Roadway Design Criteria

MARCH 2019

ILLINOIS STATE TOLL HIGHWAY AUTHORITY

Roadway Design Criteria dated March 2019 replaces the version issued March 2018.

Major Revision Highlights:

SECTION 1.0 Introduction

Article 1.3 – Updated language on definition for “crashworthy”.
Article 1.4 – Added language about reconstruction criteria in a rehablitation project.

SECTION 2.0 Design Criteria

Article 2.2 – Added or updated design speed for following: preferential lane, service interchange diamond/outer ramps, and system interchange directional ramp.
Article 2.4.1 – Added or updated Rmin values for service interchange diamond/outer ramps, and system interchange directional ramp.
Article 2.4.3 – Updated minimum length of curve requirements for “Preservation and Rehabilitation” projects.
Article 2.4.4 – Revised language and added footnote for ramp compound curve ratio.
Article 2.4.5 – Updated requirements for minimum tangent between curves for ramps.
Article 2.4.8 – Added footnotes clarifying superelevation transition requirements for reverse and compound curves.
Article 2.5.2 – Updated criteria for minimum grades.
Article 2.5.4 – Updated criteria for maximum algebraic difference in grade without vertical curve.
Article 2.5.5 – Updated crest vertical curves criteria for “Preservation and Rehabilitation” projects.
Article 2.5.6 – Updated sag vertical curves criteria for both “Reconstruction and New Construction” and “Preservation and Rehabilitation” projects.
Article 2.5.7 – Updated footnote 27 in regards to pavement profile limits.
Article 2.6.6 – Added a paragraph in regards to the usage of G-3 and G-2 gutters when noise abatement wall is adjacent to paved shoulder, and removed references to G-3 and G-2 modified gutters in their usage in snow storage areas.
Article 2.6.7 – Updated language on the following in reference to snow storage: requirements on bridges and NAWs, height of barrier/parapet wall, and minimum paved shoulder width.
Article 2.6.9 – Clarified criteria for ditch bottom width.
Article 2.6.13 – Added language in the location and other considerations sections with regards crash investigation site design requirements.

SECTION 3.0 Figures

Figure 3A – New figure for typical ramp superelevation design
Figures 4 & 8 – Updated final curve design speed and entrance taper rate requirements.
Figures 5, 9 & 20 – Updated initial curve design speed and shoulder recovery taper area near gore nose.
Figure 6 – Redesigned ramp pavement taper section from 18’ to 12’.
Figure 7 – Added note clarifying the taper distance for the left EOP from 21’ to 18’.
Figure 11 – Modified shoulder recovery taper area near gore nose.
Figure 19 – Added new figure for entarnce ramp terminal design with auxiliary lane.

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SECTION 1.0 INTRODUCTION

1.1 Purpose and Use

These criteria are prepared as a guide to aid the Designer in the design of new and reconstructed facilities, and the preservation and rehabilitation of existing facilities for the Illinois Tollway. These criteria incorporate the most current appropriate standards for geometric design of the various roadway features. These standards are based on historic Illinois Tollway criteria, modified where necessary to reflect current state-of-the-art practices as set forth in the latest edition of the AASHTO GDHS. The latest editions of the AASHTO GDHS and IDOT BDE Manual shall be used for elements not covered by these criteria subject to the Illinois Tollway's concurrence and/or approval.

The design of interchanges shall be subject to the requirements of the Illinois Tollway, Interchange and Roadway Cost Sharing Policy, current version. See Appendix A.

The Illinois Tollway's intent is to provide the user with a facility that incorporates the highest feasible standards of design commensurate with existing conditions and cost constraints. Accordingly, minimum design standards included in this manual should only be used where all factors considered dictate their choice. Design parameters lower than the minimum design standards included in these criteria should comply with the AASHTO GDHS (or another nationally recognized agency or practice) and shall only be used if a Design Deviation has been approved by the Chief Engineer.

Currently applicable design criteria are set forth in the body of this document. In some cases, these criteria are divided into two categories. This is done because the original design of the existing systems was developed to two different design speeds. See Article 1.5.

Where references are made to AASHTO Tables or Figures they are intended to refer to the 2018 AASHTO GDHS, commonly referred to as the AASHTO Green Book.

Where references are made to the Standard Drawings they are intended to refer to the latest edition of the Illinois Tollway Standard Drawings or IDOT Highway Standards.

1.2 Abbreviations & Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AASHTO GDHS	AASHTO Geometric Design of Highways and Streets (Green Book)
AASHTO RDG	AASHTO Roadside Design Guide
ADT	Average Daily Traffic
AET	All Electronic Tolling
BS	Backslope
B/C	Benefit to Cost Ratio
BWA	Barrier Warrant Analysis
CCTV	Closed Circuit Television
C-D	Collector - Distributor (Roadway)
CLSM	Controlled Low Strength Material
CM	Construction Manager
CMB	Cable Median Barrier
DCM	Design Corridor Manager

DMS	Dynamic Message Sign
DSE	Design Section Engineer
e_{max}	Maximum Superelevation
EOP	Edge of Pavement
EOS	Edge of Paved Shoulder
EOTW	Edge of Traveled Way
FS	Foreslope
FHWA	Federal Highway Administration
GEC	General Engineering Consultant
IDOT	Illinois Department of Transportation
IDOT BDE	IDOT Bureau of Design and Environment
ISTHA	Illinois State Toll Highway Authority (Illinois Tollway)
ITS	Intelligent Transportation System
IRI	International Roughness Index
LRFD	Load and Resistance Factor Design
MASH	Manual for Assessing Safety Hardware (AASHTO document)
MOT	Maintenance of Traffic
MP	Milepost
MPH or mph	Miles per Hour
MSE	Mechanically Stabilized Embankment
MUTCD	Manual of Uniform Traffic Control Devices
MVDS	Microwave Vehicle Detection System
NAW	Noise Abatement Wall
NCHRP	National Cooperative Highway Research Program
PC	Point of Curvature
PI	Point of Intersection
PT	Point of Tangency
PBD	Performance Based Design
PM	Project Manager
ROW	Right-of-Way
RSAP	Roadside Safety Analysis Program
RWIS	Roadway Weather Information System
SE	Superelevation
TBG	Traffic Barrier Guidelines
TBT	Traffic Barrier Terminal
TL - #	NCHRP or MASH Test Level (of the number specified)
VEP	Value Engineering Proposal
WBPM	Web-Based Program Management system (currently using e-Builder)

1.3 Definitions

AASHTO Roadside Design Guide. A guide that presents a synthesis of current information and operating practices related to roadside safety. It is developed and maintained by the AASHTO Subcommittee on Design, Technical Committee for Roadside Safety.

Backslope. The parallel sideslope created by connecting the ditch bottom, shelf behind gutter, or back of gutter, upward and outward from the roadway, to the natural ground line.

Barn-Roof Foreslope. Also called Variable Foreslope. Embankment section that uses a recoverable foreslope (typically 1:6 (V:H)) out to the limit of the defined clear zone and then uses a steeper slope down to the ditch bottom. This steeper slope shall be recoverable, or non-recoverable, but shall not be critical.

Barrier Terminals. See Traffic Barrier Terminal.

Barrier Warrant Analysis. The process in which a roadside obstacle is analyzed to determine whether or not it can be either removed, relocated, the severity reduced, or shielded. The term also refers to the collective document consisting of all of the locations within the contract limits, which contains all of the information needed for the analyses.

Crashworthy. A characteristic of a roadside appurtenance that has been successfully crash tested for a certain test level in accordance with a national standard such as the NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," for previous installations or AASHTO MASH for any new installations. See Illinois Tollway Traffic Barrier Guidelines Section 8.0.

Clear Zone. The clear zone is defined by the AASHTO RDG as "the unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles". See Illinois Tollway TBG Article 5.3 for detailed definition and application of the clear zone by the Illinois Tollway.

Critical Foreslope. Foreslope steeper than 1:3 (V:H) that cannot be safely traversed by a run-off-the-road vehicle. Depending on the encroachment conditions, a vehicle on a critical foreslope may overturn.

Designer. The person (or consultant team) responsible for performing a design task for an Illinois Tollway project. Although this is typically the DSE, it can also include a person (or consultant team) hired by a Contractor to perform design as part of a VEP or part of a PBD. This document will use the term "Designer" which covers anyone performing design and will only use the term "DSE" when discussing tasks specific to the DSE.

Downstream. The direction going with the flow of traffic.

Edge of Pavement. The longitudinal joint between roadway pavement and shoulder pavement. In many locations, the outside lane of roadway pavement was built 1' wider than it was striped. Along the existing Elgin O'Hare the outside lane was built 2' wider than it is striped.

Also, Lane 1 could be 14' wide and striped at 12'.

Edge of Shoulder. The edge of paved shoulder that is furthest from the edge of pavement.

Edge of Traveled Way. The edge of roadway as viewed by the driver. Commonly, signified by the inside edge of a pavement marking edge line.

Foreslope. The parallel sideslope created by connecting the outside edge of shoulder (usually aggregate shoulder) or the shelf behind the gutter, downward and outward from the roadway, to the ditch bottom or natural ground line.

Gore. An area between a ramp and the mainline (or between two ramps), generally triangular in shape. For example, on a taper type exit ramp, the gore is from the painted nose on the upstream end to the gore nose on the downstream end. The painted nose is a point with no dimensional width occurring at the separation of roadways. The physical nose has some dimensional width that separates the two roadways. The gore nose (sometimes referred to as the back of gore) is the end of the paved area between the two roadways. The painted nose, physical gore and gore nose are shown on Figures 4 through 7 for entrance and exit ramp terminals.

Impact Attenuator. A protective device used to shield a rigid obstacle, such as a concrete barrier, a median barrier, or a bridge pier, by gradually decelerating the vehicle to a safe stop or by redirecting the vehicle away from the obstacle.

International Roughness Index (IRI). A statistic used to estimate the amount of roughness in a longitudinal profile. The IRI is computed using a mathematical model known as the "quarter-car model," which represents the way a single tire system (a quarter of a car) is affected by the profile of the pavement. The quarter car model includes one tire represented by a vertical spring, the axle mass supported by the tire, a suspension spring and damper, and the body mass of the vehicle supported by the suspension for that tire. The response of this system is simulated over the profile of the pavement, and the summation of the absolute values of the suspension motions obtained from the simulation divided by the simulation length gives the average suspension motion over the simulated length, which is the IRI. A computer program to calculate the IRI statistic from a longitudinal profile is included in ASTM E1926, and another is the FHWA's Profile Viewing and Analysis (ProVAL) software.

Intersecting Slopes. See Transverse Slopes.

Lane Line. The joint line separating two lanes of traffic traveling in the same direction.

Non-Recoverable Foreslope. Foreslope which can be safely traversed, but upon which an errant vehicle is unlikely to recover. The run-off-the-road vehicle will likely continue down to the toe of the slope. For most embankment heights, if a foreslope is between 1:3 (V:H) (inclusive) and 1:4 (V:H) (exclusive), it is considered a non-recoverable parallel slope provided that the slope is free of obstacles.

Parallel Slopes. Foreslope and backslopes for which the toe/top runs approximately parallel to the roadway.

ProVAL. FHWA's Profile Viewing and Analysis (ProVAL) software. ProVAL is the Illinois Tollway's preferred software program for IRI calculation, and is available for download online for free.

Preferential Lane. A lane established on shoulder(s) for special uses per MUTCD, Section 3D.01

Recoverable Foreslope. Foreslope which can be safely traversed and upon which a motorist has a reasonable opportunity to regain control of the vehicle. Foreslopes 1:4 (V:H) and flatter are generally considered recoverable.

Right-of-Way Line. The line separating Illinois Tollway owned property from another public agency or private property owner. In the case of a permanent easement, this line could be the access control line separating Illinois Tollway jurisdiction from another's. Usually this line will

have an access control fence adjacent to it.

Roadside Safety Analysis Program. Computer software program developed for the NCHRP, Transportation Research Board, National Research Council to analyze the cost effectiveness of roadside alternatives as they relate to safety. This program is used by the Illinois Tollway in barrier warrant analyses for Level 3 warrants.

Roadway. A Roadway consists of all lanes, auxiliary lanes and shoulders in one direction of travel.

Shielding. The introduction of a barrier or crash cushion between the EOTW and an obstacle or area of concern to reduce the severity of impacts of errant vehicles.

Shielded Slope. A sideslope (foreslope or backslope) that has guardrail or another barrier placed between the slope and the roadway.

Shoulder Point. Point on a cross section where the slope of the aggregate shoulder (or shelf behind the gutter) meets the slope of the foreslope or backslope. (i.e. uppermost point on the foreslope, and the lowest point on the backslope).

Sideslope. A foreslope or backslope adjacent to the roadway. The ratio is expressed as vertical to horizontal (V:H). See Foreslope and Backslope.

Superelevation. Refers to the extra cross slope provided in curves to counteract centripetal force. Maximum SE refers to a design chart used to determine the cross slope given a speed and radius. The Illinois Tollway uses both 6% and 8% maximum SE. See Articles 2.4.1, 2.4.6 and 2.4.7. Tangent runout refers to the longitudinal distance to transition from normal crown to 0% cross slope. SE runoff refers to the longitudinal distance to transition from 0% cross slope to full SE. See Figures 3A through 3F.

Toe of Slope. The intersection of the foreslope with the natural ground line or ditch bottom, before any rounding is applied.

Top of Slope. The intersection of the backslope with the natural ground line, before any rounding is applied.

Traffic Barrier Terminal. The devices or systems attached to the approach and departing end of a guardrail installation used to anchor the installation and provide tension in the rail, and in some cases transition to other types of barriers (e.g., concrete barrier (single face and double face barrier), bridge parapets, retaining walls, etc.). See Illinois Tollway TBG Section 10.0.

Transverse Slope. Also called intersecting slope. Slope for which the toe runs approximately perpendicular to the flow of traffic on the major roadway. Transverse slopes are typically formed by intersections between the mainline and entrances, median turnarounds, or side roads. They are also formed by a bridge cone or when transitioning from a ditch section to a non-ditch section. A transverse slope facing approaching traffic is considered to have a positive grade, while a transverse slope facing away from approaching traffic is considered to have a negative grade. Negative grade transverse slopes can be also be formed by a bridge cone on the downstream side of the bridge. The ratio is expressed as vertical to horizontal (V:H).

Unshielded Slope. A sideslope (foreslope or backslope) that does not have guardrail or another barrier between the roadway and the sideslope. Because an errant vehicle would be expected on an unshielded slope, the sideslope within the clear zone limits shall be free of obstacles.

Undefined Clear Zone. Where the sideslopes along the roadway are such that a definite clear zone distance is not determined based on AASHTO RDG Table 3-1 (foreslopes steeper than 1:4 (V:H); backslopes steeper than 1:3 (V:H)).

Upstream. The direction going against the flow of traffic.

Well Outside Clear Zone. A reasonable offset distance beyond the clear zone which, when applied to an obstacle's location, would significantly reduce the probability of it being impacted by an errant vehicle. This is generally variable along the Illinois Tollway system. It is determined by the Designer, and takes several factors into account, such as ADT, number of lanes, slope configuration, and severity of obstacle.

NOTE:

This manual follows the traditional definitions for **shall**, **should**, and **may. Shall** is used to mean something that is required or mandatory, while **should** is used to mean something that is recommended, but not mandatory and **may** is used to mean something that is optional and carries no requirement or recommendation.

1.4 Project Scope of Work

The project scope of work will reflect the basic intent of the improvement and will determine the applicable design criteria for the project.

The project scope of work for Illinois Tollway facility improvements are defined as preservation, rehabilitation, reconstruction, and new construction projects.

New construction consists of new Illinois Tollway facilities on new alignments and new ROW which extend Illinois Tollway facilities.

Reconstruction includes improvements within existing Illinois Tollway facility corridors, generally on existing alignments, which expand current Illinois Tollway facilities.

Rehabilitation projects are structural or functional enhancements to the highway pavement, shoulders, and bridge decks to substantially improve the condition, safety, and ride quality in order to extend its service life. Rehabilitation projects include improvements to the structural integrity of the roadway pavement and may include but are not limited to intermittent patching, placing additional layers of surfacing, and subsequent milling and overlay of the pavement surface as well as repairing, overlaying and/or replacing existing bridge decks, bearings, superstructure, substructure, and expansion joints. If there is reconstruction in a rehabilitation project, then reconstruction criteria shall apply for those reconstructed design elements.

Preservation projects are specific treatments to the highway pavement, shoulders, and bridge decks to preserve or enhance the condition, safety, and ride quality in order to maximize its service life. Preservation improvements may include but not limited to repairing current pavement

and shoulder distress with minimal patching, crack sealing, and/or microsurfacing as well as sealing and/or repairing existing bridge decks, superstructure, substructure, and expansion joints. Preservation does not include pavement or deck overlays.

Specific items of rehabilitation work involving the correction of geometric deficiencies or deterioration will normally be specified in the scope of design work for each project. These items will reflect known conditions, deficiencies, and problem areas. Additionally, the Designer may be required to evaluate and make recommendations which may not have been apparent during the development of the project scope. It should be realized that the determination of the need for resurfacing may only be a part of the total rehabilitation necessary, and the Designer must also consider the need for additional work.

This document shows the criteria for Reconstruction and New Construction projects, and Preservation and Rehabilitation projects. For Rehabilitation projects, the Designer shall attempt to meet the Reconstruction and New Construction criteria if it is feasible to do so. If not feasible, then the Rehabilitation criteria should be followed. The term “Match Existing” shall be treated as the absolute minimum criteria. The Designer shall attempt to improve on the existing conditions where possible.

A Design Deviation is not required when “Desirable” criterion is not achieved. A Design Deviation is required when minimum/maximum criterion is not met.

1.5 General Requirements

(Rehabilitation, Reconstruction and New Construction Projects)

These are minimum criteria and should be maximized whenever feasible and within project scope.

Whenever “60 mph” criteria are cited, they shall apply to the following segments of the Illinois Tollway:

Tri-State:	In Cook County, except MP 17.5 to 39.8, including the Edens Spur.
Jane Addams Memorial:	East of the Tri-State to the Kennedy Expressway.
Elgin-O’Hare	All sections.
West O’Hare Access	All sections.

Whenever “70-mph” criteria are cited, they shall apply to all other segments of the system. Specifically:

Tri-State:	In Lake County and MP 17.5 to 39.8 in Cook County.
Jane Addams Memorial:	All sections west of the Tri-State.
Reagan Memorial:	All sections.
Veterans Memorial:	All sections.

(Preservation Projects)

Whenever reference is made to “60 mph” criteria shall apply to the following segments of the Illinois Tollway:

Tri-State:	In Cook County, except MP 17.5 to 39.8, including the Edens Spur.
Jane Addams Memorial:	East of the Tri-State to the Kennedy Expressway.
Reagan Memorial:	East of Illinois Route 83.
Elgin-O’Hare	All sections.
West O’Hare Access	All sections.

Whenever “70-mph” criteria are cited, they shall apply to all other segments of the system. Specifically:

Tri-State:	In Lake County and MP 17.5 to 39.8 in Cook County.
Jane Addams Memorial:	All sections west of the Tri-State.
Reagan Memorial:	All sections west of Illinois Route 83.
Veterans Memorial:	All sections.

1.6 Design Vehicle

(Rehabilitation, Reconstruction, and New Construction Projects)
All major components of the roadway system, including intersections at ramp termini, shall be designed to accommodate the WB-67 design vehicle (2018 AASHTO, Section 2.8).

(Preservation Projects)
Match existing.

SECTION 2.0 DESIGN CRITERIA

2.1 Desirable Level of Service (LOS)

Use Illinois Tollway provided projected ADT from current Chicago Metropolitan Agency for Planning (CMAP) and Rockford Metropolitan Agency for Planning (RMAP) design horizon.

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Mainline, C-D Roadway, Ramps	C Rural Area D Urban Area
Ramp/Crossroad Intersections	D for any Traffic movement or lane group

2.2 Design Speed

Reconstruction and New Construction Projects	
Mainline	70 mph 60 mph (where applicable: See Article1.5 - General Requirements)
Preferential Lane	70 mph (desirable); 60 mph (min.)
Ramps	
Service Interchange [1]	
Diamond/Outer	
Curve closest to mainline	60 mph (desirable); 50 mph (min.) See Figs. 4 & 5
Other horizontal curves	35 mph (min.)
Curve closest to crossroad	30 mph (desirable); 25 mph [4] (min.)
Loop	30 mph (min.) See Figs. 6 & 7
Directional [2]	50 mph (min.)
System Interchange [3]	
Loop	30 mph (min.)
Directional [2]	60 mph (desirable); 50 mph (min.)
C-D Roadway	10 mph less than adjacent Mainline

Preservation and Rehabilitation Projects – use same as Reconstruction/New except as noted below:	
Ramps	
Service Interchange [1]	
Diamond/Outer	
Other horizontal curves	25 mph (min.)
Loop[5]	25 mph (min.)

[1] Grade-separated intersection of a controlled access highway (freeway, tollway) and lesser class facility such as an arterial or collector.
[2] Ramp with a design speed of 50 mph or greater on which vehicles do not stop.
[3] Grade-separated intersection between two or more controlled access highways such as Interstate routes.
[4] 25 mph only permitted for diamond exit ramp when stop condition is downstream and all diamond entrance ramps.
[5] Shall meet AASHTO acceleration/deceleration lengths from/to 25 mph to/from posted speed limit.

2.3 Sight Distance

2.3.1 Stopping Sight Distance

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Mainline, Ramps, Preferential Lane (median), C-D Roadway	Use AASHTO Table 3-1 (for level roadway) and AASHTO Table 3-2 (on grade)

2.3.2 Decision Sight Distance
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

At certain locations, sight distance greater than stopping sight distance is desirable to allow drivers time for decisions without making last minute erratic maneuvers (Reference Chapter III of AASHTO GDHS, for a thorough discussion of the derivation of decision sight distance.)

Decision sight distance values are greater than stopping sight distance values because they give the driver an additional margin for error and afford sufficient length to maneuver at the same or reduced speed rather than to just stop. Provide decision sight distance at locations where there is high likelihood for driver error in information reception, decision making, or control actions. Examples include interchanges, major changes in cross section (such as toll plazas and drop lanes), and areas of concentrated demand where sources of information compete (such as roadway elements, traffic, traffic control devices, and oasis advertising signs). If site characteristics allow, locate these highway features where decision sight distance can be provided. If this is not practicable, use suitable traffic control devices and positive guidance to give advanced warning of the conditions.

Use of decision sight distance is recommended at locations with complex driving decisions. Consideration for adjustment to these values may be necessary when determining decision sight distance for horizontal and vertical curves.

2.3.3 Glare Screen
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Reference: IDOT BDE Manual Article 38-7.05, *Glare Screens*, for glare screen purpose, guidance on use, and design.

2.4 Horizontal Alignment

2.4.1 Minimum Radii [6] [7]

Reconstruction and New Construction Projects

	e_{max} (%)	R_{min} (feet)	
Mainline			
70 mph	6	2292 [8]	(desirable)
		2084 [9]	
60 mph	6	1910[10]	
Ramps			
Service Interchange			
Diamond/Outer			
Curve closest to mainline			
60 mph	8	1200	
55 mph		960	
50 mph		758	
Other horizontal curves			
50 mph	8	758	
45 mph		587	
40 mph		444	
35 mph		314	
Curve closest to crossroad			
30 mph	8	214	(desirable)
25 mph		134	
30 mph	6	231	
25 mph		144	
Loop			
30 mph	8	214	
Directional			
50 mph	8	758	
System Interchange			
Loop			
30 mph	8	214	
Directional			
60 mph	6	1330	
55 mph		1060	
50 mph		833	
C-D Roadway			
60 mph	6	1910[10]	
50 mph		1280	

[6] Where Barriers are proposed, shoulder widths shall be checked to verify that required stopping sight distances are provided.
[7] Horizontal curve transitions (spirals) should not be used.
[8] Matches original design criteria for 2° - 30' curve.
[9] Matches original design criteria for 2° - 45' curve.
[10] Matches original design criteria for 3° - 00' curve.

Preservation and Rehabilitation Projects – use same as Reconstruction/New except as noted below:

	e_{max} (%)	R_{min} (feet)	
Ramps			
Service Interchange			
Loop			
25 mph	8	134	
25 mph	6	144	

2.4.2 Maximum Deflection Angle without Horizontal Curve

Reconstruction and New Construction Projects

Mainline, C-D Roadway, Ramps	0° 30' [11]

Preservation and Rehabilitation Projects

Mainline, C-D Roadway, Ramps	Match Existing

2.4.3 Minimum Length of Curves

Reconstruction and New Construction Projects

Mainline, C-D Roadway	1,000' desirable 600' absolute[12]
Ramp	L = [distance traveled in 3 seconds] + [portion of SE runoff on curve at PC [13]] + [portion of SE runoff on curve at PT [13]]
Compound Curves	Use AASHTO Table 3-14

Preservation and Rehabilitation Projects

Mainline, C-D Roadway, Ramp	Match Existing
Compound Curves	Match Existing

[11] Minimum distance between PI's without horizontal curves shall be 2500'. No deflections shall be allowed at or within 2500' of the PC or PT of a horizontal curve.
[12] Shall only be used if central angle exceeds 3°.
[13] Typically, this is 20%. See Article 2.4.8 for exceptions.

2.4.4 Maximum Compound Curve Ratio

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Mainline, C-D Roadway	1.5:1 (Ratio of flatter radius to sharper radius, in the direction of travel, shall not exceed 1.5:1)
Ramps[14]	2:1 (Ratio of flatter radius to sharper radius, in the direction of travel, shall not exceed 2:1)

2.4.5 Minimum Tangent between Curves

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Mainline, C-D Roadway	
Opposite Direction (reverse curve)	1,500' (desirable) As required for continuous transition from one SE cross slope to the opposite (minimum).
Same Direction (broken back curve)	1,500' [15]
Ramps	
Opposite Direction (reverse curve)	As required for continuous transition from one SE cross slope to the opposite.
Same Direction (broken back curve)	L = [distance traveled in 3 seconds] + [portion of SE runoff on tangent at PC [16]] + [portion of SE runoff on tangent at PT [16]]

2.4.6 Maximum Superelevation[17]

Reconstruction and New Construction Projects	
Mainline, C-D Roadway	6%
Ramps	
Service Interchange	
Diamond/Outer/Loops	8%
Directional	8%
System Interchange	
Directional 50 mph	6%
Loop 30 mph	8%

[14] Exception to this criterion would be Figure 7 for the 3 degree (1909.86' R) exit curve and the following initial curve.
[15] Only when curves do not touch and tangent section is required.
[16] Typically, this is 80%. See Article 2.4.8 for exceptions.
[17] SE transitions shall be in accordance with Figures 3A through 3F. Mainline SE shall be accomplished by rotating the roadway about the median edge of pavement. One lane and two lane ramp and C-D Roadway SE shall be accomplished by rotating about the right edge (at baseline) of pavement.

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway	Follow Article 2.15
Ramps	Follow Article 2.16

2.4.7 Superelevation Rates

Reconstruction and New Construction Projects	
Mainline, C-D Roadway	Use AASHTO Table 3-9 (6% e_{max})
Ramps	
Service Interchange	
Diamond/Outer	
Curve closest to mainline	Use AASHTO Table 3-10 (8% e_{max})
Other horizontal curves	Use AASHTO Table 3-10 (8% e_{max})
Curve closest to crossroad	Use AASHTO Table 3-10 (8% e_{max}) (des.) Use AASHTO Table 3-9 (6% e_{max})
Loops/Directional	Use AASHTO Table 3-10 (8% e_{max})
System Interchange	
Loop 30 mph	Use AASHTO Table 3-10 (8% e_{max})
Directional 50 mph	Use AASHTO Table 3-9 (6% e_{max})

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway	Follow Article 2.15
Ramps	Follow Article 2.16

2.4.8 Superelevation Distribution[18] [19] [20]

Reconstruction and New Construction Projects

Mainline, C-D Roadway	85% of SE runoff on Tangent
Ramps	
Service Interchange	
Diamond/Outer	
Curve closest to mainline	80% of SE runoff on Tangent
Other horizontal curves	80% of SE runoff on Tangent
Curve closest to crossroad [21]	80% of SE runoff on Tangent (desirable) 60% of SE runoff on Tangent
Loops/Directional	80% of SE runoff on Tangent
System Interchange	
Loop 30 mph	80% of SE runoff on Tangent
Directional 50 mph	80% of SE runoff on Tangent

Preservation and Rehabilitation Projects

Mainline, C-D Roadway	60-85% of SE runoff on Tangent
Ramps	50-100% of SE runoff on Tangent [22]

[18] See Figures 3A through 3F. Also reference Illinois Tollway *Structure Design Manual*, Article 6.3.7 for SE transitions near bridges.
[19] For compound curves, if the second curve has a sharper radius than the first, the higher rate of superelevation should be reached at the PCC.
[20] For reverse curves, do not provide a normal crown section if the section cannot be maintained for at least two seconds of travel time.
[21] Applies to end of curve closest to crossroad only. (i.e. PC for entrance ramp and PT for exit ramp)
[22] 100% Runoff shall have no gap between the transition and curve. The transition shall end at the PC or begin at the PT.

2.4.9 Maximum Rollover (Algebraic difference in cross-slope)

Reconstruction and New Construction Projects	
Between Pavement and Shoulders	7%
Between Adjacent Pavement Lanes	3%
Between Pavement and Preferential Lane	3.5%
Between Pavement and Gore	
Painted Nose to Physical Nose	
Exit Ramps	5%
Entrance Ramps	5%
Physical Nose to Gore Nose	
Exit Ramps	5%
Entrance Ramps	7%

Preservation and Rehabilitation Projects – use same as Reconstruction/New except as noted below:	
Between Pavement and Shoulders	8%
Between Adjacent Pavement Lanes	4%

2.5 Vertical Alignment

2.5.1 Maximum Grades

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Mainline, C-D Roadway	2% desirable 3% absolute
Ramps Up	3% desirable 4% absolute
Ramps Down	4% desirable 6% absolute
At Traffic Controlled Areas With Storage	2%
Toll Plazas	See Article 2.8

2.5.2 Minimum Grades

Reconstruction and New Construction Projects	
Mainline, C-D Roadway, Ramps	0.5% (min.) [23]
Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

2.5.3 Minimum Length of Profile Tangent

Reconstruction and New Construction Projects	
Mainline, C-D Roadway	1000’ desirable 500’ absolute
Ramps	0’
Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

2.5.4 Maximum Algebraic Difference in Grade without Vertical Curve

Reconstruction and New Construction Projects	
Mainline, C-D Roadway, Ramps	Not allowed [24]
Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

[23] Except for mainline ramp terminals where a minimum grade of 0.3% is acceptable if adequate drainage is met.
[24] Except at the proximity of intersecting cross-roads.

2.5.5 Design Controls for Crest Vertical Curves

Reconstruction and New Construction Projects

Mainline, C-D Roadway, Ramps	See AASHTO Table 3-35 for K-values[25]

L = K x A,

Where: L = Length of vertical curve, in feet.
A = Algebraic difference in grades, in percent.
K = Length of vertical curve per percent change in A.

Minimum L (feet) = 3 x design speed (mph)

When downhill grade beyond crest curve is 3% or steeper the minimum K-values from Table 3-34 shall be adjusted as follows:

For 3% grade, increase minimum K-value by 13%
For 4% grade, increase minimum K-value by 14%
For 5% grade, increase minimum K-value by 20%
For 6% grade, increase minimum K-value by 25%

For intermediate grades, use straight-line interpolation of the values above.

Preservation and Rehabilitation Projects

Mainline, C-D Roadway, Ramps	Match existing

2.5.6 Design Controls for Sag Vertical Curves

Reconstruction and New Construction Projects

Mainline, C-D Roadway, Ramps	See AASHTO Table 3-37 for K-values

$L = K \times A$

May utilize AASHTO Equation 3-52 for comfort factor to determine sag vertical curve lengths when roadway lighting is present:
$L = (A \times V^2) \div 46.5$,

Where: L = Length of vertical curve, in feet
A = Algebraic difference in grades, in percent
K = Length of vertical curve per percent change in A
V = Design speed, in mph

Minimum L (feet) = 3 x design speed (mph)

Preservation and Rehabilitation Projects

Mainline, C-D Roadway, Ramps	Match existing

[25] K values are based on stopping sight distances on flat grades.

2.5.7 Lane Profile Smoothness

High levels of initial smoothness have been shown to have a significant effect on the future smoothness of pavements and have been linked to increases in pavement life. The design shall provide adequate theoretical lane profile smoothness in order to achieve high levels of initial smoothness in construction. The pavement profiles below shall be designed to meet smoothness criteria when analyzed using ProVal software. The DSE shall submit a ProVal smoothness assurance report using short continuous analysis for each pavement profile below at each design milestone submittal including and after preliminary (60%) design.

Mainline, C-D roadway, and ramp pavement profiles for each edge of lane[26] are required including the following:

- Left edge of pavement (including Preferential Lane if present) [27]
- Right edge of each lane
- Right edge of pavement [28]

Reconstruction and New Construction Projects	
Mainline, C-D Roadway	IRI value of 30 in./mi. max.
Ramps	IRI value of 50 in./mi. max.

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway	IRI value of 30 in./mi. desired
Ramps	IRI value of 50 in./mi. desired

Note: All superelevation transitions should include a symmetrical, parabolic vertical curve inserted at each lane edge transition break point as follows:

Mainline, C-D Roadways	70’ vertical curve, desirable
Ramps	50’ vertical curve, desirable

[26] Each edge of lane refers to the edge of the paved lane, not an offset pavement marking location.
[27] The pavement profile along the left edge of ramp pavement shall extend the entire length of the ramp to/from the physical nose of gore.
[28] The pavement profile along the ramp baseline (right edge of ramp pavement) shall extend the entire length of the ramp baseline to/from the mainline or C-D roadway right edge of the outside lane.

2.6 Cross-Sectional Elements

The Illinois Tollway has provided guide drawings to illustrate new construction/reconstruction proposed cross sectional elements to aid Designers with typical section creation. The Microstation files may be used to create typical sections for the majority of proposed pavement, and as a basis for typical sections that must be customized. Reference Illinois Tollway Standard Drawings – Section M (Base sheets), M-RDY-400 through M-RDY-406 in dgn format.

2.6.1 Pavement Width

Reconstruction and New Construction Projects	
Mainline	2 lanes – 25’ 3 lanes – 37’ 4 lanes – 49’ 5 lanes – 61’
Auxiliary Lane	12’
C-D Roadway	
1 lane	16’
2 lanes	24’
1-Lane Ramps	
Loop	18’
All other ramps	16’
2-Lane Ramps	
Loop	NA
All other ramps	24’

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

2.6.2 Pavement Cross Slope

Reconstruction and New Construction Projects	
Mainline, C-D Roadway, Ramps	
Travel Lanes	1.5%
For 3rd and 4th lane in same cross slope direction	2.0%
For additional lanes in same cross slope direction	2.5%

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

2.6.3 Minimum Paved Shoulder Width[29] [30]

Reconstruction and New Construction Projects	
Mainline	
Right Shoulder	11’ (does not include 1’ of extended outside lane pavement)
Left Shoulder	
Open Median	4’ (12’ when used for preferential lane)
Median Barrier	11.5’ (12’ when used for preferential lane)
C-D Roadway, Ramp	
Right Shoulder	10’
Left Shoulder	
1-Lane Loop ramps	6’
C-D Roadway, All other ramps	4’

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway, Ramps	Match existing

[29] Where barriers are constructed, shoulder widths should be checked to verify that stopping sight distances are provided.

[30] Gutter, frames and grates, and barrier base shall be located beyond the edge of shoulder. These elements shall not be considered drivable shoulder.

2.6.4 Paved Shoulder Cross Slope[31]

Reconstruction and New Construction Projects	
Mainline	
Right Shoulder	3.0% or 4.0% [32] inclusive (or as required by 7% max. rollover criterion in Article 2.4.9). For low side of SE, slope shall not be flatter than adjacent lane.
Preferential Lane (median)	
Normal Crown	2.0%
High Side of SE	Matches cross slope of Lane 1
Low Side of SE	Matches cross slope of Lane 1 (2% minimum)
Left Shoulder with Open Median or Closed Median	4.0% (or as required by 7% max. rollover criterion in Article 2.4.9). For low side of SE, slope shall not be flatter than adjacent lane.
C-D Roadway, Ramp	
Left and Right Shoulder	4.0% (or as required by 7% max. rollover criterion in Article 2.4.9). For low side of SE, slope shall not be flatter than adjacent lane.

Preservation and Rehabilitation Projects	
Mainline, C-D Roadways, Ramps	Match existing

2.6.5 Aggregate Shoulder Width

Reconstruction and New Construction Projects	
Mainline, C-D Roadway, Ramps	
Left and Right Shoulder	4' (without gutter or wall) All aggregate shoulders slope at 6% away from paved shoulder. For low side of SE, slope shall not be flatter than adjacent paved shoulder. 3' (with gutter and guardrail)[33] Aggregate shoulders used with guardrail and terminals shall be no steeper than 10%. See Illinois Tollway TBG, Articles 9.5 and 9.6.

Preservation and Rehabilitation Projects	
Mainline	
Left Shoulder	Paved width plus aggregate width shall total 8' min.
Right Shoulder	Match existing.
C-D Roadway, Ramps	Match existing.

[31] Reference Illinois Tollway *Structure Design Manual*, Article 15.3.2.1 for shoulder cross slope transition approaching a bridge.
[32] Maintain a consistent shoulder slope throughout the project corridor.
[33] Aggregate shoulder shall not be used adjacent to gutter unless guardrail is present.

2.6.6 Use of Gutters and Curbs (Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Cross slope and width of pavement and shoulders as well as longitudinal grade, affect the rate of runoff to the sideslope. Gutters and associated drainage structures at the edge of shoulder can be used to intercept pavement runoff where concentrated flows would otherwise cause erosion of the sideslope. However, the Designer shall consider other erosion control measures, to maximize the effective stormwater treatment train, prior to utilizing gutter.

No portion of the gutter should be considered part of the rideable area of the shoulder or counted as part of the shoulder width.

The use of gutters or curbs shall not create an obstacle for vehicles.

The use of gutter is independent of the need for guardrail. Guardrail can be installed with or without gutter and gutter can be used with or without adjacent guardrail.

The Illinois Tollway primarily uses two types – Gutter, Type G-3 is 3' wide and is used along the mainline roadway; and Gutter, Type G-2 is 2' wide and is used along ramps. The following tables show the use of Gutter, Type G-3 and Gutter, Type G-2, respectively. Note that in the Tables that the term "Not Preferred" does not preclude the use of gutter, if gutter is deemed necessary by the Designer.

Gutter, Type G-3 (along Mainline and C-D Roadways) or Type G-2 (along Ramp)

Gutter, Type G-3 or Type G-2 shall not be used along unshielded embankment foreslopes steeper than 1:6 (V:H).

Gutter, Type G-3 or Type G-2 with a proper gutter transition shall be used at all Traffic Barrier Terminal Type T6 locations along the mainline or ramps. No drainage structure shall be located within the limits of the Terminal Type T6. Reference Illinois Tollway Standard Drawing B3.

Gutter, Type G-3 or Type G-2 shall be used at the edge of the paved shoulder when adjacent to crashworthy noise abatement walls (NAW). Refer to Illinois Tollway Standard Drawings, Section M-Base Sheets

Table 2.6.6 – Use of Gutter, Type G-3 or Type G-2

Sideslope Condition	Low Side of SE	Normal Crown or High Side of SE
Foreslope – Steeper than 1:3 (V:H)	(See Note 1)	Not Preferred (See Note 2)
Foreslope – 1:3 (V:H) or Flatter	Not Preferred (See Note 2)	Not Preferred
Backslope – Any slope	Required	Required

Notes:

1. Sheet flow energy dissipation measures shall be required and may include, but are not limited to: installation of gutter, aggregate shoulder Type C (in shielded locations), or revetment mat.
2. Additional permanent erosion control measures may be required and may include, but are not limited to: the installation of turf reinforcement mat, or other soil stabilization system.

Gutter, Type G-3 Modified (along Mainline and C-D Roadways)

When gutter is required adjacent to a Traffic Barrier Terminal Type T1 (Special), Gutter, Type G-3 Modified shall be used.

Gutter, Type G-2 Modified (along Ramps)

When gutter is required adjacent to a Traffic Barrier Terminal Type T1 (Special) or a Type T1-A (Special), Gutter, Type G-2 Modified shall be used. Another use for Gutter, Type G-2 Modified is adjacent to a retaining wall parapet.

Concrete Curb Type C

Concrete Curb Type C is 9” high and shall only be used along toll plaza parking areas, at maintenance facilities, or in conjunction with guardrail on the tapering approach to a non-AET plaza.

2.6.7 Snow Storage Area (Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

During snow removal operations, Illinois Tollway Maintenance can usually push snow up and over a 44" high barrier or parapet to clear the shoulder of snow. When removal of snow over the parapet is not possible or not allowed (such as along a bridge), the snow can be pushed longitudinally along the parapet for a distance of approximately 500'. For lengths exceeding 500', an additional area adjacent to the full width shoulder should be provided for the storage of snow.

Where snow storage is required, the shoulder shall be widened to accommodate the additional width. The minimum width from edge-of-pavement to face of wall shall be the required paved shoulder width plus a 5' minimum width for snow storage. Transitions upstream and downstream of the snow storage area shall be addressed by the Designer.

See Illinois Tollway Standard Drawings, Section M – Base Sheets, for typical section details and Illinois Tollway *Structure Design Manual* for retaining wall parapet details.

For Preservation and Rehabilitation projects, contact Illinois Tollway Maintenance for areas of concern regarding snow storage.

Retaining Wall

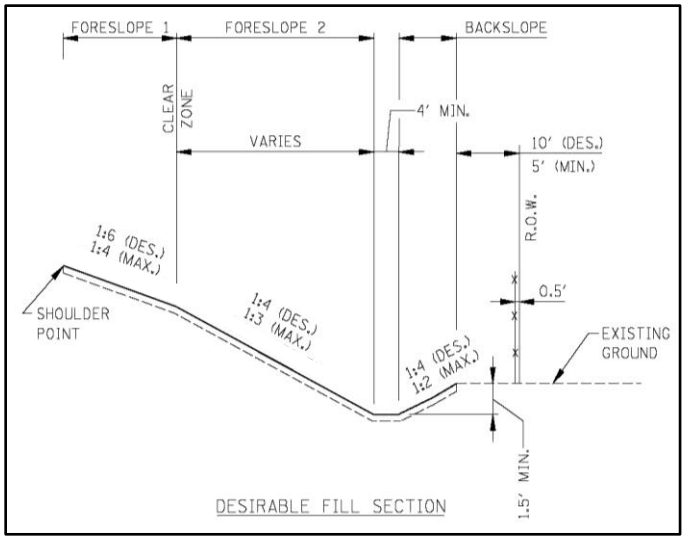
A snow storage area should be provided between the outside shoulder and the retaining wall when there is a:

- Cut wall (roadway is lower than adjacent ground) where the vertical distance from the paved shoulder surface to the top of wall exceeds 44";
- Fill wall (roadway is higher than adjacent ground) when there is a NAW mounted on top of the parapet;
- Fill wall where snow cannot be thrown over the parapet because the low side of the wall is environmentally sensitive or private property.

Ground-Mounted Noise Abatement Wall

For ground-mounted NAWs located near the edge of shoulder, a snow storage area shall be provided between the outside shoulder and the NAW. See Illinois Tollway *Structure Design Manual* for barrier requirements in front of a ground-mounted NAW. The snow storage area should be paved with 6" asphalt shoulder material or similar.

2.6.8 Sideslopes
(Rehabilitation, Reconstruction, and New Construction Projects)



Sideslopes Hierarchy (in order of preference for fill section)			
Foreslope 1	Foreslope 2	Ditch (min.)	Backslope
1:6 or flatter	-	4'	1:4 or flatter
1:6	1:4	4'	1:4
1:6	1:4	4'	1:3
1:6	1:3	4'	1:3
1:4	-	4'	1:3
1:4	-	4'	1:2
1:4	1:3	4'	1:3
1:6	1:3	4'	1:2
1:4	1:3	4'	1:2
1:6	1:2.5 **	4'	1:2
1:2.5 *	-	4'	1:3
1:2.5 *	-	4'	1:2
1:2.5 *	-	2'	1:2

* Design Deviation if fill height is less than 9'
** Design Deviation in all cases

Figure 2.6.8 Typical Sideslopes

<u>Allowable Foreslopes (all slopes shown V:H)</u>

Defined Clear Zone

Continuous foreslope:	1:6 (des.) 1:4 (max.)
Variable foreslope (barn roof):	1:6 (des.) 1:4 (max.) for Foreslope 1
	1:4 (des.) 1:3 (max.) for Foreslope 2

Note: Foreslope 1 shall be 1:6 or flatter behind gutter without guardrail

Undefined Clear Zone

Continuous Foreslope (Fill height ≥ 9'):	1:2.5 (max.)
Continuous Foreslope (Fill height < 9'):	Requires a <u>design deviation</u>

<u>Allowable Backslopes (all slopes shown V:H)</u>

From ditch bottom:	1:4 or flatter (des.) 1:2 (max.)
From shelf behind gutter or from gutter [34]:	1:4 or flatter (des.) 1:2.5 (max.) [35]

[34] Backslopes steeper than 1:3 (V:H) have an undefined clear zone.
[35] Backslope of 1:2 (V:H) from graded area around light poles is allowable in cut sections (See Illinois Tollway Standard Drawing H1).

Desirable sideslope transition lengths
Applies from steeper to flatter and vice versa
Applies to foreslope transitions or backslope transitions

Transition from 1:6 to 1:4 in 150'
Transition from 1:6 to 1:3 in 200'
Transition from 1:6 to 1:2.5 in 250'

Transition from 1:4 to 1:3 in 75'
Transition from 1:4 to 1:2.5 in 100'

Note that transitioning from a foreslope to a backslope (or vice versa) should be done such that the transverse slope created is within allowable grades (see IL Tollway TBG, Article 5.5.10).

(Preservation Projects)

Allowable Foreslopes
Match Existing

Allowable Backslopes
Match Existing

2.6.9 Ditch Bottom Width

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
All locations (Except Below)	4.0' (minimum) unless Figure 2.6.8 states otherwise
Ditch located at the Top of Backslope	2.0' (minimum)

2.6.10 Gore Area Cross Slopes

Ideally, the entire paved gore area should drain away from the mainline and onto the ramp pavement. The gore pavement shall never be sloped to drain toward the mainline lanes. If absolutely necessary, the gore may be sloped to drain toward its middle by creation of a swale. Trench drain and drainage structures within the gore pavement shall be minimized. When a swale is used the following cross slope criteria shall be met:

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Within shoulder width	4.0% (maximum) for mainline side of swale 4.0% (maximum) for ramp side of swale

The grass area downstream from the paved gore area of an exit ramp and upstream from the paved gore area of an entrance ramp shall be graded according to the following:

Preservation, Rehabilitation, Reconstruction, and New Construction Projects	
Grass area beyond paved area for first 200' (400' desirable for exit ramps)	1:6 (V:H) or flatter Note: Infield slopes shall be as flat as practical not to exceed maximums set for foreslopes and backslopes.

2.6.11 Rumble Strips, Delineation Devices and Markings (Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Shoulder rumble strips shall be installed along full width (10' min.) shoulders for:

- Mainline roadway (median and outside).
- Auxiliary lanes that are 1000' or longer.
- C-D roads that are 1000' or longer (left and right).

Rumble strips shall not be installed along ramps, ramp terminals, and most bridges.

For preferential lane usage, the Designer shall provide a rumble strip detail based on shoulder width, location of edgeline pavement marking, presence of barrier and other site conditions.

See details shown in Illinois Tollway Standard Drawings D4, D5, D6 and D8 for barrier delineation devices and markings.

2.6.12 Emergency Turnarounds (Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Emergency turnarounds shall be located at sites that allow a minimum of 1000' clear stopping sight distance in both directions. The location selected shall be acceptable to the Illinois Tollway's Maintenance staff and the Illinois State Police, District 15.

A clearance opening of 30' shall be provided between the impact attenuators placed at each end of the opening in the median barrier wall to allow for emergency vehicles to maneuver.

For a median width of 35' or greater, the median barriers should be offset at the turnaround. See Illinois Tollway Standard Drawing, Section M – Base Sheet M-RDY-411.

2.6.13 Crash Investigation Sites (Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Location

- Placed at full interchanges.
    - Preferably locations without tolls to get on and off system.
    - Do not place inside cloverleaf interchanges.
    - Place in ramp infields between an outer ramp and the mainline.
- At mainline plazas downstream of toll booth.
- ¼ to ½ mile downstream from emergency turnarounds.
- Approximately every 4 miles in rural areas.
- Approximately every 2 to 3 miles in urban areas.
- Site should be combined with radio tower access roads and ITS communication structures, where possible.
- Avoid placing site within superelevated sections.

Layout

- Usually trapezoidal in shape.
- Desirable size: 150' long (not including tapers) by 40' wide (measured from outside edge of paved shoulder).
- Desirable tapers: 3:1 tapers on upstream and downstream side of site. Consider a flatter taper on downstream side for efficient acceleration.
- Positive protection (either guardrail or barrier wall) required at proper offset from edge of traveled way. If guardrail is used, the length shall meet the minimum length requirement for a free-standing installation. A barrier warrant is not required for this installation.
- Entrance and exit vehicle path width shall be 20' minimum (measured perpendicular from back of guardrail or concrete barrier to edge of site).
- No additional ROW should be acquired for site.
- If absolutely necessary, the site may be narrowed or shortened (but not both) to fit into existing ROW.
- Snow storage is not needed behind site.
- Slope to drain away from mainline.

Signing (see Illinois Tollway *Roadway Signing and Pavement Marking Guidelines*)

Other Considerations

- Site shall have adequate lighting. See Illinois Tollway *Guidelines for Roadway Illumination*, Article 6.7, for guidance on breakaway devices. Light poles shall not be ground-mounted within the paved area.
- Site shall have CCTV camera coverage.
- Traffic detectors may be installed.
- Take into consideration existing drainage conditions.

For Preservation and Rehabilitation projects, contact Illinois Tollway Maintenance regarding crash investigation sites.

2.7 Structures

2.7.1 Shoulder Widths

Rehabilitation, Reconstruction, and New Construction Projects	
Mainline (all configurations, 2 lanes through multi-lanes) Left and Right shoulder	See Illinois Tollway *Structure Design Manual*, Article 5.4 [36]
Ramps/C-D Roadway Left and Right shoulder	See Illinois Tollway *Structure Design Manual*, Article 5.4. [36]

Preservation Projects	
Mainline	Match existing
Ramps/C-D Roadway	Match existing

[36] Structures on curves shall have minimum lateral clearance for stopping sight distance.

2.7.2 Horizontal Clearances

Reconstruction and New Construction Projects	
Tollway under	Horizontal clearance to be determined by a Barrier Warrant Analysis. Minimum shall match approach shoulder width. (See Illinois Tollway TBG Article 5.5.10).
Tollway over	In accordance with IDOT Bureau of Local Roads and Streets Manual or IDOT BDE Manual for the appropriate route/road designation.
Sign Truss Supports	Horizontal clearance to be determined by a Barrier Warrant Analysis. (See Illinois Tollway TBG Articles 5.5.7, 5.5.8, 5.5.9). Minimum barrier clearance distance behind guardrail shall conform to Illinois Tollway Standard Drawing C1. Use bridge-mounted signs wherever cost effective. Desirable to locate well outside the clear zone. Design based on ultimate roadway cross section.
Retaining Wall/NAW	Horizontal clearance to be determined by a Barrier Warrant Analysis. (See Illinois Tollway TBG Articles 5.5.10 and 5.5.11). Minimum shall match approach shoulder width. Snow storage shall also be considered (See Article 2.6.7)

Preservation and Rehabilitation Projects – use same as Reconstruction/New except as noted below:	
Tollway under	Match existing.
Tollway over	Match existing.
Sign Truss Supports	Horizontal clearance to be determined by a Barrier Warrant Analysis. (See Illinois Tollway TBG Articles 5.5.7, 5.5.8, 5.5.9). Minimum barrier clearance distance behind guardrail shall conform to Illinois Tollway Standard Drawing C1. Use bridge-mounted signs wherever cost effective. Desirable to locate foundation well outside the clear zone.
Retaining Wall/NAW	Horizontal clearance to be determined by a Barrier Warrant Analysis. (See Illinois Tollway TBG Articles 5.5.10 and 5.5.11).

2.7.3 Vertical Clearances
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Reference Illinois Tollway *Structure Design Manual*, Article 5.2 for all structure design vertical clearances.

2.7.4 Deck Cross Slope
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Reference Illinois Tollway *Structure Design Manual*, Article 15.3 for deck cross slope criteria.

2.8 Toll Plazas
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

Contact Illinois Tollway Engineering for current design criteria for all toll plazas. The horizontal design of a plaza varies with location, traffic volumes, queue length, deceleration diverges, and acceleration merges. The design for Dedicated I-PASS lanes introduces safety concerns that must be carefully considered. Each location should be individually analyzed and designed.

See Illinois Tollway *Drainage Design Manual* for toll plaza drainage requirements.

2.9 Roadside Safety
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

The evaluation of lateral clear zones and roadside safety shall be in accordance with the AASHTO RDG, Latest Edition and the Illinois Tollway TBG, Latest Edition.

2.10 Access Control
(Reconstruction and New Construction Projects)
Access control shall be established in accordance with the Illinois Tollway Interchange and Roadway Cost Sharing Policy, current version. See Appendix.[37]

(Preservation and Rehabilitation Projects)
Match existing access control, unless otherwise required for roadside safety improvements

2.11 Ramp Terminals
(Reconstruction and New Construction Projects)
Ramp terminals shall be in accordance with the Illinois Tollway's Ramp Terminal Design Guidelines. See Figures 4 through 11, 19 and 20.

(Preservation and Rehabilitation Projects)
Match existing ramp terminals.

[37] Select largest value between Tables 1 and 2 for access control.

2.12 Ramp/Roadway Convergence and Divergence Applications

(New Construction and Reconstruction Projects)
Major and minor convergences and divergences, or C-D Roadways configuration shall follow the IDOT's BDE Manual, Latest Edition.

Reference IDOT BDE Manual, Chapter 37, *Interchanges*.

(Preservation and Rehabilitation Projects)
Match existing convergences and divergences.

2.13 Stationing

2.13.1 General Stationing

Reconstruction and New Construction Projects	
Mainline	Stationing shall be carried along the median centerline, and shall generally increase from south to north and from west to east based on the overall direction of the route.
C-D Roadway	Stationing shall be carried along the baseline, which generally follows the right pavement edge, and shall increase in the direction of traffic flow.
Ramps Single lane	Ramp stationing shall be carried along the baseline, which shall follow the right pavement edge, and shall increase in the direction of traffic flow.
Two lane	Ramps shall be stationed along the right edge of pavement and shall increase in the direction of traffic flow.

Preservation and Rehabilitation Projects	
Mainline, C-D Roadway	Match existing
Ramps	Match existing

2.13.2 Dual Stationing

The Illinois Tollway has recently re-recorded the centerline along several existing segments of its System. The new centerline has eliminated station equations, and is consistent with the State Plane Coordinate System. The Illinois Tollway is now requiring the use of this system as the principal system, and all Contract Documents shall utilize the new centerline. All current Illinois Tollway records and Contract Documents used the original centerline and referenced the original stationing called "record stationing". As the Illinois Tollway requires a reference to the record stationing, until further notice, all Contract Plans shall be prepared showing both the new and record stationing on the alignment plan sheets. The new stationing will still be the principal

stationing, with all callouts, roadway plans, profiles, typical sections, cross-sections, and schedules referencing only the new centerline stationing. The record stationing will also be shown at matchlines (alongside the new stationing), crossroad centerlines and at all record station equation points on the alignment plan sheets. A different font shall be used for the record stationing data.

2.14 Right-of-Way Limits
(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

2.14.1 General

Whenever possible, ROW limits shall be set along relatively long tangents so as to provide a smooth line, rather than a series of short zigzag segments.

2.14.2 Permanent Right-of-Way

Distances to be provided from the top of backslope to the existing or proposed ROW line:

All situations	10’ (desirable); 5’ (minimum)

2.14.3 Permanent Easements

Permanent Easements are acquired only in special circumstances and guidelines for such will be developed on an individual project basis.

2.14.4 Temporary Construction Easements

When required, the limits of temporary construction easements shall be established to provide a desirable minimum work area of 20’ beyond the limit of construction.

2.15 Design Policy for the Evaluation of Mainline Superelevation Deficiencies for Preservation and Rehabilitation Projects

This policy has been prepared to provide direction to the Designer involved in pavement preservation and rehabilitation projects that include the evaluation of mainline SE deficiencies in the scope of services. Guidelines presented herein are applicable for the evaluation of existing mainline curves for rehabilitation projects on all routes of the Illinois Tollway System. Preservation projects are not required to evaluate mainline SE deficiencies unless explicitly included in the project scope.

2.15.1 Evaluation

Current requirements for mainline SE are indicated in Articles 2.4.6 through 2.4.8. In general, these criteria exceed those utilized in the design of the original system, and as a result, existing SE rates will be found to be less than currently required.

It is recognized that deficiencies may exist due either to initial construction or subsequent embankment settlement. Therefore, the Illinois Tollway's policy for evaluating the SE on mainline curves in conjunction with pavement preservation and rehabilitation projects is as follows:

Mainline curves shall be corrected to the current SE rates if feasible. If not feasible then the mainline curves shall be corrected to the original SE rates.

SE transition length and SE distribution should match the original design.

2.15.2 Application of Policy

The application of this policy for the evaluation of mainline pavement SE should include the following steps at a minimum:

A. Record drawings shall be reviewed for pertinent information including stationing, curve data, SE rates, etc.

B. A field survey including verification of topographic information shown on record drawings and pavement cross-sectioning shall be performed to establish existing conditions.

C. The existing SE rates and transitions found during the field survey shall be compared to the current rates.

D. Where existing conditions meet the current rates, no correction is required. Pavement edge elevations shall be verified to ensure that smooth profiles exist, and adjustments shall be made as necessary.

Where existing conditions are less than the current rates, the Designer must investigate and make recommendations for the most cost-effective method for establishing the current SE rate. Possible alternate methods include wedging with asphalt or complete replacement of the concrete pavement. Grinding of concrete pavement as a method for the correction of SE deficiencies is not allowed. Alternative methods should consider the limitations of construction materials and methods and the limits of correction which are practical. Pavement edge elevations should be shown on the plans.

If it is not feasible to meet the current SE rate due to overhead clearance issues, etc. the Designer must investigate and make recommendations for the most cost-effective method for re-establishing the original SE rate.

E. Shoulders adjacent to mainline resurfacing shall meet the new pavement overlay elevation. Additionally, all shoulders adjacent to mainline curves shall be checked for shoulder rollover deficiencies regardless of the need for SE correction.

The maximum algebraic difference between pavement and shoulder cross slopes shall not exceed the criteria in Article 2.4.9. Shoulder rollover rates exceeding criteria require correction of the shoulder cross-slope.

Generally, shoulder cross-slope can be corrected by the placement of an asphalt overlay on the existing shoulder. Shoulder cross-slope corrections on median shoulders require a determination of the limit of resurfacing possible within the constraint imposed by the median barrier wall. Shoulder overlay thickness shall not exceed the height of the vertical face at the bottom of the median barrier wall.

If the required shoulder overlay thickness exceeds the above limits on the barrier wall, modification of the barrier wall will be required. The Designer shall determine the most cost-effective method for such modification.

Breaking of the shoulder cross-slope for the correction of rollover deficiencies is generally not acceptable, except in special circumstances such as with the use of concrete shoulders and only with an approved Design Deviation.

F. Details, notes, special provisions, and pay items reflecting approved recommendations for the correction of SE deficiencies shall be developed and incorporated into the contract plans.

2.16 Design Policy for the Evaluation of Ramp Superelevation Deficiencies for Preservation and Rehabilitation Projects

This policy has been prepared to provide direction to the Designer involved in pavement preservation and rehabilitation projects that include the evaluation of ramp SE deficiencies in the scope of services. Guidelines presented herein are applicable for the evaluation of existing ramp pavements for rehabilitation projects on all routes of the Illinois Tollway System. Preservation projects are not required to evaluate ramp SE deficiencies unless explicitly included in the project scope.

2.16.1 Evaluation

It is not possible to determine the exact SE rate utilized for ramp designs in all cases. Many of the original record plans call out SE rates in conjunction with ramp curve data and, in such cases, the original rates are easily verified. However, original roadway plans for several sections do not indicate any design ramp SE rates. Furthermore, field investigations have revealed variations between these criteria and actual conditions either due to inadequacies in the original construction or subsequent pavement deterioration. Current criteria for ramp SE are found in Article 2.4.6 through 2.4.8.

The evaluation of ramp SE can result in the following cases:

For cases where the original design meets or exceeds current criteria:

Case I: Existing SE rate equals original design rate.

Case II: Existing SE rate is less than original design rate but equal to or greater than current criteria.

Case III: Existing SE rate is less than current criteria.

In the case where the original design is less than current criteria:

Case IV: Existing SE rate is less than original design.

A. <u>Case I</u>

When the existing SE rate is equal to the original design rate, no correction is required. Since the rate for the existing system generally exceeds current criteria, this situation will normally result in higher SE rates than required. Corrective measures which reduce rates to meet current requirements are not to be made, but verification that existing rates meet or exceed these requirements is necessary. Pavement edge elevations should also be checked to ensure that relatively smooth profiles exist. Adjustments should be made as necessary to produce smooth edge profiles.

B. <u>Case II</u>

Ramp pavement which exhibit SE rates less than those originally designed but still equal to or greater than current criteria should be handled in the same manner as Case I

situations, and normally no corrective action is necessary. Verification that existing SE rates meet or exceed current requirements is required, and pavement edge elevations must be checked to ensure that relatively smooth profiles exist.

C. Case III

When SE rates are found to be less than current criteria, corrective measures are required. These measures shall result in the establishment of SE rates meeting those in these criteria. Special situations may be encountered where it is desirable to correct deficiencies to meet the original design rate (e.g., where a section of ramp is deficient, but the remainder meets the original design criteria, a smooth profile may not be attainable unless the deficient section is corrected to original criteria.

Corrective measures to increase ramp SE may include overlay wedging with asphalt or complete pavement replacement. Grinding of concrete pavement as a method for the correction of SE deficiencies is not allowed. The Designer shall make cost estimates of alternate corrective strategies to determine the most cost-effective method for correcting SE.

As in cases I and II, relatively smooth pavement edge profiles shall result from all corrective work.

D. Case IV

When SE rates are found to be less than original design rates and the original design rates are less than current criteria, corrective measures are required. These measures shall result in the establishment of the SE rates meeting the original design.

E. All Cases

The geometrics of all ramps shall be investigated to verify that posted ramp advisory speeds are adequate for existing curvature and SE rates or those to be provided. Where deficiencies are found, the Designer shall make recommendations for the correction of geometrics, SE, or signing.

SE transition length and SE distribution should match the original design.

2.16.2 Application of Policy

The application of this policy for the evaluation of ramp pavement SE should generally include the following steps:

A. Record drawings should be reviewed for pertinent geometric information including stationing, curve data, SE rates, etc., and other pertinent data.

B. Existing conditions should be established through a field survey. Survey work should include verification of topographic information shown on record drawings and cross-sectioning of ramp pavements and shoulders. Normally, only elevations at the edges of the pavement are required; however, additional elevations should be taken as needed to fully evaluate existing SE rates (e.g. at crown lines of two lane ramps).

C. The existing SE rates and transitions found during the field survey should be evaluated against the criteria discussed herein and any deficiencies identified.

D. Recommendations for the correction of deficiencies should be developed and submitted to the Illinois Tollway. Recommendations should result from a cost-effective analysis of alternative corrective strategies and may include asphalt wedging, removal and replacement of concrete pavement, or do-nothing. Alternatives should consider the limitations of construction materials and methods and the limits of correction which are practical.

E. When ramp pavements are to be resurfaced either for the correction of SE deficiencies or as part of a general rehabilitation strategy, utilize current Illinois Tollway material as specified in the Standard Specifications or Special Provisions.

F. Where SE corrections are made or ramp pavements are resurfaced, appropriate shoulder reconstruction must also be made if elevation differences occur. Additionally, all ramp shoulders shall be checked for shoulder rollover deficiencies regardless of the need for SE correction.

The maximum algebraic difference between pavement and shoulder cross slopes shall not exceed the criteria in Article 2.4.9. Shoulder rollover rates exceeding criteria require correction of the shoulder cross-slope.

Generally, shoulder cross-slopes can be corrected by the placement of an asphalt overlay on the existing shoulder.

Breaking of the shoulder cross-slope for the correction of rollover deficiencies is generally not acceptable, except in special circumstances such as with the use of concrete shoulders and only with an approved Design Deviation.

G. Reviewed and approved recommendations shall be incorporated into the contract plans. Appropriate details, notes, special provisions, pay items, etc., shall be developed as required to fully identify the extent of work required.

2.17 Guidelines for Replacement of Right-of-Way Fence along the Illinois Tollway System

(Preservation, Rehabilitation, Reconstruction, and New Construction Projects)

New construction and reconstruction projects should have all new Type 1 ROW fence in accordance with Illinois Tollway Standard Drawing D1. For preservation and rehabilitation projects, the replacement of Illinois Tollway ROW fence shall be in accordance with the current Illinois Tollway Standard Drawing D1 and design criteria, supplemented by the following:

2.17.1 Existing Fence

Existing 4-foot high ROW fence shall be replaced regardless of fence condition with a 6-foot high fence when ROW lines are adjacent to areas where pedestrians may be present such as:

- Residential, commercial or industrial areas
- Golf courses
- Playgrounds
- Frontage roads

2.17.2 Forest Preserve

Generally, when the fence is adjacent to a forest preserve, the existing fence shall remain if in good condition and only sections which are damaged shall be replaced with fence of same kind and height. However, if a playground and/or bike trail is in the forest preserve adjacent to the ROW, the fence shall be replaced with 6-foot high fence.

2.17.3 Farmland

Generally, when the fence is adjacent to farmland and other remote areas, the existing fence shall remain if in good condition and only sections which are damaged shall be replaced with fence of same kind and height.

2.17.4 Relocation

No ROW fence shall be relocated without prior approval of the Illinois Tollway.

SECTION 3.0 FIGURES

List of Figures

FIGURE 1 (RESERVED)

FIGURE 2 (RESERVED)

RAMP SUPERELEVATION TRANSITIONS

$$L_r = \frac{w \times e_d \times b_w}{\Delta}$$

L_r = Minimum Length of Superelevation Runoff (ft)

w = Total Ramp Lane Width (ft) - See Table 1

e_d = Design Superelevation Rate (percent)

n_1 = w/12, Number of Lanes Rotated

$b_w = \frac{[1 + 0.5(n_1 - 1)]}{n_1}$, Adjustment Factor for Number of Lanes Rotated

Δ = Maximum Relative Gradient (percent) - See Table 2

For Design Superelevation Rates and Distribution, see Articles 2.4.7 and 2.4.8.

Table 1

Lane Configuration (Article 2.6.1)	Ramp Lane Width, w
	ft
One Lane	
Loop	18
All Others	16
Two Lane	24

Table 2

Design Speed	Maximum Relative Gradient, Δ
mph	%
≥ 50	0.50
45	0.53
40	0.57
35	0.62
30	0.67
25 *	0.73
20 **	0.80

This criteria is based on AASHTO's "A Policy on Geometric Design of Highways and Streets, 2018" (The Green Book).

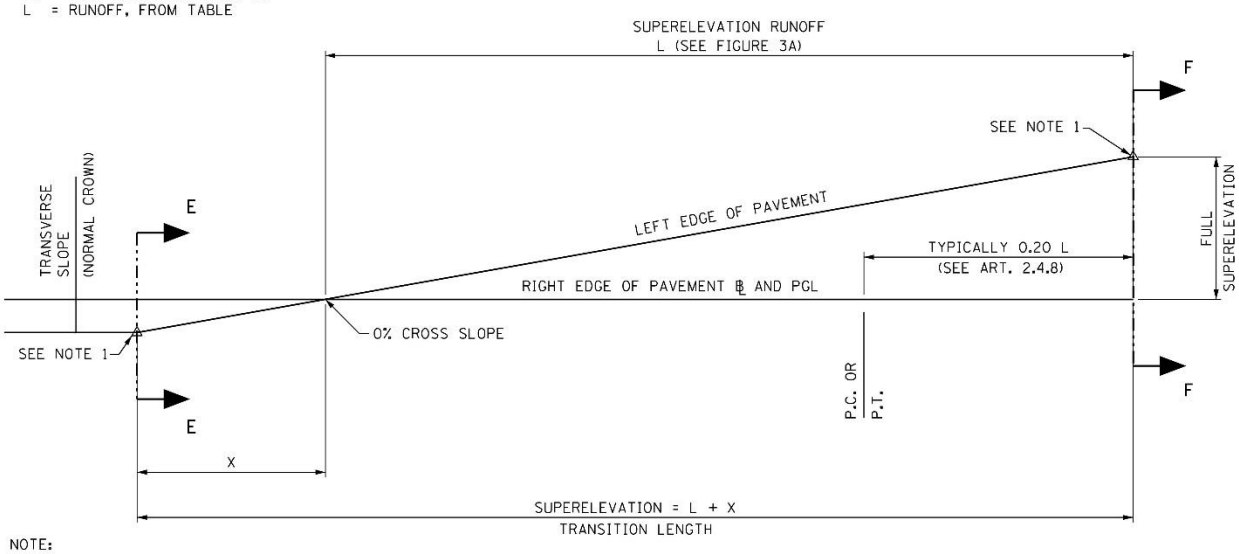
* Design Deviation for some cases (see Article 2.2)

** Design Deviation for all cases

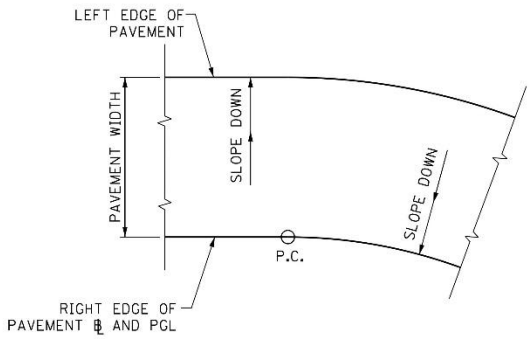
Figure 3A

$$X = \left(\frac{NC}{FS}\right) \cdot L$$

X = TANGENT RUNOUT
NC = NORMAL CROWN (NORMAL SLOPE FOR ONE-LANE RAMP) (%)
FS = FULL SUPERELEVATION (%)
L = RUNOFF, FROM TABLE

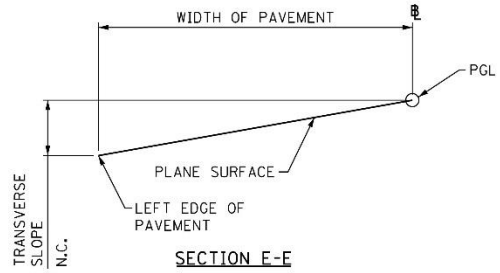


NOTE:
1. INSERT 50' PARABOLIC CURVE AT THE GRADE BREAK POINT INDICATED BY "Δ".

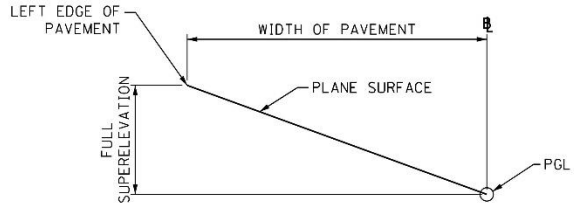


PLAN

NOTE:
PAVEMENT REVOLVED ABOUT ITS RIGHT EDGE (℄).



SECTION E-E

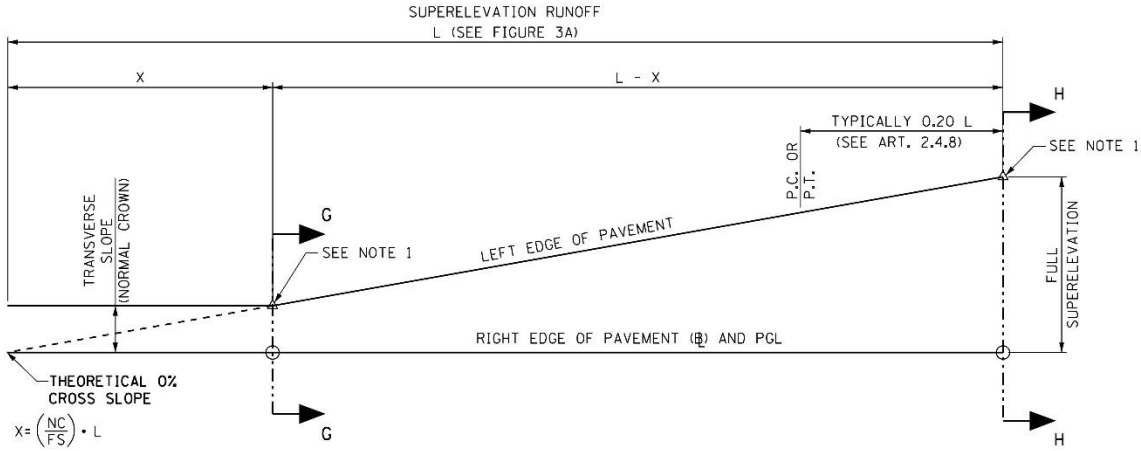


SECTION F-F

SUPERELEVATION

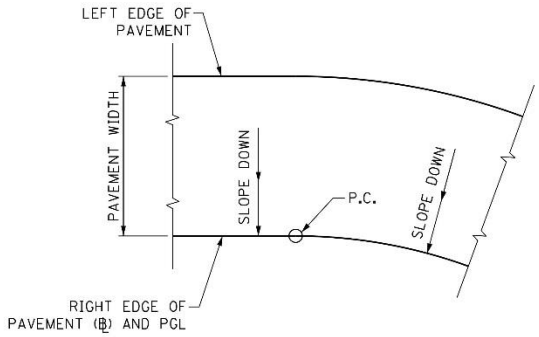
ONE-LANE AND TWO-LANE RAMP WHERE TRANSVERSE SLOPE ON TANGENT SECTION IS OPPOSITE TO SLOPE OF SUPERELEVATION

FIGURE 3B



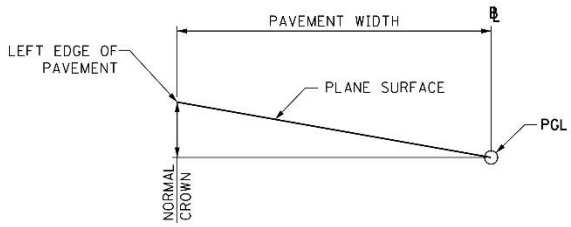
X = TANGENT RUNOUT
NC = NORMAL CROWN (NORMAL SLOPE FOR ONE-LANE RAMP) (%)
FS = FULL SUPERELEVATION (%)
L = RUNOFF, FROM FIGURE 3A

NOTE:
1. INSERT 50' PARABOLIC CURVE AT THE GRADE BREAK POINT INDICATED BY "Δ".

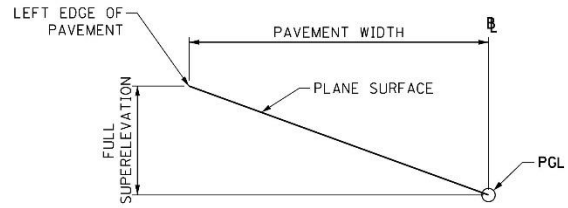


PLAN

NOTE:
PAVEMENT REVOLVED ABOUT ITS RIGHT EDGE (℄).



SECTION G-G

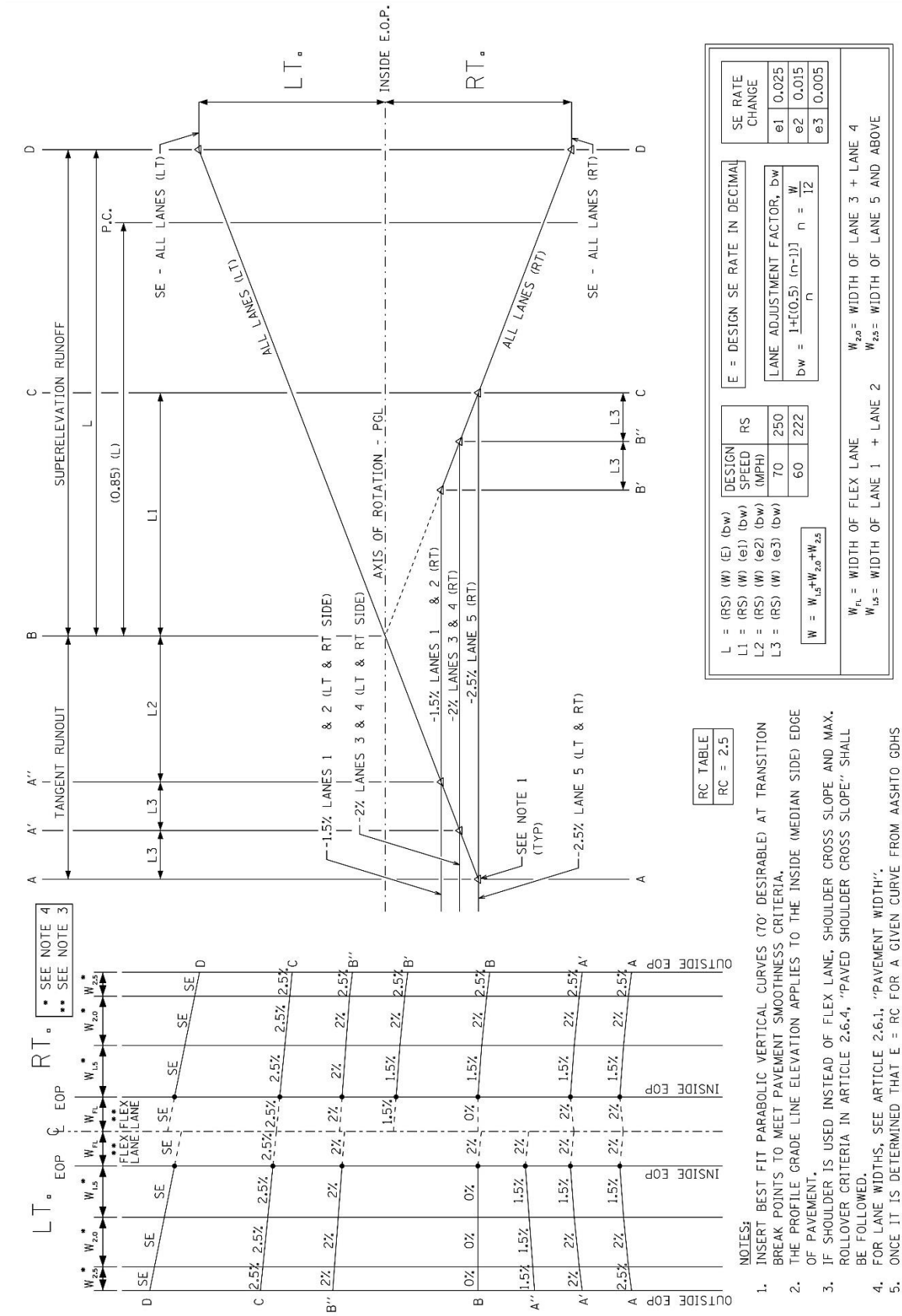


SECTION H-H

SUPERELEVATION

ONE-LANE AND TWO-LANE RAMP WHERE TRANSVERSE SLOPE ON TANGENT SECTION IS SAME DIRECTION AS SLOPE OF SUPERELEVATION

FIGURE 3C



NOTES:

1. INSERT BEST FIT PARABOLIC VERTICAL CURVES (70' DESIRABLE) AT TRANSITION BREAK POINTS TO MEET PAVEMENT SMOOTHNESS CRITERIA.
2. THE PROFILE GRADE LINE ELEVATION APPLIES TO THE INSIDE (MEDIAN SIDE) EDGE OF PAVEMENT.
3. IF SHOULDER IS USED INSTEAD OF FLEX LANE, SHOULDER CROSS SLOPE AND MAX. ROLLOVER CRITERIA IN ARTICLE 2.6.4, "PAVED SHOULDER CROSS SLOPE" SHALL BE FOLLOWED.
4. FOR LANE WIDTHS, SEE ARTICLE 2.6.1, "PAVEMENT WIDTH".
5. ONCE IT IS DETERMINED THAT E = RC FOR A GIVEN CURVE FROM AASHTO GDHS TABLE 3-9, REFER TO RC TABLE FOR VALUE.

MAINLINE SUPERELEVATION TRANSITION FOR 10 AND 12 LANE SECTIONS

FIGURE 3D

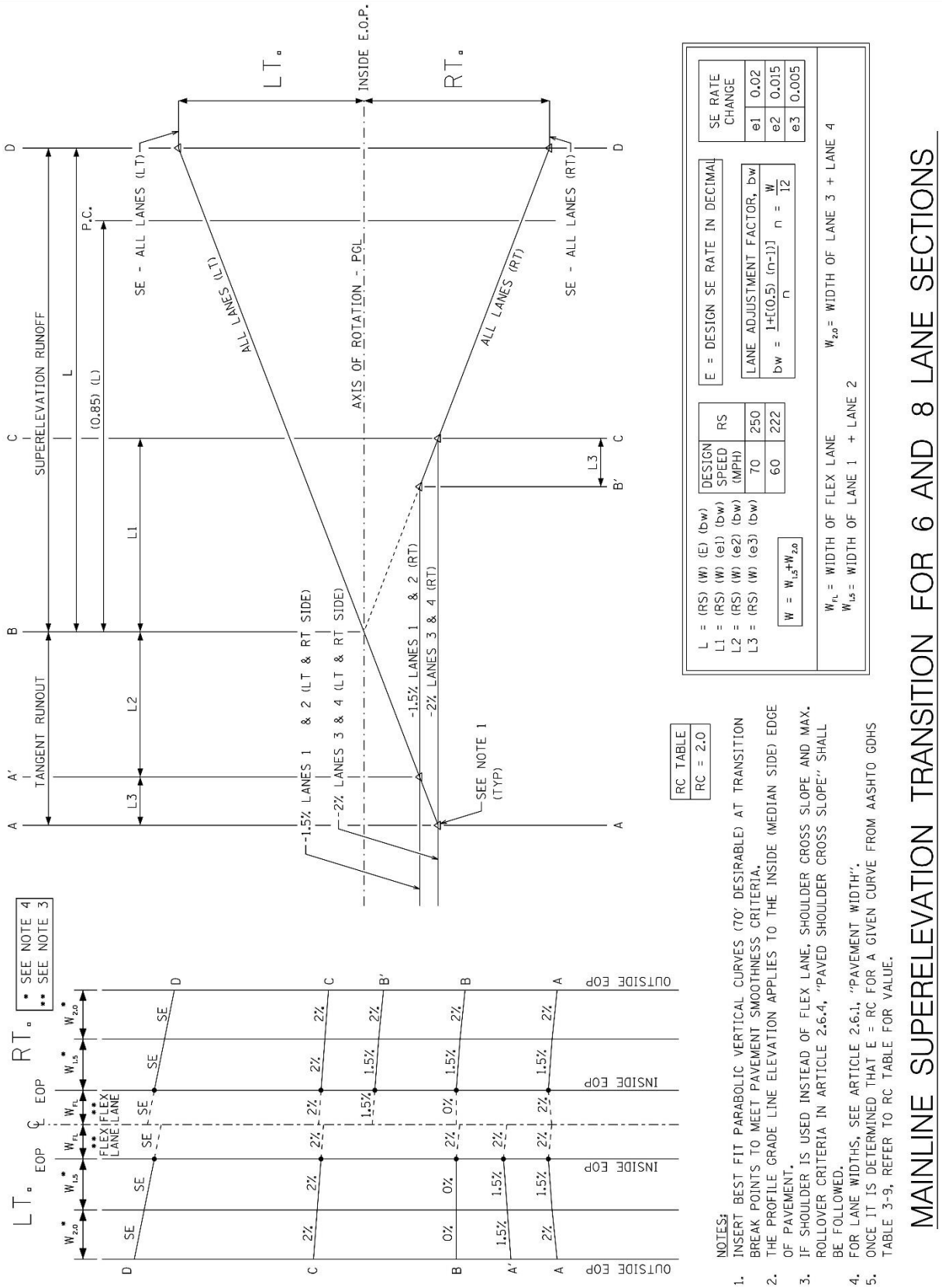
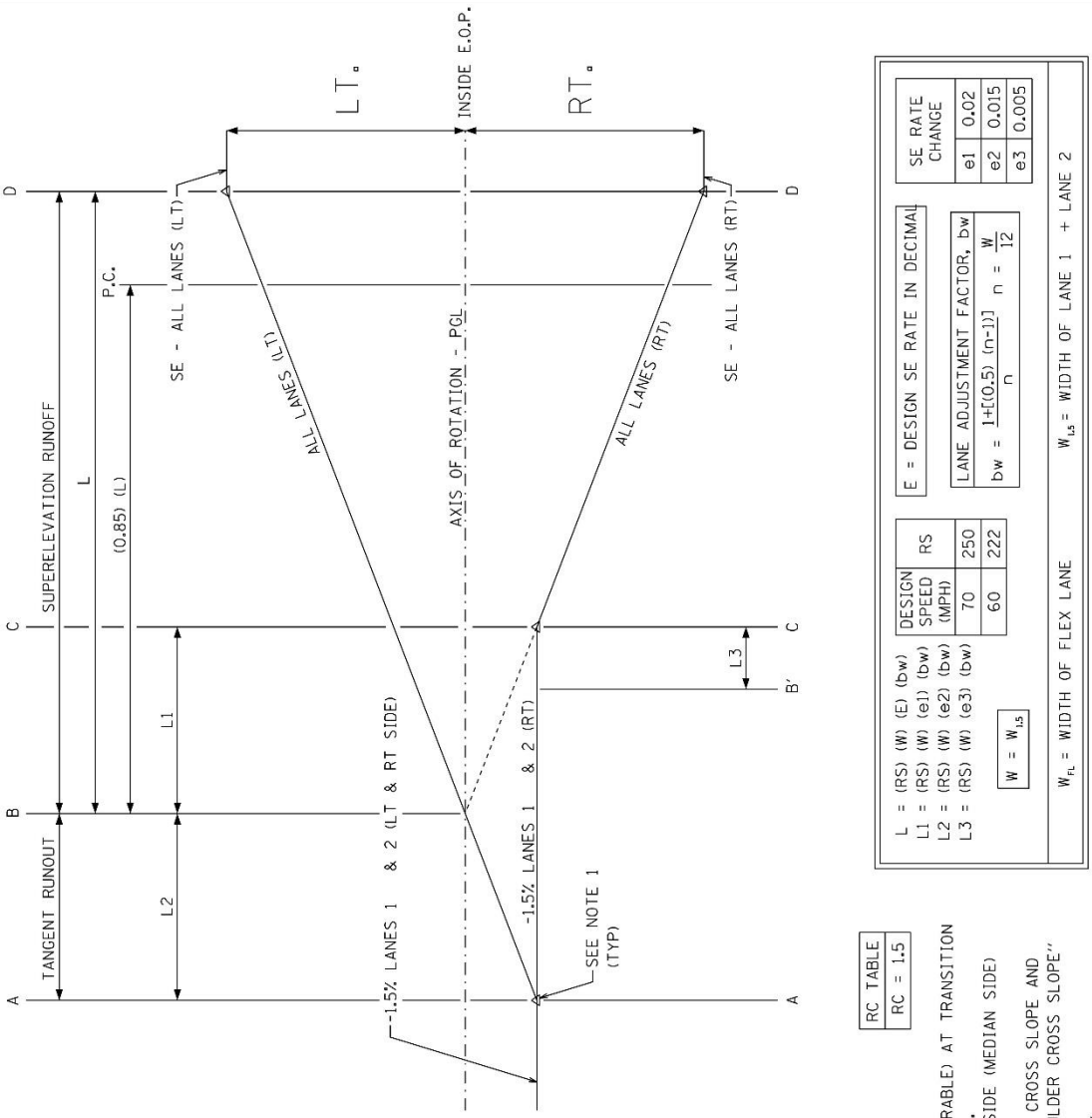
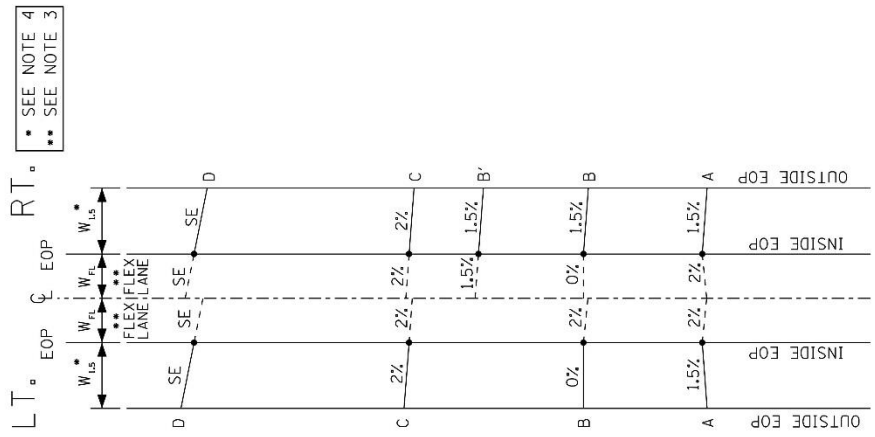

LT.
RT.
INSIDE E.O.P.
SE - ALL LANES (LT)
SE - ALL LANES (RT)
ALL LANES (LT)
ALL LANES (RT)
AXIS OF ROTATION - PGL
P.C.
SUPERELEVATION RUNOFF
TANGENT RUNOUT
(0.85) (L)
L
L1
L2
L3
-1.5% LANES 1 & 2 (LT & RT SIDE)
-2% LANES 3 & 4 (LT & RT SIDE)
-1.5% LANES 1 & 2 (RT)
-2% LANES 3 & 4 (RT)
SEE NOTE 1 (TYP)
* SEE NOTE 4
** SEE NOTE 3
FLEX LANE
OUTSIDE EOP
INSIDE EOP
EOP
SE
2%
1.5%
0%
L = (RS) (W) (E) (bw)
L1 = (RS) (W) (e1) (bw)
L2 = (RS) (W) (e2) (bw)
L3 = (RS) (W) (e3) (bw)
DESIGN SPEED (MPH)
RS
70 250
60 222
E = DESIGN SE RATE IN DECIMAL
LANE ADJUSTMENT FACTOR, bw
bw = 1+[(0.5) (n-1)] / n
n = W / 12
SE RATE CHANGE
e1 0.02
e2 0.015
e3 0.005
W = W1.5+W2.0
WFL = WIDTH OF FLEX LANE
W1.5 = WIDTH OF LANE 1 + LANE 2
W2.0 = WIDTH OF LANE 3 + LANE 4
RC TABLE
RC = 2.0
NOTES:
1. INSERT BEST FIT PARABOLIC VERTICAL CURVES (70' DESIRABLE) AT TRANSITION BREAK POINTS TO MEET PAVEMENT SMOOTHNESS CRITERIA.
2. THE PROFILE GRADE LINE ELEVATION APPLIES TO THE INSIDE (MEDIAN SIDE) EDGE OF PAVEMENT.
3. IF SHOULDER IS USED INSTEAD OF FLEX LANE, SHOULDER CROSS SLOPE AND MAX. ROLLOVER CRITERIA IN ARTICLE 2.6.4, "PAVED SHOULDER CROSS SLOPE" SHALL BE FOLLOWED.
4. FOR LANE WIDTHS, SEE ARTICLE 2.6.1, "PAVEMENT WIDTH".
5. ONCE IT IS DETERMINED THAT E = RC FOR A GIVEN CURVE FROM AASHTO GDHS TABLE 3-9, REFER TO RC TABLE FOR VALUE.
MAINLINE SUPERELEVATION TRANSITION FOR 6 AND 8 LANE SECTIONS

FIGURE 3E





RC TABLE

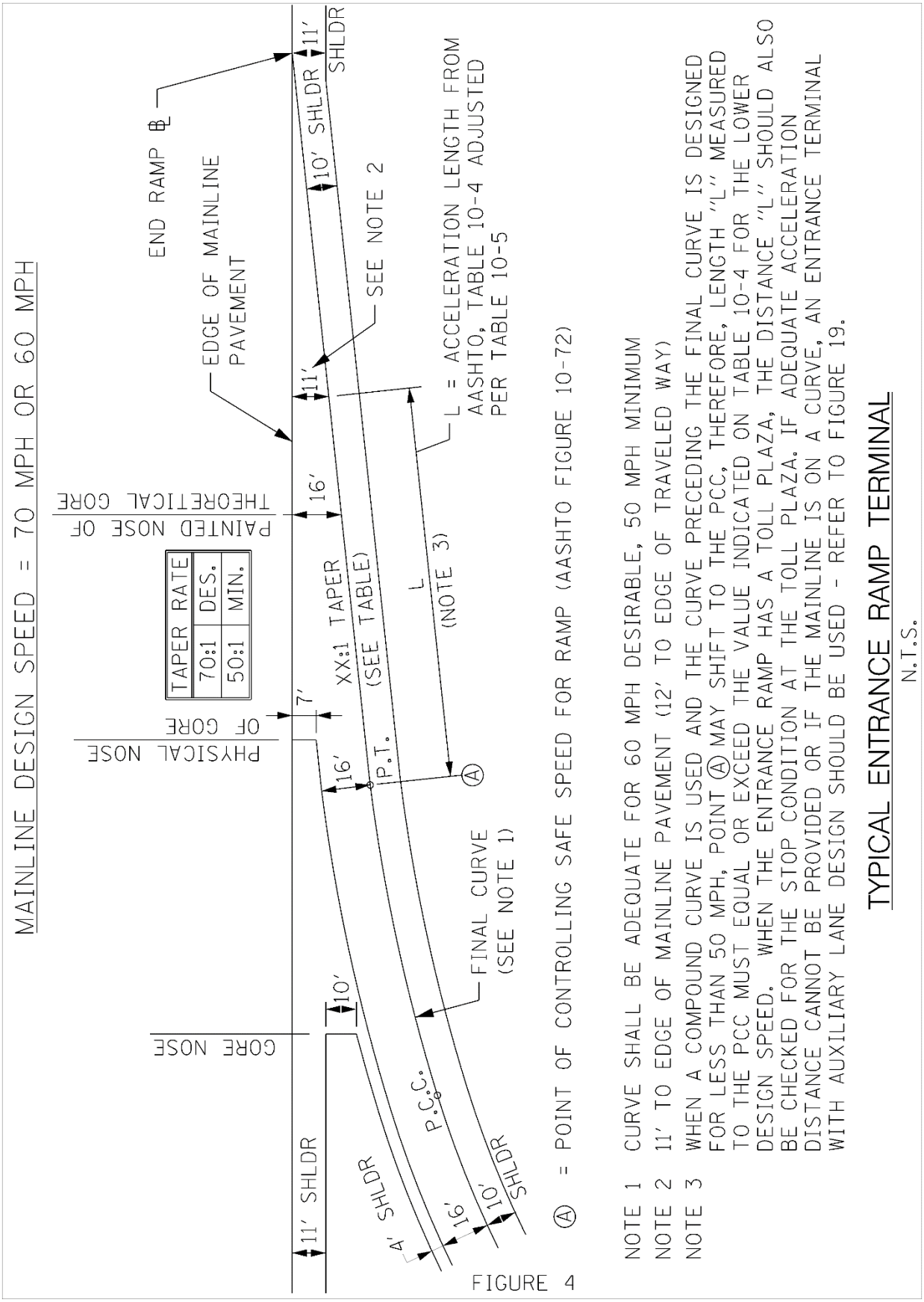
RC = 1.5

NOTES:

1. INSERT BEST FIT PARABOLIC VERTICAL CURVES (70' DESIRABLE) AT TRANSITION BREAK POINTS TO MEET PAVEMENT SMOOTHNESS CRITERIA.
2. THE PROFILE GRADE LINE ELEVATION APPLIES TO THE INSIDE (MEDIAN SIDE) EDGE OF PAVEMENT.
3. IF SHOULDER IS USED INSTEAD OF FLEX LANE, SHOULDER CROSS SLOPE AND MAX. ROLLOVER CRITERIA IN ARTICLE 2.6.4, "PAVED SHOULDER CROSS SLOPE" SHALL BE FOLLOWED.
4. FOR LANE WIDTHS, SEE ARTICLE 2.6.1, "PAVEMENT WIDTH".
5. ONCE IT IS DETERMINED THAT E = RC FOR A GIVEN CURVE FROM AASHTO GDHS TABLE 3-9, REFER TO RC TABLE FOR VALUE.

MAINLINE SUPERELEVATION TRANSITION FOR 4 LANE SECTION

FIGURE 3F



Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO FIGURE 10-72)

NOTE 1 CURVE SHALL BE ADEQUATE FOR 60 MPH DESIRABLE, 50 MPH MINIMUM

NOTE 2 11' TO EDGE OF MAINLINE PAVEMENT (12' TO EDGE OF TRAVELED WAY)

NOTE 3 WHEN A COMPOUND CURVE IS USED AND THE CURVE PRECEDING THE FINAL CURVE IS DESIGNED FOR LESS THAN 50 MPH, POINT Ⓐ MAY SHIFT TO THE PCC, THEREFORE, LENGTH "L" MEASURED TO THE PCC MUST EQUAL OR EXCEED THE VALUE INDICATED ON TABLE 10-4 FOR THE LOWER DESIGN SPEED. WHEN THE ENTRANCE RAMP HAS A TOLL PLAZA, THE DISTANCE "L" SHOULD ALSO BE CHECKED FOR THE STOP CONDITION AT THE TOLL PLAZA. IF ADEQUATE ACCELERATION DISTANCE CANNOT BE PROVIDED OR IF THE MAINLINE IS ON A CURVE, AN ENTRANCE TERMINAL WITH AUXILIARY LANE DESIGN SHOULD BE USED - REFER TO FIGURE 19.

TYPICAL ENTRANCE RAMP TERMINAL

N.T.S.

FIGURE 4

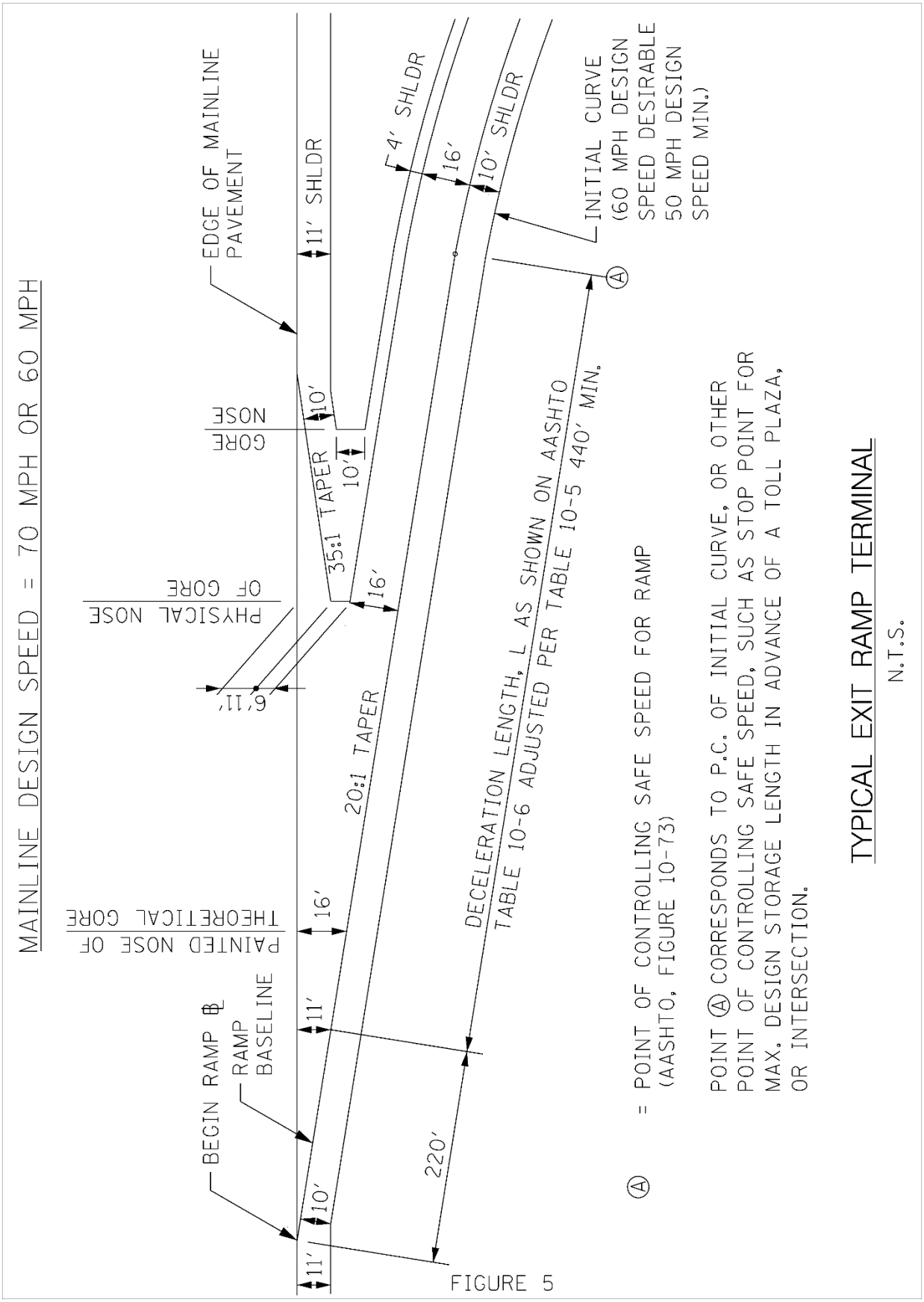
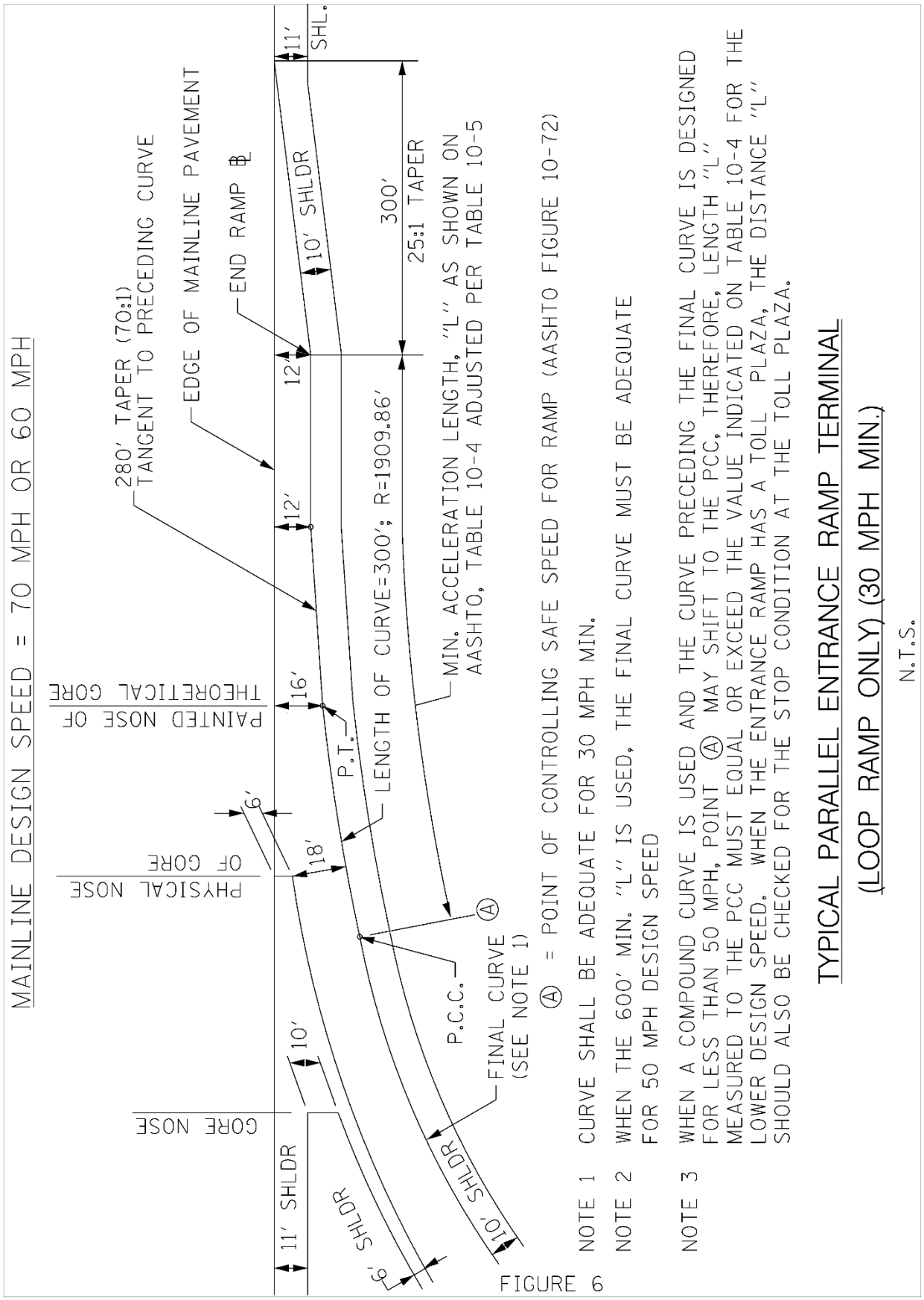

MAINLINE DESIGN SPEED = 70 MPH OR 60 MPH
EDGE OF MAINLINE PAVEMENT
11' SHLDR
4' SHLDR
16'
10' SHLDR
INITIAL CURVE (60 MPH DESIGN SPEED DESIRABLE 50 MPH DESIGN SPEED MIN.)
Ⓐ
GORE NOSE
10'
35:1 TAPER
10'
16'
PHYSICAL NOSE OF GORE
6'
11'
20:1 TAPER
DECELERATION LENGTH, L AS SHOWN ON AASHTO TABLE 10-6 ADJUSTED PER TABLE 10-5 440' MIN.
PAINTED NOSE OF THEORETICAL GORE
16'
BEGIN RAMP ℄
RAMP BASELINE
11'
220'
10'
11'
Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO, FIGURE 10-73)
POINT Ⓐ CORRESPONDS TO P.C. OF INITIAL CURVE, OR OTHER POINT OF CONTROLLING SAFE SPEED, SUCH AS STOP POINT FOR MAX. DESIGN STORAGE LENGTH IN ADVANCE OF A TOLL PLAZA, OR INTERSECTION.
TYPICAL EXIT RAMP TERMINAL
N.T.S.

FIGURE 5



NOTE 1 CURVE SHALL BE ADEQUATE FOR 30 MPH MIN.

NOTE 2 WHEN THE 600' MIN. "L" IS USED, THE FINAL CURVE MUST BE ADEQUATE FOR 50 MPH DESIGN SPEED

NOTE 3 WHEN A COMPOUND CURVE IS USED AND THE CURVE PRECEDING THE FINAL CURVE IS DESIGNED FOR LESS THAN 50 MPH, POINT Ⓐ MAY SHIFT TO THE PCC, THEREFORE, LENGTH "L" MEASURED TO THE PCC MUST EQUAL OR EXCEED THE VALUE INDICATED ON TABLE 10-4 FOR THE LOWER DESIGN SPEED. WHEN THE ENTRANCE RAMP HAS A TOLL PLAZA, THE DISTANCE "L" SHOULD ALSO BE CHECKED FOR THE STOP CONDITION AT THE TOLL PLAZA.

FIGURE 6

TYPICAL PARALLEL ENTRANCE RAMP TERMINAL

(LOOP RAMP ONLY) (30 MPH MIN.)

N.T.S.

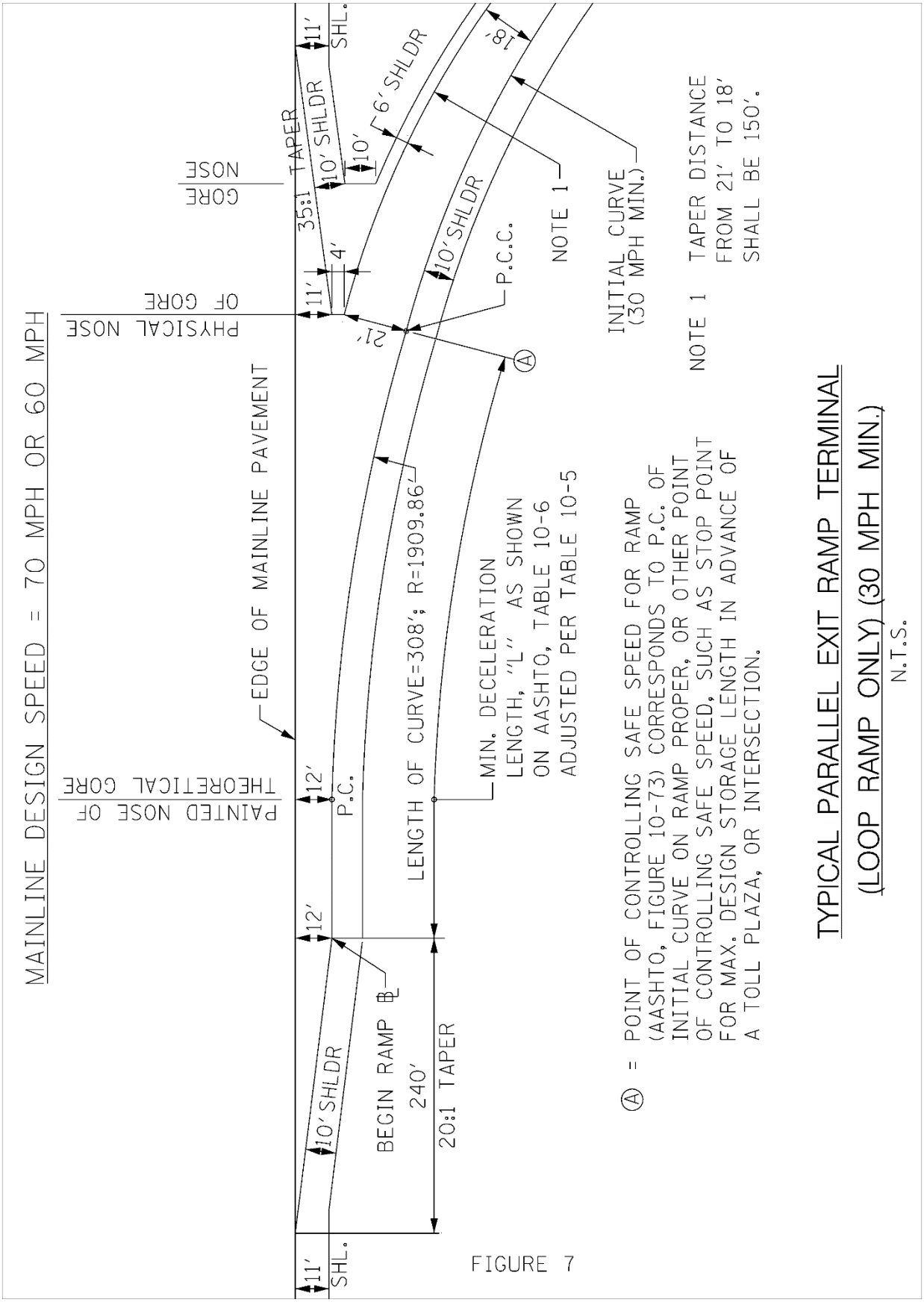

MAINLINE DESIGN SPEED = 70 MPH OR 60 MPH
EDGE OF MAINLINE PAVEMENT
PHYSICAL NOSE OF GORE
PAINTED NOSE OF THEORETICAL GORE
GORE NOSE
TAPER
35:1
11'
SHL.
10' SHLDR
10'
6' SHLDR
4'
21'
12'
P.C.
LENGTH OF CURVE=308'; R=1909.86'
BEGIN RAMP ℄
240'
20:1 TAPER
P.C.C.
NOTE 1
INITIAL CURVE (30 MPH MIN.)
18'
Ⓐ
MIN. DECELERATION LENGTH, "L" AS SHOWN ON AASHTO, TABLE 10-6 ADJUSTED PER TABLE 10-5
Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO, FIGURE 10-73) CORRESPONDS TO P.C. OF INITIAL CURVE ON RAMP PROPER, OR OTHER POINT OF CONTROLLING SAFE SPEED, SUCH AS STOP POINT FOR MAX. DESIGN STORAGE LENGTH IN ADVANCE OF A TOLL PLAZA, OR INTERSECTION.
NOTE 1 TAPER DISTANCE FROM 21' TO 18' SHALL BE 150'.
TYPICAL PARALLEL EXIT RAMP TERMINAL
(LOOP RAMP ONLY) (30 MPH MIN.)
N.T.S.

FIGURE 7

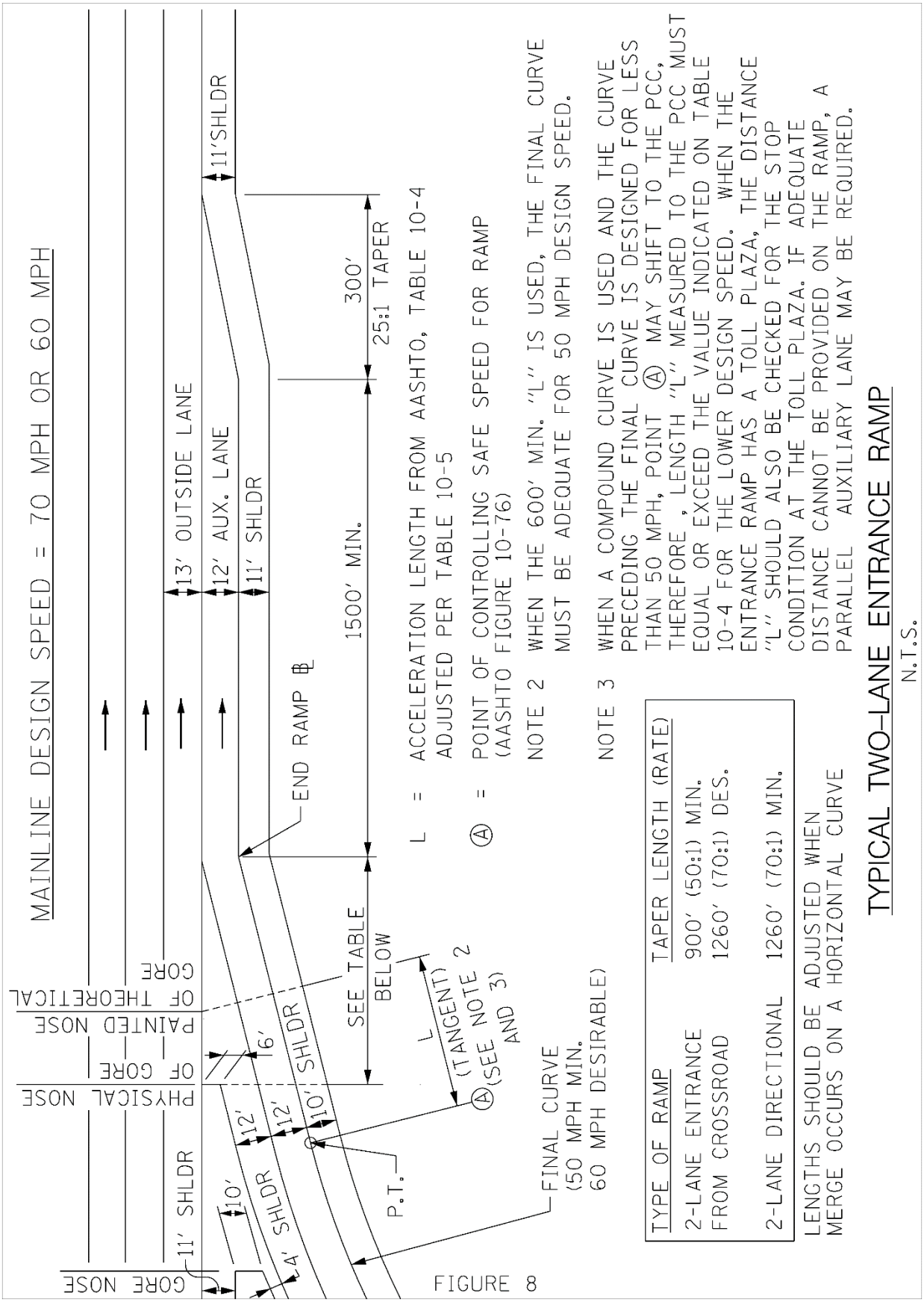

MAINLINE DESIGN SPEED = 70 MPH OR 60 MPH
13' OUTSIDE LANE
12' AUX. LANE
11' SHLDR
11'SHLDR
END RAMP ℄
1500' MIN.
300'
25:1 TAPER
SEE TABLE BELOW
L
(TANGENT)
Ⓐ (SEE NOTE 2 AND 3)
P.T.
FINAL CURVE (50 MPH MIN. 60 MPH DESIRABLE)
GORE NOSE
11' SHLDR
10'
4' SHLDR
12'
12'
10'
6'
PHYSICAL NOSE OF GORE
PAINTED NOSE OF THEORETICAL GORE
L = ACCELERATION LENGTH FROM AASHTO, TABLE 10-4 ADJUSTED PER TABLE 10-5
Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO FIGURE 10-76)
NOTE 2 WHEN THE 600' MIN. "L" IS USED, THE FINAL CURVE MUST BE ADEQUATE FOR 50 MPH DESIGN SPEED.
NOTE 3 WHEN A COMPOUND CURVE IS USED AND THE CURVE PRECEDING THE FINAL CURVE IS DESIGNED FOR LESS THAN 50 MPH, POINT Ⓐ MAY SHIFT TO THE PCC, THEREFORE , LENGTH "L" MEASURED TO THE PCC MUST EQUAL OR EXCEED THE VALUE INDICATED ON TABLE 10-4 FOR THE LOWER DESIGN SPEED. WHEN THE ENTRANCE RAMP HAS A TOLL PLAZA, THE DISTANCE "L" SHOULD ALSO BE CHECKED FOR THE STOP CONDITION AT THE TOLL PLAZA. IF ADEQUATE DISTANCE CANNOT BE PROVIDED ON THE RAMP, A PARALLEL AUXILIARY LANE MAY BE REQUIRED.
TYPE OF RAMP | TAPER LENGTH (RATE)
2-LANE ENTRANCE FROM CROSSROAD | 900' (50:1) MIN. 1260' (70:1) DES.
2-LANE DIRECTIONAL | 1260' (70:1) MIN.
LENGTHS SHOULD BE ADJUSTED WHEN MERGE OCCURS ON A HORIZONTAL CURVE
TYPICAL TWO-LANE ENTRANCE RAMP
N.T.S.

FIGURE 8

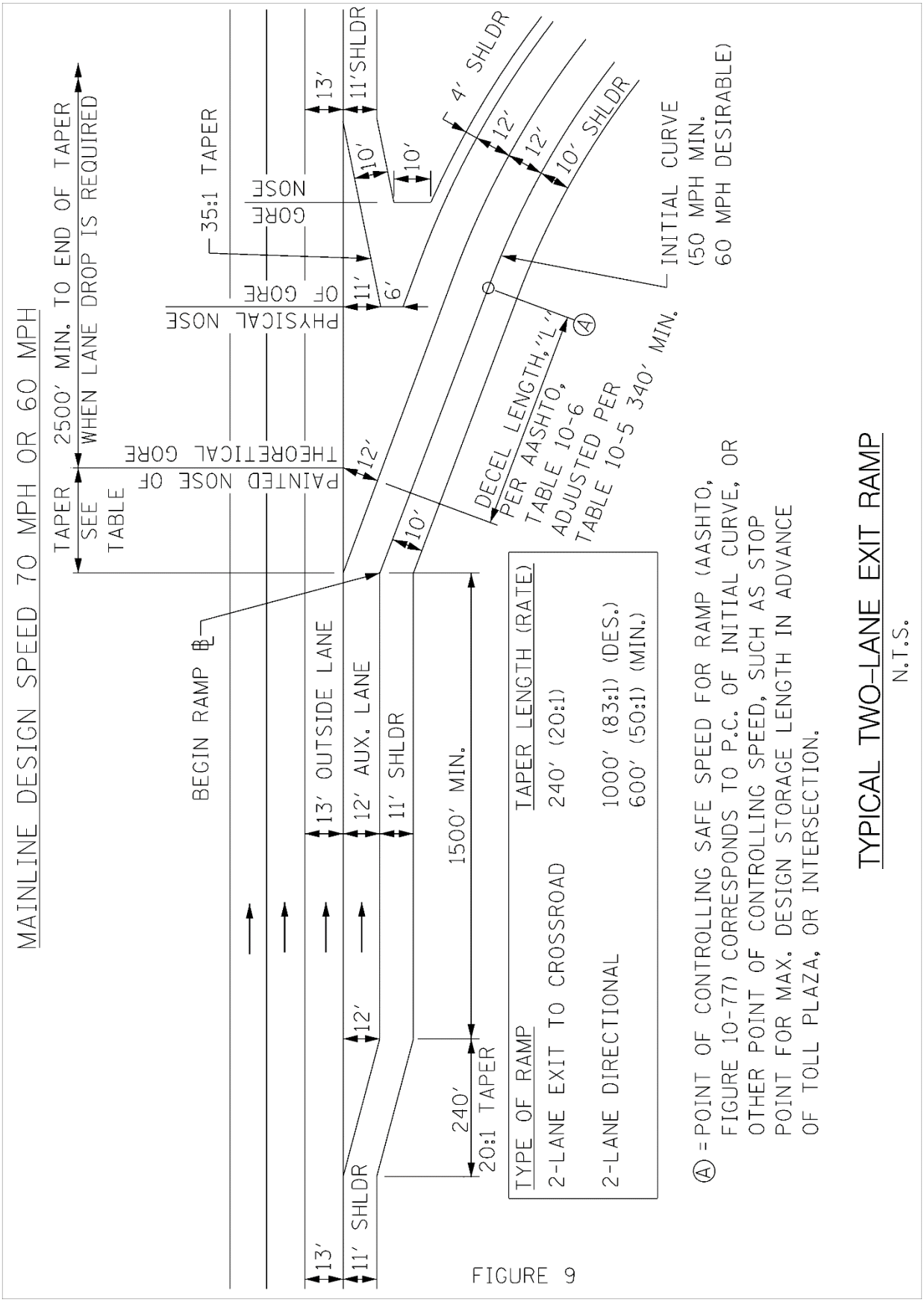
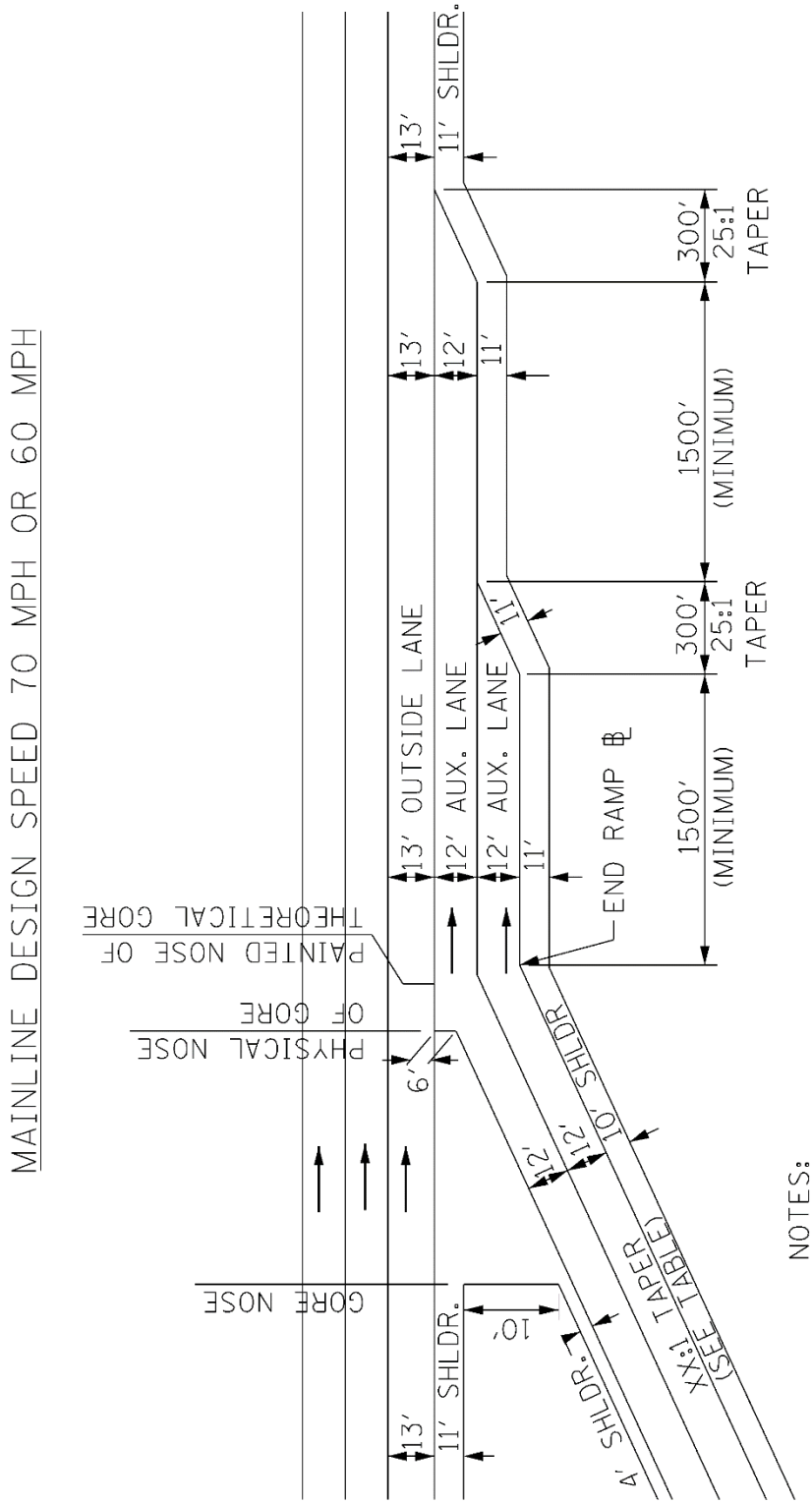

MAINLINE DESIGN SPEED 70 MPH OR 60 MPH
TAPER
SEE TABLE
2500' MIN. TO END OF TAPER
WHEN LANE DROP IS REQUIRED
PAINTED NOSE OF
THEORETICAL GORE
PHYSICAL NOSE
OF GORE
GORE
NOSE
35:1 TAPER
BEGIN RAMP ℄
13' OUTSIDE LANE
12' AUX. LANE
11' SHLDR
13'
11' SHLDR
12'
240'
20:1 TAPER
1500' MIN.
13'
11'SHLDR
10'
10'
6'
11'
12'
10'
4' SHLDR
12'
12'
10' SHLDR
DECEL LENGTH,"L"
PER AASHTO,
TABLE 10-6
ADJUSTED PER
TABLE 10-5 340' MIN.
Ⓐ
INITIAL CURVE
(50 MPH MIN.
60 MPH DESIRABLE)
TYPE OF RAMP
TAPER LENGTH (RATE)
2-LANE EXIT TO CROSSROAD
240' (20:1)
2-LANE DIRECTIONAL
1000' (83:1) (DES.)
600' (50:1) (MIN.)
Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO, FIGURE 10-77) CORRESPONDS TO P.C. OF INITIAL CURVE, OR OTHER POINT OF CONTROLLING SPEED, SUCH AS STOP POINT FOR MAX. DESIGN STORAGE LENGTH IN ADVANCE OF TOLL PLAZA, OR INTERSECTION.
TYPICAL TWO-LANE EXIT RAMP
N.T.S.

FIGURE 9



NOTES:

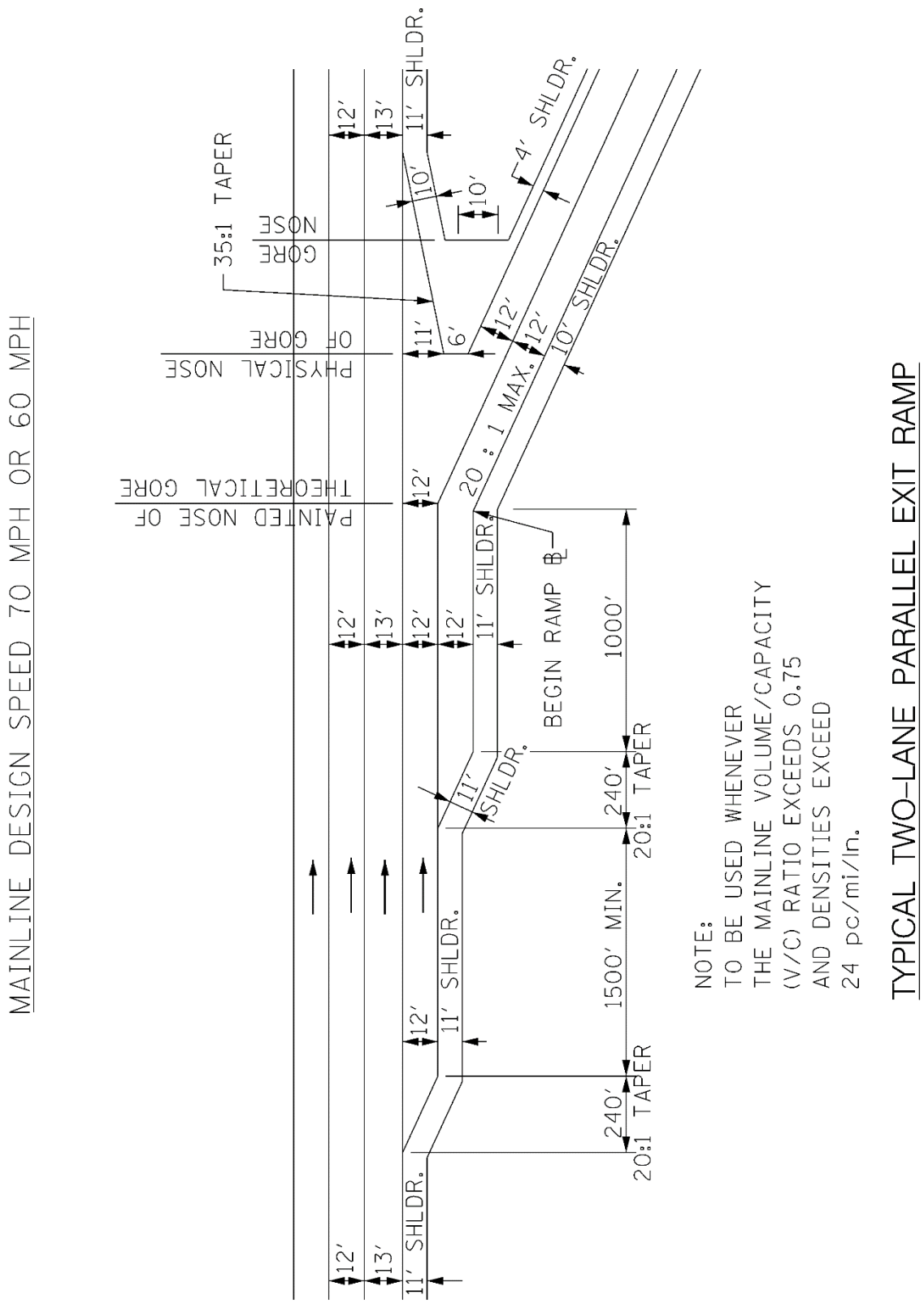
1. TO BE USED WHENEVER THE MAINLINE VOLUME/CAPACITY (V/C) RATIO EXCEEDS 0.75 AND DENSITIES EXCEED 24 pc/mi/ln.
2. LENGTHS SHOULD BE ADJUSTED WHEN AUX. LANE IS LOCATED IN A HORIZONTAL CURVE

TAPER RATE	
70:1	DES.
50:1	MIN.

TYPICAL TWO-LANE PARALLEL ENTRANCE RAMP

N.T.S.

FIGURE 10



TYPICAL TWO-LANE PARALLEL EXIT RAMP

N.T.S.

FIGURE 11

FIGURE 12 (RESERVED)

FIGURE 13 (RESERVED)

FIGURE 14 (RESERVED)

FIGURE 15 (RESERVED)

FIGURE 16 (RESERVED)

FIGURE 17 (RESERVED)

FIGURE 18 (RESERVED)

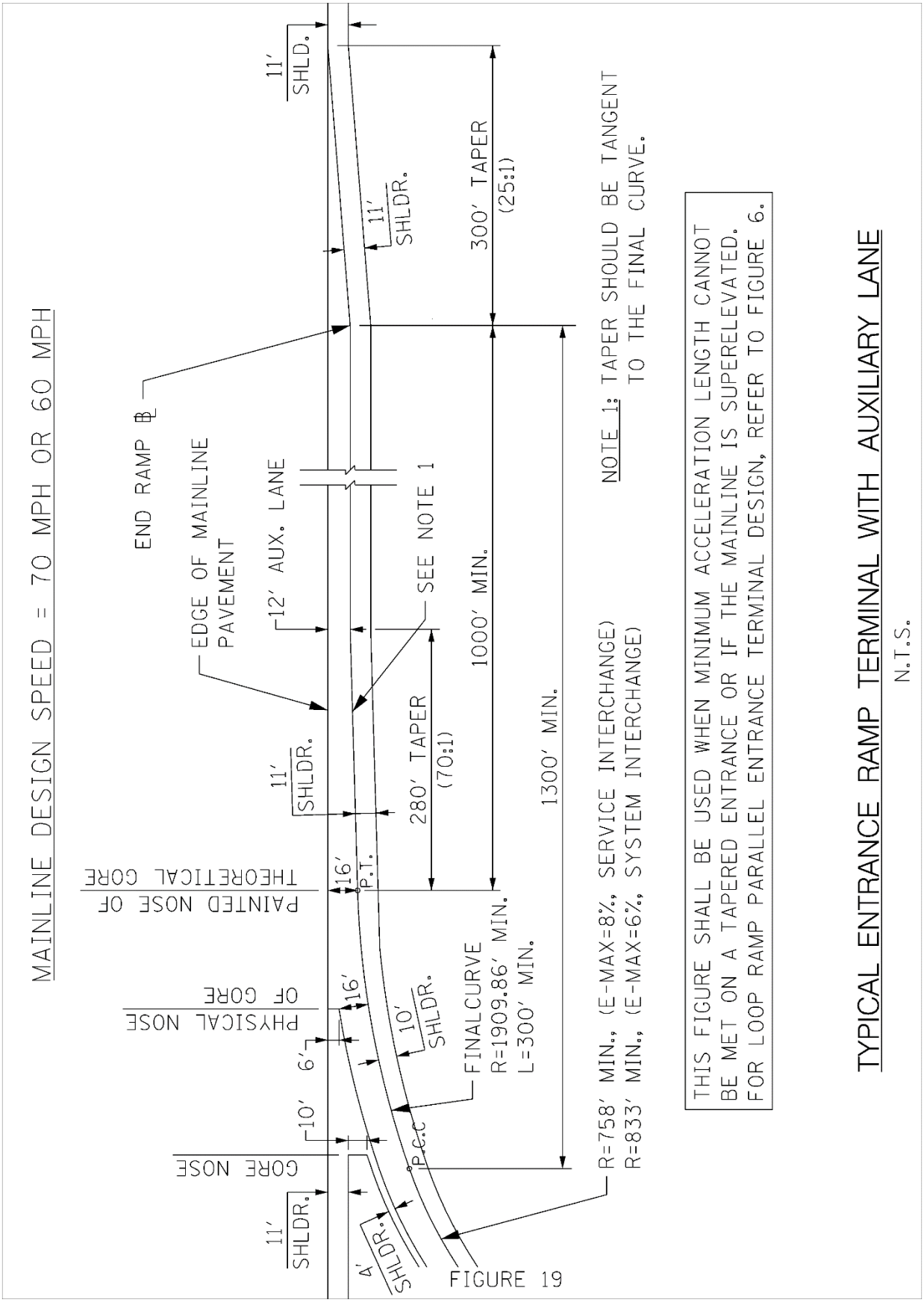
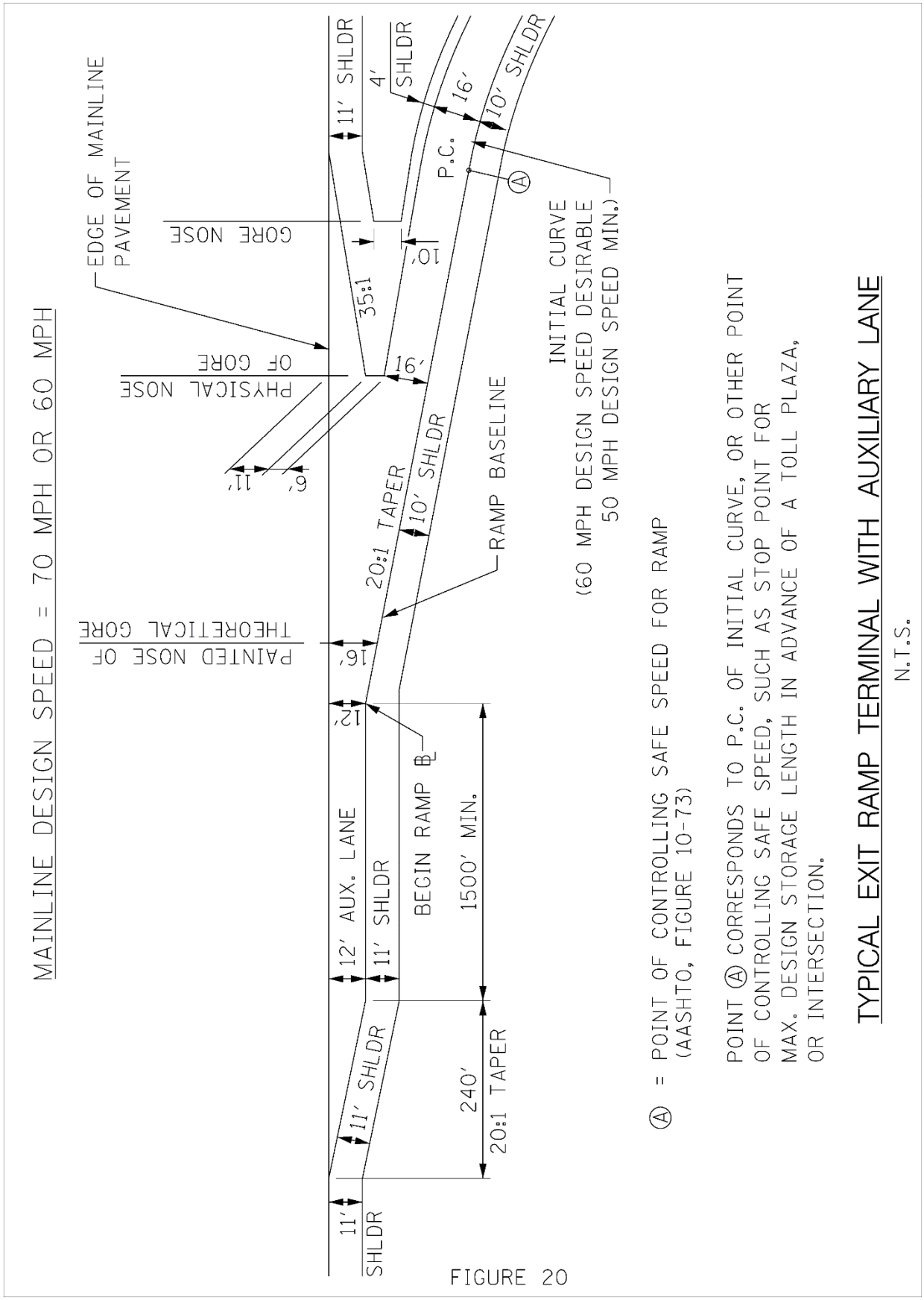

MAINLINE DESIGN SPEED = 70 MPH OR 60 MPH
END RAMP ℄
EDGE OF MAINLINE PAVEMENT
12' AUX. LANE
SEE NOTE 1
11' SHLD.
11' SHLDR.
300' TAPER (25:1)
1000' MIN.
1300' MIN.
280' TAPER (70:1)
11' SHLDR.
16'
P.T.
PAINTED NOSE OF THEORETICAL GORE
16'
PHYSICAL NOSE OF GORE
10' SHLDR.
FINALCURVE R=1909.86' MIN. L=300' MIN.
6'
10'
P.C.C.
GORE NOSE
11' SHLDR.
4' SHLDR.
R=758' MIN., (E-MAX=8%, SERVICE INTERCHANGE)
R=833' MIN., (E-MAX=6%, SYSTEM INTERCHANGE)
NOTE 1: TAPER SHOULD BE TANGENT TO THE FINAL CURVE.
THIS FIGURE SHALL BE USED WHEN MINIMUM ACCELERATION LENGTH CANNOT BE MET ON A TAPERED ENTRANCE OR IF THE MAINLINE IS SUPERELEVATED. FOR LOOP RAMP PARALLEL ENTRANCE TERMINAL DESIGN, REFER TO FIGURE 6.
TYPICAL ENTRANCE RAMP TERMINAL WITH AUXILIARY LANE
N.T.S.

FIGURE 19



Ⓐ = POINT OF CONTROLLING SAFE SPEED FOR RAMP (AASHTO, FIGURE 10-73)

POINT Ⓐ CORRESPONDS TO P.C. OF INITIAL CURVE, OR OTHER POINT OF CONTROLLING SAFE SPEED, SUCH AS STOP POINT FOR MAX. DESIGN STORAGE LENGTH IN ADVANCE OF A TOLL PLAZA, OR INTERSECTION.

TYPICAL EXIT RAMP TERMINAL WITH AUXILIARY LANE

N.T.S.

FIGURE 20

FIGURE 21 (RESERVED)

APPENDIX A

Illinois Tollway, Interchange and Roadway Cost Sharing Policy

https://www.illinoistollway.com/about/regulations-rules-policies