-18

1. The intent of a two lane exit ramp is to provide successive deceleration lengths, thus requiring a total minimum length of 2,400 feet. A typical two lane exit ramp is shown in Exhibit 1-31.
2. The treatment of a major split of three lanes into two roadways of three lanes each is different in concept from successive deceleration lanes. In this case a total minimum length of 3,600 feet from the beginning of the split to the nose is required, with each original lane (12 feet) expanding to two lanes (24 feet) simultaneously.
3. A typical lane drop configuration following a deceleration lane exit is shown on Exhibit 1-32.

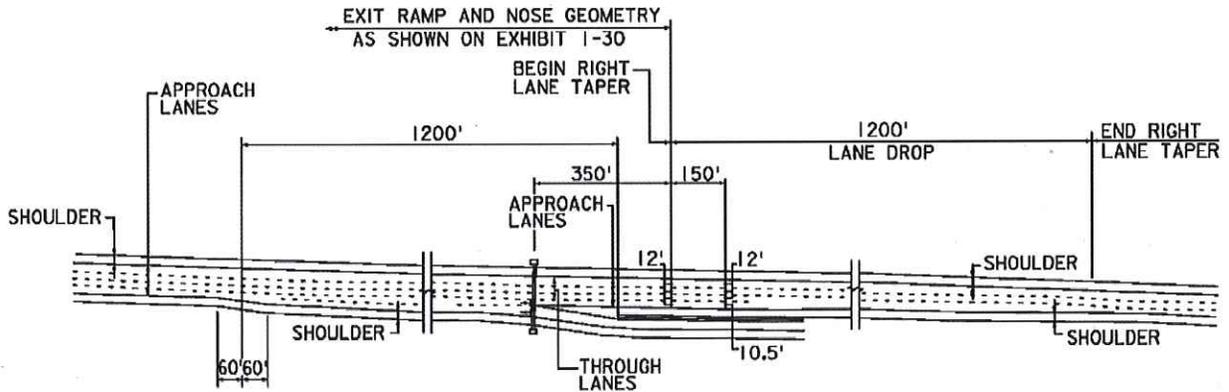
- 4. See PM Standard Drawings for exit ramp pavement markings.
- 5. Typical nose grading between mainline roadway and auxiliary lanes is shown in Exhibit 1-33.

**Exhibit 1-31 Two-Lane Exit Ramp**



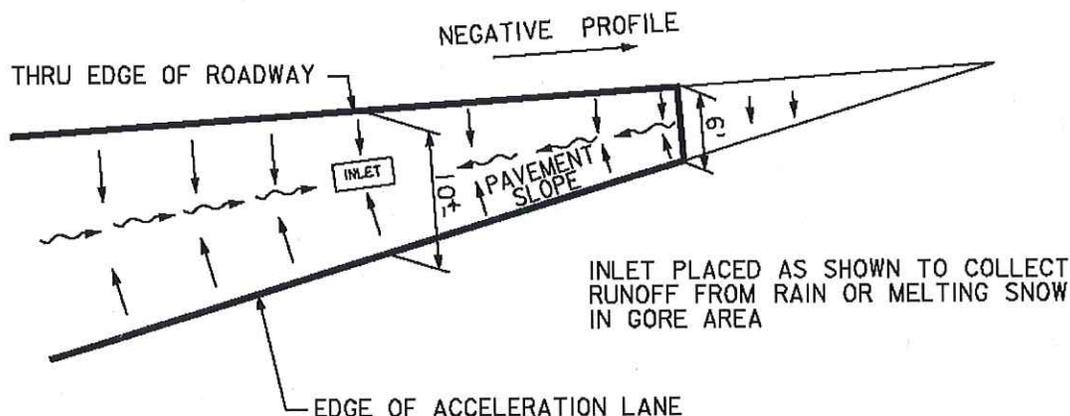
(3 LANE ROADWAY SHOWN, 4 LANE ROADWAY SIMILAR)

**Exhibit 1-32 Lane Drop Configuration**



(4 TO 3 LANE ROADWAY SHOWN, 3 TO 2 LANE ROADWAY SIMILAR)  
 (REFER TO SECTION 7 FOR SIGN LOCATIONS)

**Exhibit 1-33 Typical Nose Grading**



**1.4.3. Climbing Lanes**

~~With a maximum of 3 percent grades, the Authority does not use truck climbing lanes. As indicated in Subsection 1.2.6, the absolute minimum length of vertical tangent shall be limited by a maximum permissible loss in truck speed of 10 mph.~~

**1.5. OTHER ROADWAYS**

**1.5.1. Crossroads**

Where local roads are being replaced, the intent of the Authority with respect to any work under the jurisdiction of the state, county, municipality, or any other agency is "replacement in kind", according to the present standards of that agency. All such work is subject to the approval of the Authority's Engineering Department and must be previously agreed to in writing by the concerned agency, as noted elsewhere in this manual and the Procedures Manual.

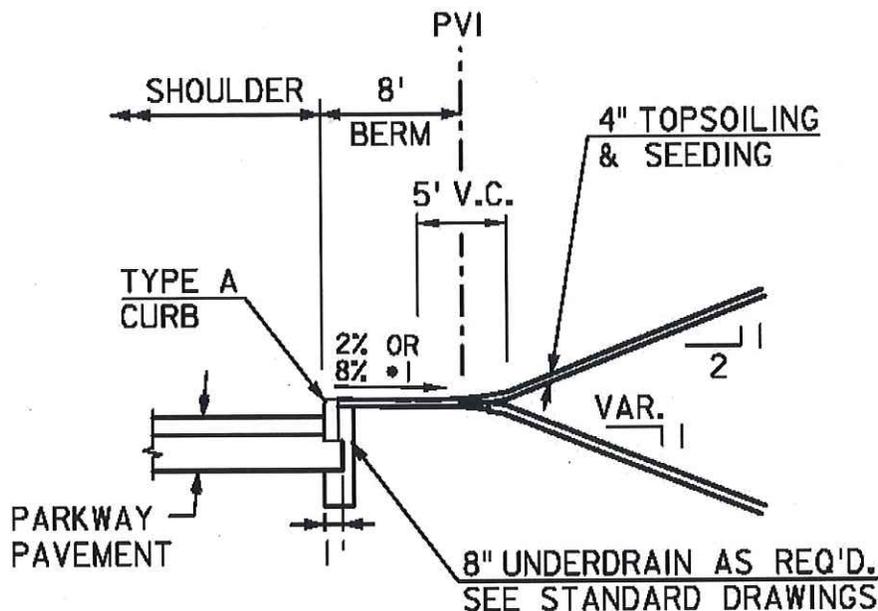
Similarly, all detouring and/or closing of local roads during construction must be approved by the appropriate agencies in accordance with the Procedures Manual.

**1.5.2. Access and Service Roads**

Treatment shall be similar to Subsection 1.5.1. Where the Authority has jurisdiction, the pavement design shall be in accordance with Subsection 6.7.4 of this Manual.

**1.5.3. U-Turns**

1. U-Turns shall be designated by milepost location. Refer to Section 7 for U-Turn signing.



## TYPICAL CURB SECTION

\*1 BERM TO BE SLOPED AS INDICATED  
IN EXHIBIT 2-24.

## 2.5. AUXILIARY LANES

### 2.5.1. Entrance Ramp Acceleration Lanes

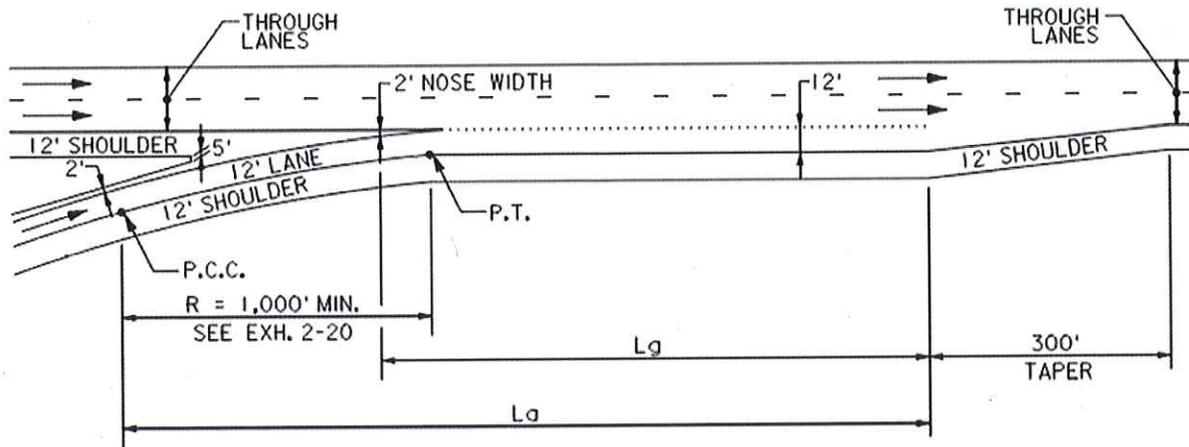
1. Single Lane and Two-Lane Entrance ramps:
  - a. A typical acceleration lane for a single lane entrance ramp is shown in Exhibit 2-25.
  - b. A two-lane entrance ramp shall consist of the typical ramp acceleration geometry followed by a single lane drop. A typical two-lane entrance ramp is shown in Exhibit 2-28.
2. If the mainline is curved, the acceleration lane shall be curved to fit the required lengths and dimensions shown.
3. Where the acceleration lane falls within a section of roadway with 3 percent or greater profile (upgrade or downgrade), the acceleration lengths from Exhibit 2-26 shall be adjusted by the ratios indicated in Exhibit 2-27 to determine minimum acceleration lane lengths.

4. See PM Standard Drawings for entrance ramp pavement markings.

5. The continuity of the through (mainline) roadway shall be maintained at all times.

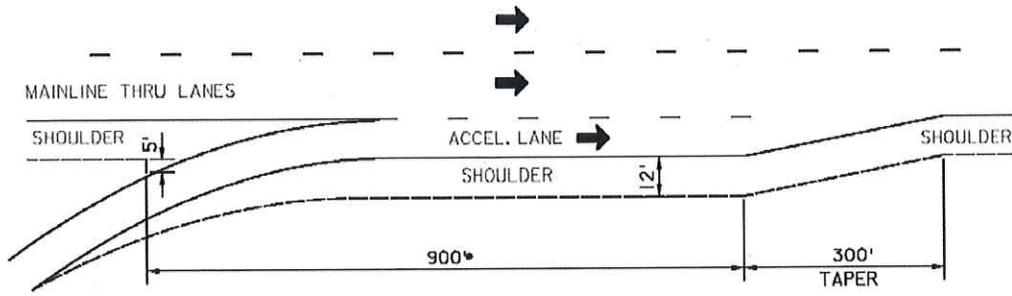
~~The minimum length of acceleration and deceleration lanes is shown in Exhibit 2-26 and Exhibit 2-27. Desirably all interchange entrances and exits should connect at the right of through traffic. Freeway entrances and exits should be located on tangent sections where possible in order to provide maximum sight distance and optimum traffic operation.~~

**Exhibit 2-~~25~~-26 Ramp Terminal Treatment - Single Lane Entrance Ramp**

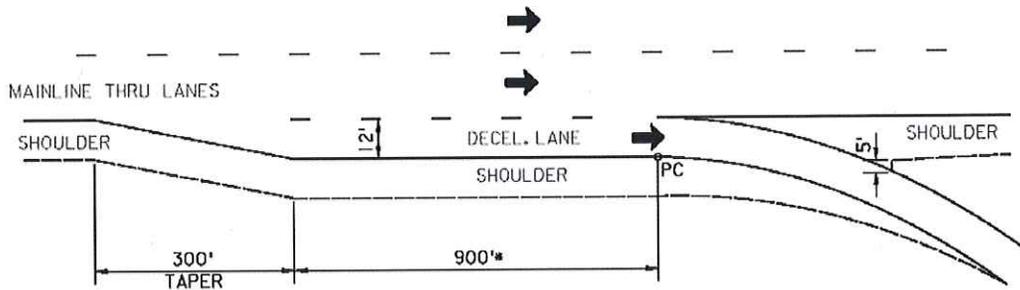


**NOTES:**

1. "Lg" SHALL BE OBTAINED FROM EXHIBITS 2-26 AND 2-27 FOR ACCELERATION LENGTH AND GRADE ADJUSTMENT FACTORS.
2. "Lg" SHALL BE 300' MINIMUM, MEASURED FROM 2' NOSE WIDTH TO START OF TAPER.
3. THE VALUE OF "La" OR "Lg", WHICHEVER RESULTS IN THE GREATER DISTANCE DOWNSTREAM FROM WHERE THE NOSE WIDTH EQUALS 2' SHALL DETERMINE THE LENGTH OF THE RAMP ACCELERATION LANE.



ACCELERATION LANE



DECELERATION LANE

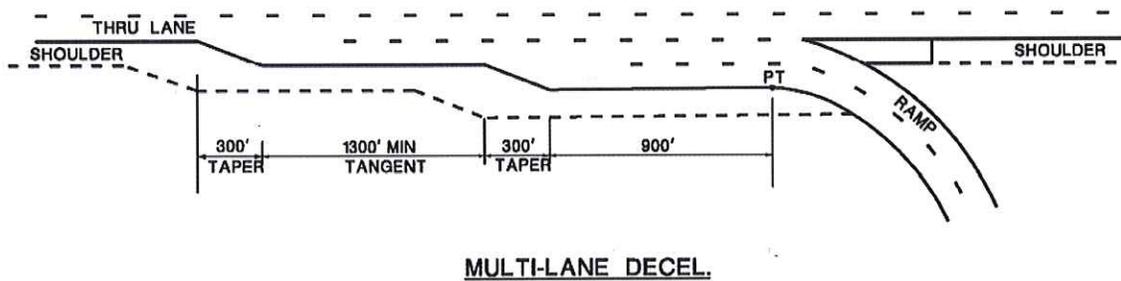
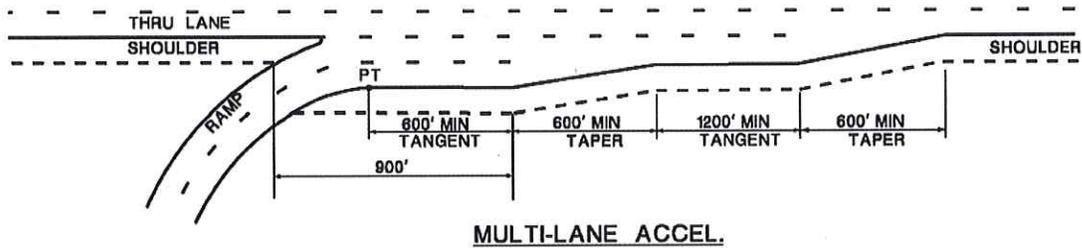
\* FOR ABSOLUTE MINIMUM LENGTH REFER TO AASHTO GEOMETRIC DESIGN OF HIGHWAYS AND STREETS.

**Exhibit 2-262-27 Ramp Terminal Treatment Multi-Lane Ramp Minimum Length of Acceleration Lane**

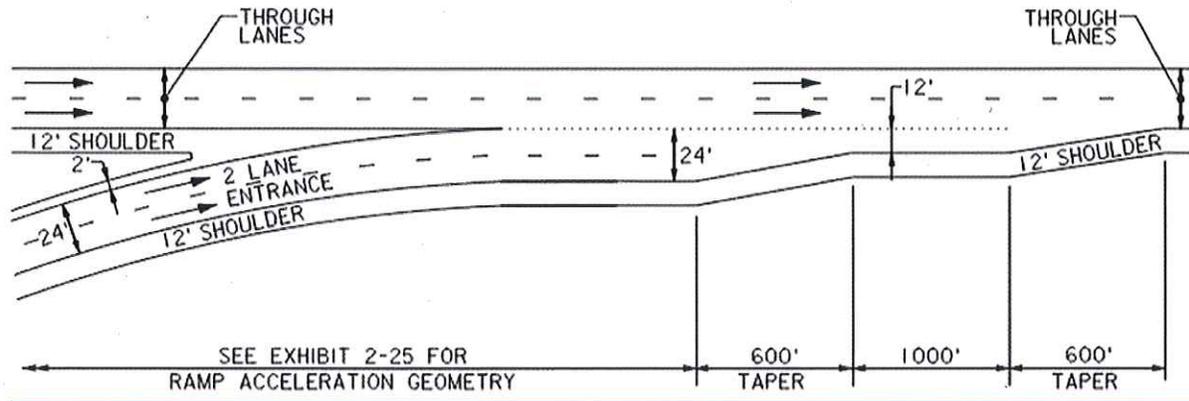
<u>Highway Design Speed, V (mph)</u>	<u>Acceleration Length, La (ft) for Entrance Curve Design Speed (mph)</u>					
	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>
<u>60</u>	<u>1020</u>	<u>910</u>	<u>800</u>	<u>550</u>	<u>420</u>	<u>180</u>
<u>70</u>	<u>1420</u>	<u>1350</u>	<u>1230</u>	<u>1000</u>	<u>820</u>	<u>580</u>

**Exhibit 2-27 Acceleration Lane Grade Adjustment Factors**

Highway Design Speed (mph)	Acceleration Lanes Ratio of Length on Grade to Length of Level for Design Speed of Turning Curve (mph)				
	25	30	40	50	All Speeds
	3 to 4 percent upgrade				3 to 4 percent downgrade
60	1.4	1.5	1.5	1.6	0.6
70	1.5	1.6	1.7	1.8	0.6
	5 percent upgrade				5 percent downgrade
60	1.7	1.9	2.2	2.5	0.5
70	2.0	2.2	2.6	3.0	0.5



**Exhibit 2-28 Two-Lane Entrance Ramp**



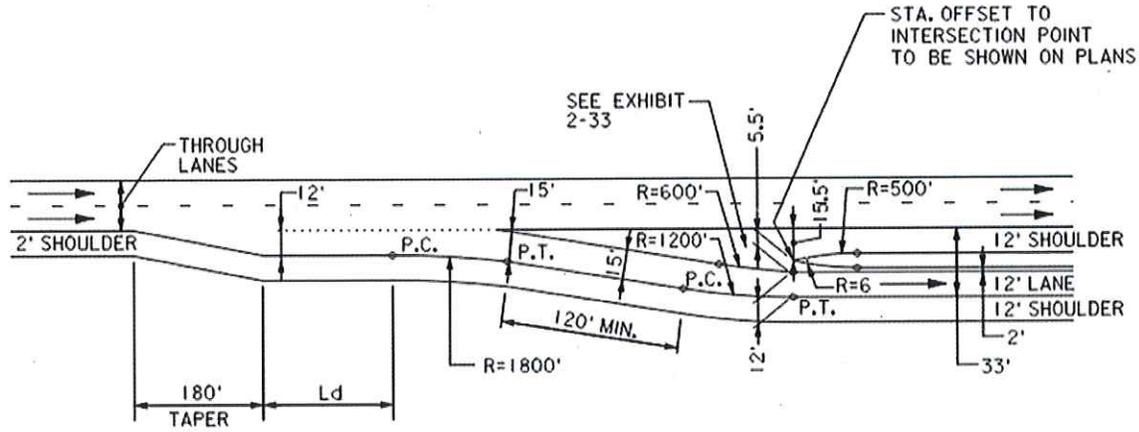
**2.5.2. Exit Ramp Deceleration Lanes**

**1. Single Lane and Two-Lane Exit Ramps**

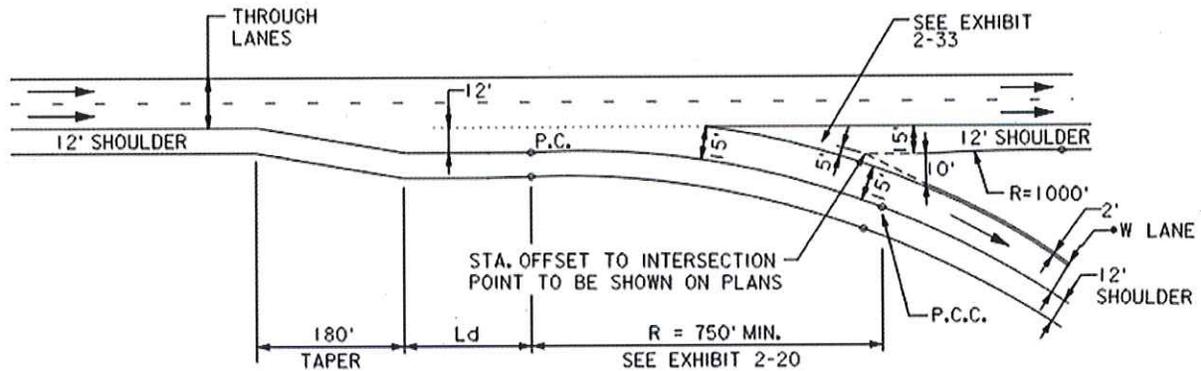
- a. For Single Lane exit ramps there are two types of deceleration lanes as shown in [Exhibit 2-29](#). The application of these two types is dependent upon the overall geometry of the situation. The "Parallel Ramp Configuration" is generally used in conjunction with a dual-dual roadway for exit from the inner roadway.
- b. A two-lane exit ramp shall consist of a single lane widening followed by the typical ramp deceleration. A typical two lane exit ramp is shown in [Exhibit 2-32](#).

2. If the mainline is curved, the deceleration lane shall be curved to fit the required lengths and dimensions shown.
3. Where the deceleration lane falls within a section of roadway with 3 percent or greater profile (upgrade or downgrade), the deceleration lengths from [Exhibit 2-30](#) shall be adjusted by the ratios indicated in [Exhibit 2-31](#) to determine minimum deceleration lane lengths.
4. See PM Standard Drawings for exit ramp pavement markings.
5. The continuity of the through (mainline) roadway shall be maintained at all times. Where directed by the Authority, the mainline through lanes may be reduced with a lane drop that maintains through lanes for 900 feet beyond the exit ramp followed by a 300-foot taper.

**Exhibit 2-29 - Single Lane Exit Ramp**



PARALLEL RAMP CONFIGURATION



• SEE EXHIBIT 2-19

LOOP RAMP CONFIGURATION

**NOTES:**

1. "Ld" SHALL BE DETERMINED FROM EXHIBITS 2-30 AND 2-31 FOR DECELERATION LANE LENGTH AND GRADE ADJUSTMENT FACTORS.

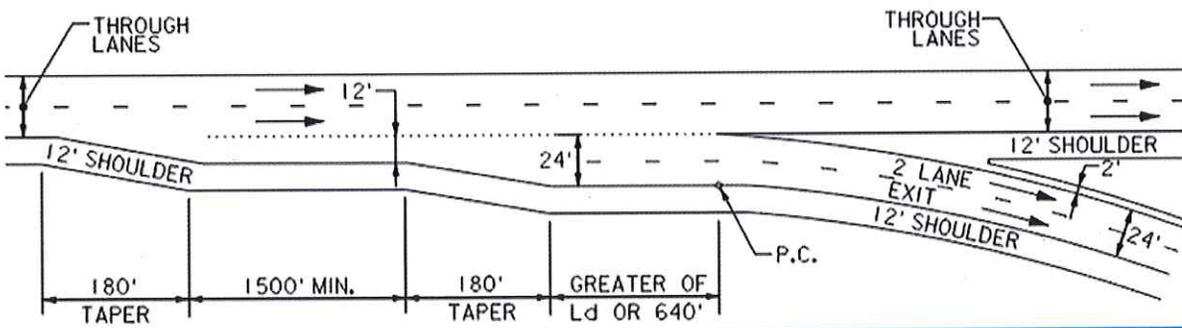
**Exhibit 2-30 Minimum Length of Deceleration Lane**

Highway Design Speed, $V$ (mph)	Deceleration Length, $L_d$ (ft) for Exit Curve Design Speed (mph)					
	25	30	35	40	45	50
60	460	430	405	350	300	240
70	550	520	490	440	390	340

**Exhibit 2-31 Deceleration Lane Grade Adjustment Factors**

Highway Design Speed (mph)	Deceleration Lanes Ratio of Length on Grade to Length of Level for Design Speed of Turning Curve (mph)	
	All Speeds	
	3 to 4 percent upgrade	3 to 4 percent downgrade
All Speeds	0.9	1.2
	5 percent upgrade	5 percent downgrade
All Speeds	0.8	1.35

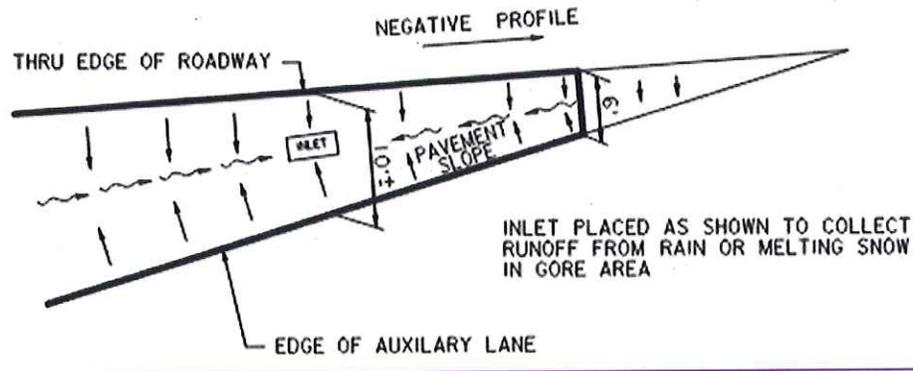
**Exhibit 2-32 Two-Lane Exit Ramp**



**2.5.3. Nose Grading**

Typical nose grading between a mainline roadway and an auxiliary lane(s) is shown in [Exhibit 2-33.](#)

**Exhibit 2-33 Typical Nose Grading**



## 2.6. OTHER ROADWAYS

### 2.6.1. Crossroads

Where local roads are being replaced, the intent of the Authority with respect to any work under the jurisdiction of the state, county, municipality, or any other agency is "replacement in kind", according to present standards of that agency. All such work is subject to the approval of the Authority's Engineering Department and must be previously agreed to in writing by the concerned agency, as noted elsewhere in this manual and the Procedures Manual.

Similarly, all detouring and/or closing of local roads during construction must be approved by the appropriate agencies in accordance with the Procedures Manual.

### 2.6.2. Access and Service Roads

Treatment similar to "Crossroads" above.

### 2.6.3. U-Turns and Z-Turns

1. U-Turns and Z-Turns shall be designated by milepost location. Refer to Section 7 for signing.
2. Use and Location -Consult the Authority for location criteria.