Pima County Department of Transportation
and City of Tucson
Department of Transportation

PAVEMENT MARKING DESIGN MANUAL

Second Edition
August 2008

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City of Tucson
Department of Transportation

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Department of Transportation

First Edition
October 2000

First Revision
October 2002

Second Edition
August 2008

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FOREWORD

This publication is intended to provide guidance in the design of new and major reconstruction projects. It is also intended to provide guidance for resurfacing, restoration and rehabilitation (R.R.R.) projects. The guidelines described in this edition provide the transportation professional with the information needed to make appropriate decisions regarding the use of traffic control devices for the reasonable, prudent, and legal road user.

The fact that new design values are presented herein does not imply that existing streets and highways are unsafe, nor does it mandate the initiation of improvement projects. The values contained herein are expected to generally provide more satisfactory design for new street and highway facilities, as well as for major modifications of existing facilities.

Deviations from this guideline are frequently necessary based upon engineering judgment. Sufficient flexibility is permitted to encourage independent designs tailored to particular situations.

The highway, vehicle, and individual users are all integral parts of transportation safety and efficiency. While this document primarily addresses traffic and design issues, a properly equipped and maintained vehicle along with the prudent and legal performance by the road user are also critically necessary for safe and efficient operation of the transportation system.

THE SECOND EDITION
OF THE
PAVEMENT MARKING DESIGN MANUAL

In cooperation with Pima County Department of Transportation / Traffic Engineering Division, the City of Tucson Traffic Engineering Division is pleased to issue the Second Edition of the Pavement Marking Design Manual.

This second edition becomes effective immediately, and supersedes the First Edition (October 2000) and the First Revision to the manual (October 2002). Several new sheets are included in this Second Edition, including a sheet showing signing and striping for the HAWK pedestrian beacon. Other sheets have been updated to reflect proposed amendments to the Manual on Uniform Traffic Control Devices. Treatments for lane drops and trap lane have been modified and clarified.

If you have any questions and/or suggestions regarding the use of this manual, please contact Ms. Diahn Swartz at 791-4259.

R B Nassi

Richard B. Nassi
City of Tucson Transportation Administrator

8/21/08
Date

Introduction

Purpose

This first edition of the Pavement Marking Design Manual is a joint effort between the Pima County Department of Transportation (PCDOT) and the City of Tucson Department of Transportation (COTDOT) to provide consistent practices throughout the Tucson Metropolitan Area and Pima County. The purpose of this manual is to provide a set of guidelines, practices, and standards for designers, engineers, and contractors to follow in the design and placement of roadway pavement markings. This manual is intended to supplement the most recent edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Application

This manual is a collection of practices and guidelines used by the PCDOT Traffic Engineering Division (PCDOT/TED) and the COTDOT Traffic Engineering Division (COTDOT/TED) for typical roadway conditions. It is designed to expedite the production and review of plans by providing drafting symbols, standard notes and details. As a result, engineers, designers, and contractors should use the information presented in this manual for consistency.

Users of this manual are encouraged to use engineering judgment when applying this manual to conditions that are not addressed in this manual. All users are also encouraged to suggest changes to improve the Manual. Suggestions should be submitted in written and/or diagram form to either the PCDOT/TED or the COTDOT/TED. Each suggestion will be reviewed and responded to. If both the PCDOT/TED and COTDOT/TED staff agree with the suggested change or addendum, the manual will be updated to reflect the change in the next revision.

Should questions arise in the use of this manual, they should be referred to either the Pima PCDOT County Traffic Engineer or the COTDOT City Traffic Engineering Manager.

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ABBREVIATIONS

CIP	Capital improvement project
CL	Centerline
COT	City of Tucson
DOT	Department of Transportation
DL	Dual left
EB	Eastbound
EL	Edge line
EP	Edge of pavement
FHWA	Federal Highway Administration
L	Left; either a side of the road or the direction an arrow is to point.
LA	Left arrow
MUTCD	Manual on Uniform Traffic Control Devices
NB	Northbound
NEC	Northeast corner
NWC	Northwest corner
PC	Point of curvature. The point where a straight section of road begins to curve.
PCDOT/TED	Pima County Department of Transportation/Traffic Engineering Division
PT	Point of tangency. The point where a curved section of road becomes straight.
R	Right; either a side of the road or the direction an arrow is to point.
RA	Right arrow
RPM	Raised Pavement Marker
R/W	Right-of-way
SB	Southbound
SEC	Southeast corner
SWC	Southwest corner
TWLTL	Two-way left turn lane
WB	Westbound

DEFINITIONS

Bike Route: Selected local streets identified by Bike Route (D11-1) signs that offer advantages for use by bicyclists due to directness of travel and connectivity to activity center and other bike routes.

Bicycle Facility: A general term that encompasses a range of facilities for use by bicyclists, including bike routes, bike lanes and shared-use paths.

Bike (Bicycle) Lane: A lane that is both signed and marked for the preferential or exclusive use by bicyclists.

Bike Route With Striped Shoulder: A 4-foot to 10-foot wide paved shoulder, typically along a major street, that is identified by a white edge line and a Bike Route (D11-1) sign.

Bike Path: A facility for bicyclists that is separated from motor vehicle travel lanes. A more comprehensive term is "shared-use path," which acknowledges the path's use by other non-motorized users, like walkers, joggers and roller bladers.

Broken Lines: Ten-foot longitudinal marking used to direct lanes of traffic.

Divided Roadway: A road that has the opposing traffic streams separated, as with a median.

Edgeline: A solid continuous stripe used to delineate left or right edge of roadway.

Edge of Pavement: The edge of pavement at the outside edge of the roadway or at the edge of the median.

Glass Beads: Very small spherical glass particles added to the paint for striping visibility and retroreflectivity.

Gore: The area between two lanes preceding a merge point or succeeding a diverge point.

Guidance: A statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgement or engineering study indicates the deviation to be appropriate.

Guide Lines: Two-foot lines used to direct traffic or emphasize certain movements.

Island: A defined area between traffic lanes for control of vehicle movements or for pedestrian refuge. An island may be painted or raised (curbed).

Longitudinal Markings: Markings installed parallel to traffic flow. Edge, lane, and centerline markings are longitudinal markings.

Median: A portion of a divided highway separating the traveled way for traffic in opposing directions. Medians may be painted or raised (curbed).

Multi-use Lane: A lane to the right of travel lanes for use by vehicles traveling at slow speeds, such as right-turning vehicles, transit vehicles picking up or discharging passengers, bicycles, and golf carts. This lane can be used for disable vehicles.

DEFINITIONS – Continued

Obliterate: To remove pavement markings by obliteration, such as sand blasting, hydroblasting, or grinding. Refer to the current edition of the City of Tucson/Pima County Standard Specifications for approved obliteration techniques.

Option: A statement of practice that is a permissive condition and carries no requirement or recommendation. Options may contain allowable modifications to a Standard or guidance.

Pavement Marking Materials: Typical pavement marking materials that are used include paint, thermoplastic, preformed tape, and raised pavement markers. For detailed descriptions of various pavement-marking materials, please refer to the current edition of the City of Tucson/Pima County Standard Specifications.

Right-of-Way: In the context of real property, it is the publicly owned or publicly controlled land that a road and/or utilities are constructed on.

Shared-Use Path: A paved 8-foot to 12-foot wide path, separated from the street, for use by bicyclists, pedestrians, and other non-motorized users.

Shoulder: There are two types of shoulder:

1. Unpaved shoulder – the width from the edge of pavement to the intersection of the embankment slope, typically 8-10 feet.
2. Paved shoulder – the width outside the traffic lane having an all-weather surface.

Standard: A statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device.

Tangent: A straight section of road.

Taper: The section of roadway used to move traffic laterally from one path to another.

Transition Area: In order to guide traffic to move from the "normal" travel path to the "new" or temporary travel path, a sufficient amount of time and distance is necessary in order to make that movement comfortable and safely. The transition area is usually characterized by the use of a taper.

Transition: Transitions contain tapers and are required where the roadway section changes.

Transverse Markings: Markings that are installed perpendicular to the roadway. Crosswalks and stop lines are examples of transverse markings.

PIMA COUNTY / CITY OF TUCSON

PAVEMENT MARKING PLAN REVIEW CHECKLIST

Reviewer: _____ Date: _____

Consultant: _____ Submittal: _____

Project: _____

Pavement marking design patterns shall be based on the geometric requirements of the Roadway Design Manual.

A. Plan Features

1. North arrow and scale (typically 1" = 40') shall be included on each plan sheet, excluding notes and detail sheets.

2. Line weights and types are to be consistent with standard practice used by the City of Tucson and Pima County.

3. ROW, edge of pavement, and curbs are to be clearly delineated. Exclude drainage facilities, utilities, topographic lines, etc. Include all driveways and intersecting streets.

4. Limits of the project (beginning and ending stations) are to be provided.

5. Centerlines and stationing are to be provided and shown within the roadway limits, not external to the curb or edgelines. Stationing shall be at 100-foot intervals with callouts every 500 feet.

6. An appropriate title block designating submittal status, date, designer, engineer shall be provided on each plan sheet.

7. A separate sheet containing general notes, symbol legend, pavement marking quantities, and details shall be provided.

B. Items to Review

1. Design speed and posted speed limits of the project are to be noted in the pavement marking general notes.

2. The limits of pavement surface treatments that are being applied to allow for pavement marking changes should be defined.

3. Limits of new and old pavement on which pavement markings are to be placed should be defined. The pavement type should also be noted.

4. Check for any special conditions in the area; i.e. schools, recreation facilities, shopping centers, which may require extra striping, crosswalks, or merge arrows, etc.

5. Review all taper lengths (bay tapers, storage lengths, approach and departure tapers) relative to the roadway design speed or posted speed limit, as approved by the Traffic Engineer.

6. The proposed new striping patterns and type are to be compatible with existing striping on both ends of the project.

7. All striped lines are to be labeled correctly, per PC/COT design guidelines.

8. Edgelines are to be properly placed per PC/COT requirements.

9. Concrete or dirt medians shall have solid yellow median edgelines.

10. Check intersection radii size. Edgeline striping should end at the beginning of the radius, point of curvature (PC); centerline striping ends at mid radius.

11. The striping plans should extend 500 feet on either side of the project, and transitions from existing striping patterns to new patterns should be defined.

12. At median openings to named side streets, the striping on the main roadway should not be continued through the intersection.

13. No passing zones (if applicable) shall be determined in the field by the PCDOT Traffic Engineering Division Staff (Pima Country projects only). Review the pavement marking plans to ensure that the locations of no passing zones are consistent with the field determination.

14. Check the beginning and ending points for all guide line extensions to ensure correctness. Guide line extensions are typically applied to turn bays, bike lanes, dual left turn lanes, etc. The radius for dual LT/RT lane guide line extensions through the intersection should be defined.

15. The roadway cross section is to be properly dimensioned at locations where the cross section changes. This includes beginning and ending of median and edgeline/curbline tapers, beginning and ending of lane shift tapers of tapers to add a lane, both legs of major intersections, bridges, and locations where the pavement widens or narrows. The dimensioning shall include widths of all lanes (thru, turn, multi-use, bike, bus, golf cart), median widths, and paved shoulders. Cross section change locations shall be denoted by station. Striping taper lengths shall be noted.

16. Transverse pavement marking dimensions are to be provided at least once on each segment on each sheet.

17. Crosswalks and stop lines are to be properly placed relative to wheel chair ramps and median walk throughs. The approach crosswalk line shall be spaced 4 feet from the stop line. The crosswalk lines shall be spaced 10 feet apart.

18. Pavement Arrows and ONLYs for mandatory turn lanes are typically applied only at signalized intersections. Arrows and ONLYs can be applied at unsignalized intersections at the discretion of the Traffic Engineer. The location of the approach edge of all legends should be either dimensioned, typically from the stop line, or stationed.

19. Raised Pavement Markers (RPMs) are required for all roadway construction projects.

20. Medians/bullnoses/islands are to be properly marked with crosshatching, chevrons, RPMs, etc.

21. All intersecting streets and driveways are to be shown. Typically, local side streets and driveways are not striped.

22. All roadway names should be identified, including side streets.

23. PC/COT standard striping notes are to be included on the general notes sheet.

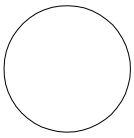
24. Each plan sheet is to list quantities and descriptions for striping materials including number and type of RPMs, lineal footage quantities of longitudinal and transverse striping, arrows, words and symbols (i.e., turn arrows, "ONLYs", "STOP AHEAD", merge arrows, railroad markings, etc.).

25. If detours are planned during construction, check traffic control plans for temporary striping layout.

GENERAL NOTES FOR PAVEMENT MARKING PLANS

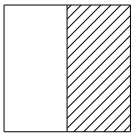
THE FOLLOWING NOTES SHALL APPEAR ON ALL PAVEMENT MARKING PLANS AND ARE INCLUDED HERE FOR THE USERS' REFERENCE.

1. ALL PAVEMENT MARKINGS SHALL CONFORM TO PIMA COUNTY / CITY OF TUCSON (PC/COT) STANDARDS AND SPECIFICATIONS.
2. THE PERMANENT PAVEMENT MARKINGS MAY BE MODIFIED AS DIRECTED BY THE TRAFFIC ENGINEER.
3. THE DESIGN SPEED FOR THE ROAD IS:_____. THE DESIGN VEHICLE IS:_____. THE POSTED SPEED LIMIT IS:_____.
4. ALL LANE DIMENSIONS ARE FROM CENTER OF LANE LINE, CENTER OF DOUBLE LANE LINE, FACE OF CURB, OR EDGE OF PAVEMENT UNLESS OTHERWISE NOTED.
5. THE PAVEMENT MARKING DRAWINGS ARE SCHEMATIC ONLY. THE CONTRACTOR SHALL FOLLOW ALL DIMENSIONS, DETAILS, AND STANDARDS WHEN INSTALLING PAVEMENT STRIPING, MARKINGS AND MARKERS.
6. THE FINAL LONGITUDINAL STRIPING SHALL BE 60 MIL (0.060") THICK HOT-SPRAYED THERMOPLASTIC REFLECTORIZED STRIPING PLACED OVER THE TEMPORARY STRIPING WITHIN 14 TO 30 CALENDAR DAYS AFTER COMPLETION OF THE FINAL PAVEMENT SURFACE, OR AS DIRECTED BY THE TRAFFIC ENGINEER. ALL OTHER MARKINGS SHALL BE APPLIED AT THE SAME TIME. TEMPORARY STRIPING SHALL BE PAINT.
7. ALL FINAL TRANSVERSE MARKINGS SHALL BE HOT SPRAYED 90 MIL THERMOPLASTIC STRIPING (0.090"). ALL PAVEMENT ARROWS AND LEGENDS SHALL BE HOT SPRAYED 90 MIL THERMOPLASTIC PAVEMENT MARKING (0.090"). EXTRUDED THERMOPLASTIC OR PREFORMED APPLICATIONS MAY BE USED IF APPROVED BY THE TRAFFIC ENGINEER.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT AND INSTALLATION OF PAVEMENT MARKINGS ON FINAL SURFACE COURSE FOLLOWING CONTROL POINTS THAT HAVE BEEN SET NO MORE THAN 50 FEET APART ALONG THE LINES TO BE STRIPED. IN TANGENT SECTIONS OF A ROAD WHERE THE PAVEMENT MARKING PATTERN DOES NOT CHANGE, CONTROL POINTS CAN BE SET AT 200 FEET APART. THE LAYOUT AND INSPECTION OF ALL PAVEMENT MARKINGS SHALL BE APPROVED BY THE TRAFFIC ENGINEER PRIOR TO THE APPLICATION OF MATERIALS.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT THE FINAL SURFACE COURSE IS PLACED SO THAT THE STRIPING IS OFFSET NO MORE THAN ONE FOOT CLEAR OF THE CONSTRUCTION JOINT, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
10. THE CONTRACTOR SHALL CLEAN THE ROADWAY SURFACE TO THE SATISFACTION OF THE TRAFFIC ENGINEER BY SWEEPING AND AIR-JET BLOWING IMMEDIATELY PRIOR TO THE PLACEMENT OF ALL PAVEMENT MARKINGS. THE TEMPERATURE SHALL NOT BE LESS THAN 50 DEGREES F. FOR THE PLACEMENT OF HOT SPRAYED THERMOPLASTIC STRIPING, AND 40 DEGREES F. FOR THE PLACEMENT OF RPMs.
11. ALL RAISED PAVEMENT MARKERS (RPMs) SHALL BE INSTALLED SO THAT THE REFLECTIVE FACE OF EACH MARKER IS FACING THE DIRECTION OF TRAFFIC AND IS PERPENDICULAR TO THE DIRECTION OF TRAFFIC FLOW. TYPE C PAVEMENT MARKERS SHALL BE INSTALLED SO THAT THE CLEAR REFLECTIVE FACE OF EACH MARKER IS FACING APPROACHING TRAFFIC AND PERPENDICULAR TO THE DIRECTION OF TRAFFIC FLOW.
12. AT INTERSECTION APPROACHES ON ROADWAYS WITH MEDIANS, TYPE C RPMs SHALL BE PLACED AS PER PC/COT STANDARDS OR AS DIRECTED BY THE TRAFFIC ENGINEER.
13. ALL REMOVAL OF EXISTING PAVEMENT MARKINGS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH SECTION 701 OF THE PC/COT STANDARD SPECIFICATIONS. PAINTING OVER EXISTING STRIPING DOES NOT CONSTITUTE APPROVED STRIPING OBLITERATION.
14. THE ENGINEER OF RECORD SHALL BE REQUIRED TO PRODUCE AS-BUILT STRIPING PLANS WITHIN 90 DAYS OF STRIPING COMPLETION.
15. BLUE RAISED PAVEMENT MARKERS SHALL BE PLACED ADJACENT TO FIRE HYDRANTS AS SHOWN ON SHEET 7-1 OF THE PC/COT PAVEMENT MARKING DESIGN MANUAL.
16. FOR ALL CONSTRUCTION, ALL PAVEMENT MARKINGS AND SIGNING SHALL BE INSTALLED AND SHALL BE PAID FOR BY THE PROJECT OWNER/DEVELOPER.
17. FINAL INSPECTION/ACCEPTANCE OF PAVEMENT MARKINGS SHALL BE PERFORMED BY THE TRAFFIC ENGINEER.

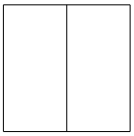


Non-Reflective RPM
Type A (White)
Type AY (Yellow)
Type AB (Black)

Reflective side

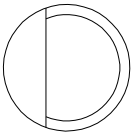


One-Way Reflective RPM
Type G (White)
Type H (Yellow)



Two-Way Reflective RPM
Type D (Yellow)
Type C (White, Red)
Type F (Blue,Blue)

Reflective side



Reflective Dagmar
Type J (White, Reflective)
Type JY (Yellow, Reflective)

NOTE:

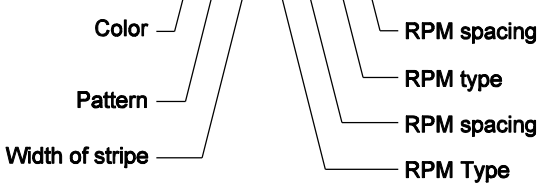
The offset dimension of RPMs placed next to solid lines shall be not less than 2", but not more than 4". RPMs placed in gaps of lane lines or guide lines shall have no offset from the centerline of the striped line.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Raised Pavement Marker (RPM) Symbols**		SHEET NO. **2-2**

Description and Application of Pavement Markings

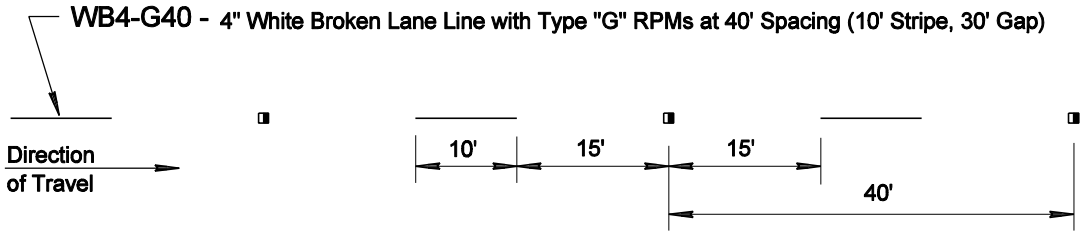
Line Series	Color	Description	Width Inches	Typical Applications
WB	White	Broken (10' stripe w/ 30' gap)	4"	- Lane lines between travel lanes in the same direction where changing of lanes is permitted.
WS	White	Solid	6" 6" 6", 8" 8" 12" 12" 12" 24" 24" 24"	- Edge lines to delineate the right edge of the roadway. - Left edge of bicycle lane. - Lane lines between travel lanes in the same direction where changing of lanes is discouraged. - Turn-lane lines on approaches to intersections. - Cross-walk lines. - Stop lines at signalized intersections and stop signs ≤40 mph. - Diagonal hatching and chevrons used in gores and channelization ≤40 mph. - Stop lines at stop signs ≥45 mph. - Hatching in high visibility cross-walks. - Diagonal hatching and chevrons used in gores and channelization for speed limits ≥45 mph.
WG YG	White Yellow	Guide (2' stripe w/6' gap)	4" 6" 8" 4", 6", 8"	- Guide lines through intersections. - Guide lines for bicycle lanes across turn lane entrances. - Guide lines for turn lane entrances on curves. - Other applications, width should equal line being approached.
YDS	Yellow	Double Solid	*4 - 4 - 4"	- Center line that separates travel lanes in opposite directions where passing on left side of double yellow line is prohibited in both directions. - Channelization of islands, medians and piers.
YB	Yellow	Broken (10' line w/30' gap)	4"	- Separates travel lanes in opposite directions where passing is permitted in both directions of travel.
YSB	Yellow	Solid & Broken	*4 - 4 - 4"	- Separates travel lanes in opposite directions where passing is permitted in one direction and prohibited in the opposite direction. - Used for edge of two-way left-turn lanes (TWLTL).
YS	Yellow	Solid	4" 12" 24"	- Edge lines to delineate the left edge of a divided roadway, a one-way road, or ramp. - Diagonal hatching and chevrons for channelization. - Hatching in school cross-walks.
YDB	Yellow	Double Broken	*4 - 4 - 4"	- Defines the edges of center reversible lanes that are used as TWLTLs during intermittent periods.

Line Style Designation : YSB4 - D40/D40

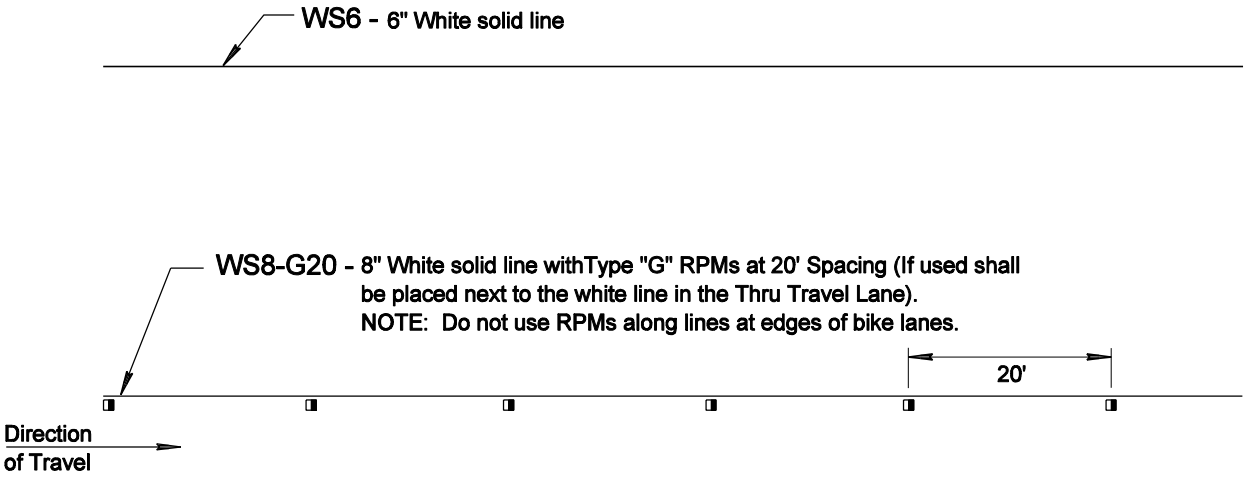


* The 4 - 4 - 4" represents a 4" wide stripe, 4" wide gap, 4" wide stripe.

1. WB Series Lines - White Broken Lines



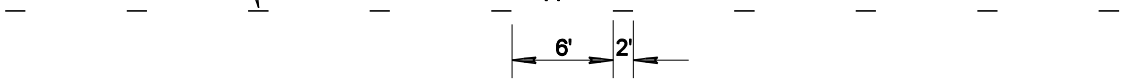
2. WS Series Lines - White solid lines.



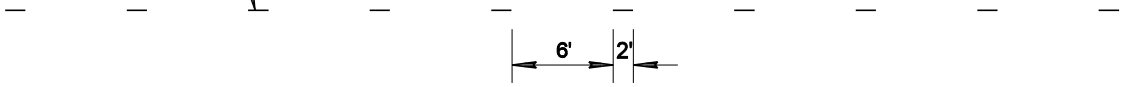
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Line Styles for Pavement Markings**		SHEET NO. **2-4**

3. WG and YG Series Lines - White guide lines (dotted lines), short stripe with gaps.

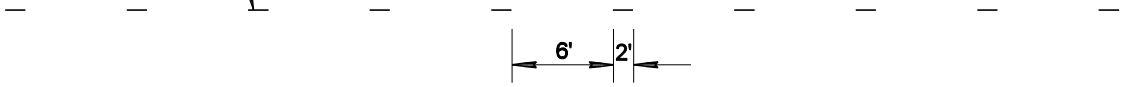
WG4 (2x6) - 4" White Guide Striping (2' Stripe, 6' Gap). YG4 may be used if applicable.



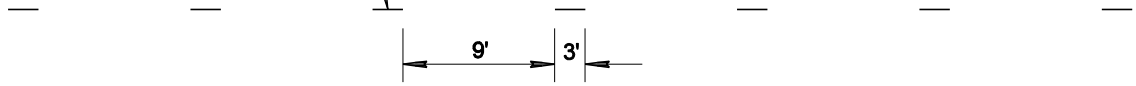
WG6 (2x6) - 6" White Guide Striping (2' Stripe, 6' Gap)



WG8 (2x6) - 8" White Guide Striping (2' Stripe, 6' Gap)

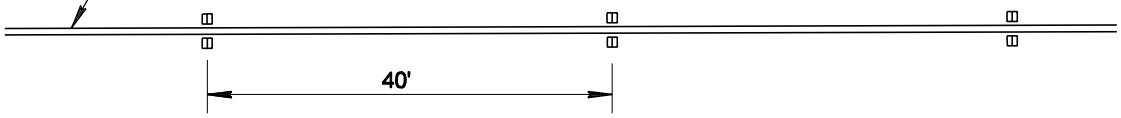


WG4 (3x9) - 4" White Guide Striping (3' Stripe, 9' Gap)



4. YDS Series Lines - Yellow Double Solid Lines

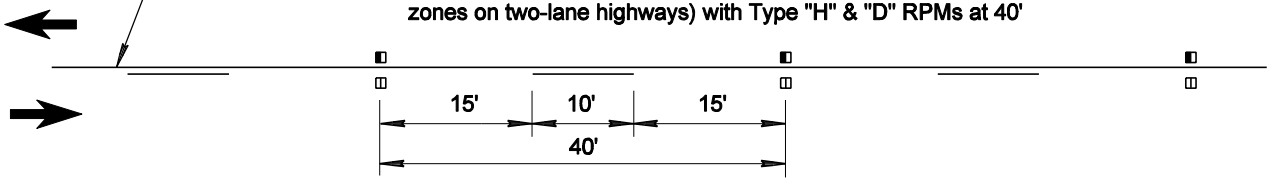
YDS4 - D40/D40 - 4" Double Yellow Solid Lane Line with Type "D" RPMs at 40' Spacing



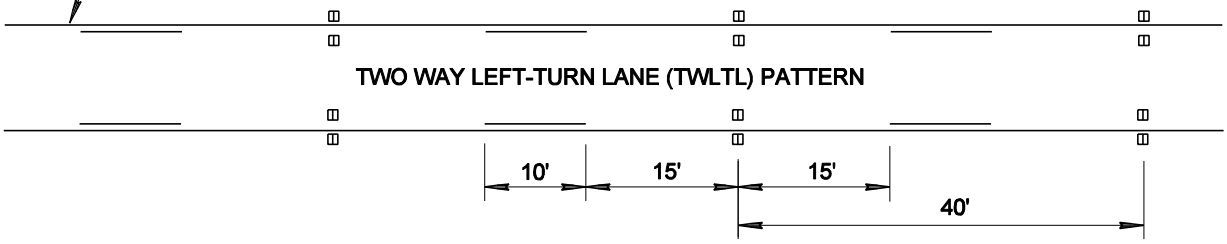
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Line Styles for Pavement Markings**		SHEET NO. **2-5**

5. YSB Series Lines - Yellow Solid Line & Yellow Broken Line

YSB4-D40/H40 - 4" Yellow Solid Line & Yellow Broken Lane Line (for Passing/No Passing zones on two-lane highways) with Type "H" & "D" RPMs at 40'

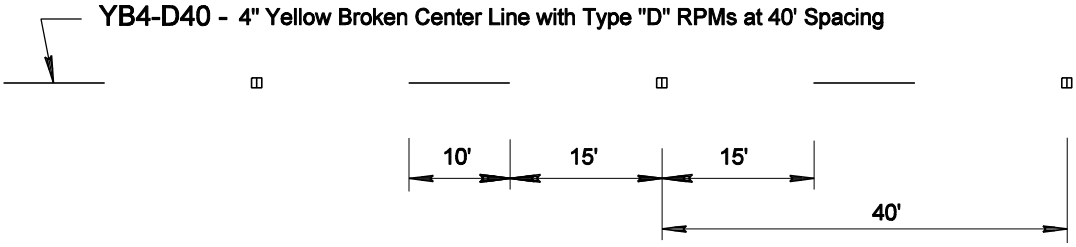


YSB4 - D40/D40 - 4" Yellow Solid Line & Yellow Broken Line w/Type D RPMs at 40' spacing. (for use with TWLTL's)

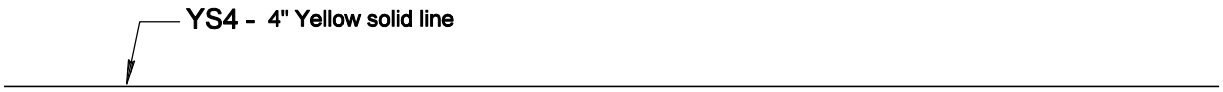


6. YB Series Lines - Yellow Broken Lines

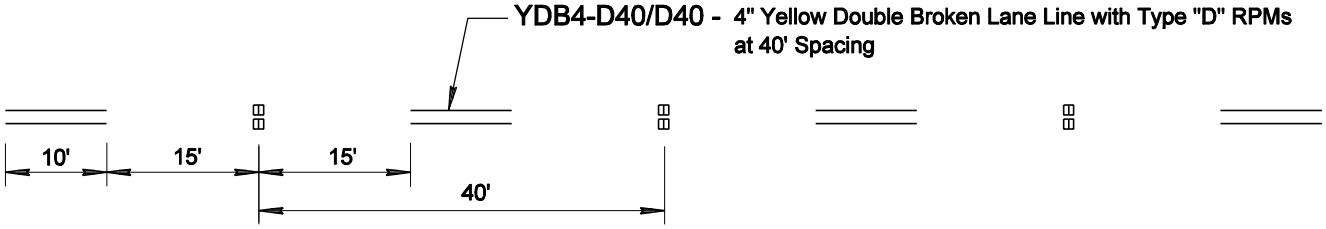
YB4-D40 - 4" Yellow Broken Center Line with Type "D" RPMs at 40' Spacing



7. YS Series Lines- Yellow Single Solid Lines



8. YDB Series Lines- Yellow Double Broken Lines



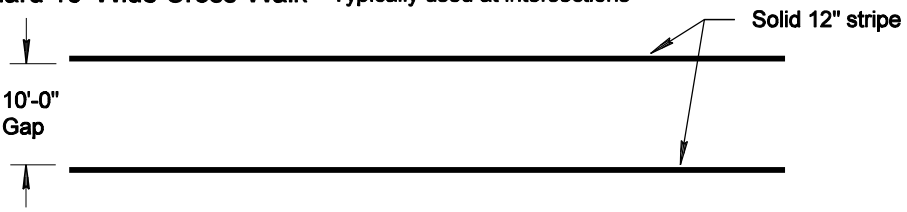
ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Typical Line Styles for Pavement Markings		SHEET NO. 2-7

9. Transverse Line Details

Stop Lines - 12" wide, for use at intersections controlled by stop signs where the speed limit is ≤40 mph.
24" wide, for use at intersections controlled by stop signs where the speed limit is ≥45 mph.
At non-signalized intersections the highest speed approach will determine the width of the stop line for all approaches. Use WS12 at intersections with traffic signal control.

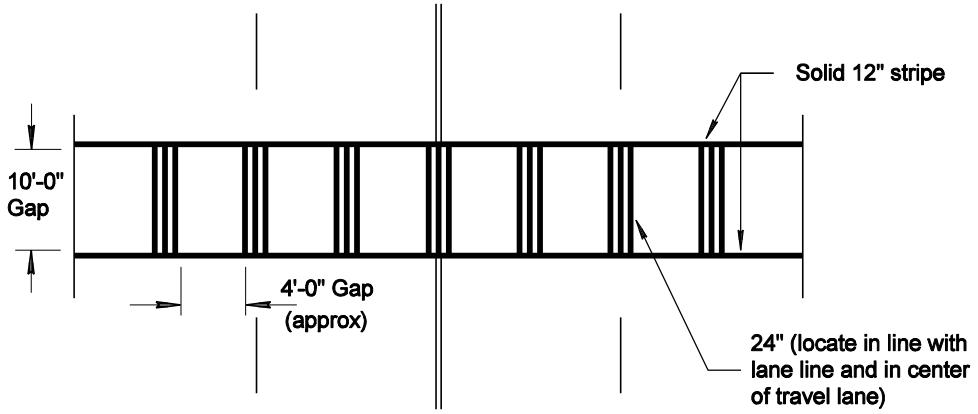
Crosswalks - Crosswalk edgelines are 12" wide, total clear width of Crosswalks is 10' (typical).

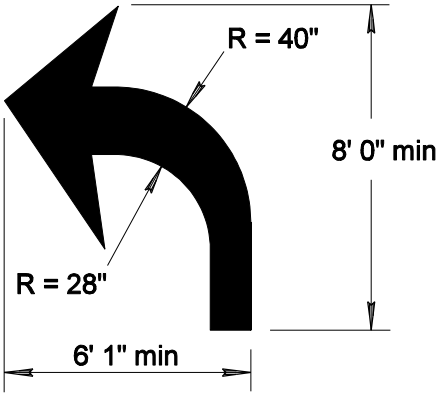
Standard 10' Wide Cross-Walk - Typically used at intersections



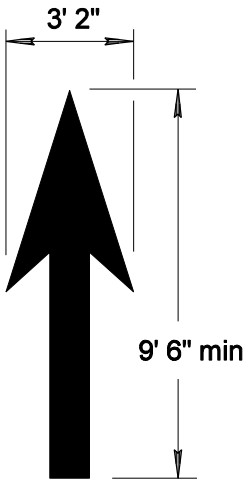
High Visibility Crosswalk (White) - Typically used at non-signalized locations for collector and arterial roadways and locations requiring extra emphasis.

High Visibility School Crosswalk (Yellow) - Typically used for elementary schools and middle/junior high school cross-walks on collector and arterial roadways.

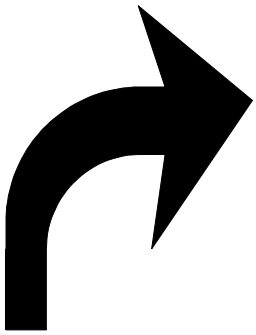




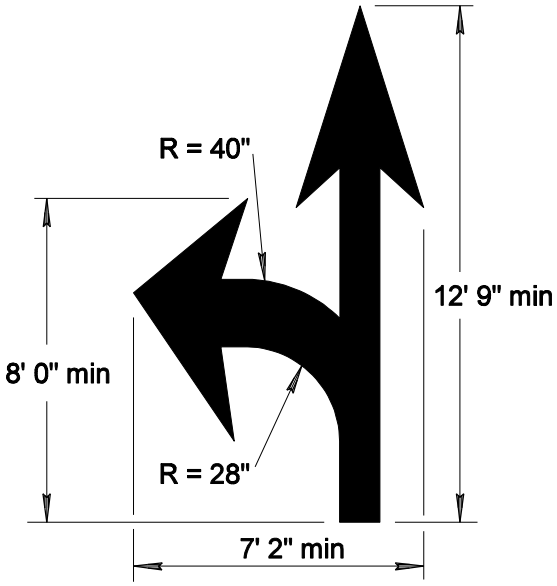
Left
Turn Arrow



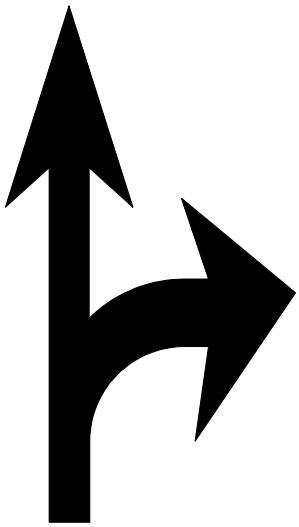
Through
Arrow



Right
Turn Arrow



Left - Through
Turn Arrow

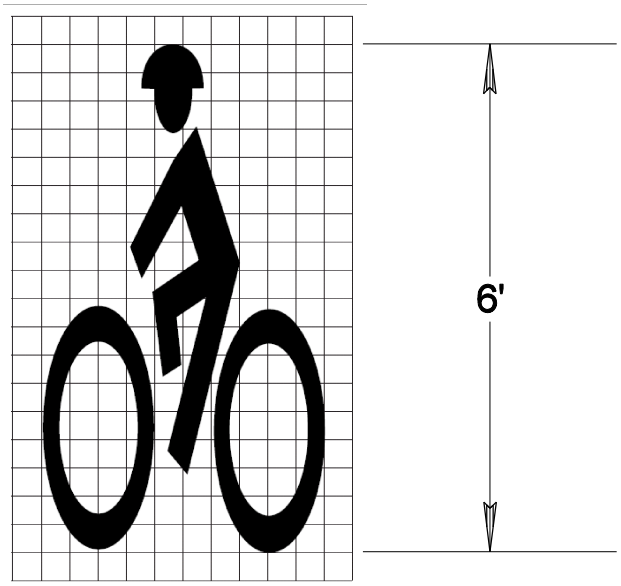


Right - Through
Turn Arrow

Note: 1. Dimensions are typical for right and left arrows. All arrows shall be white.

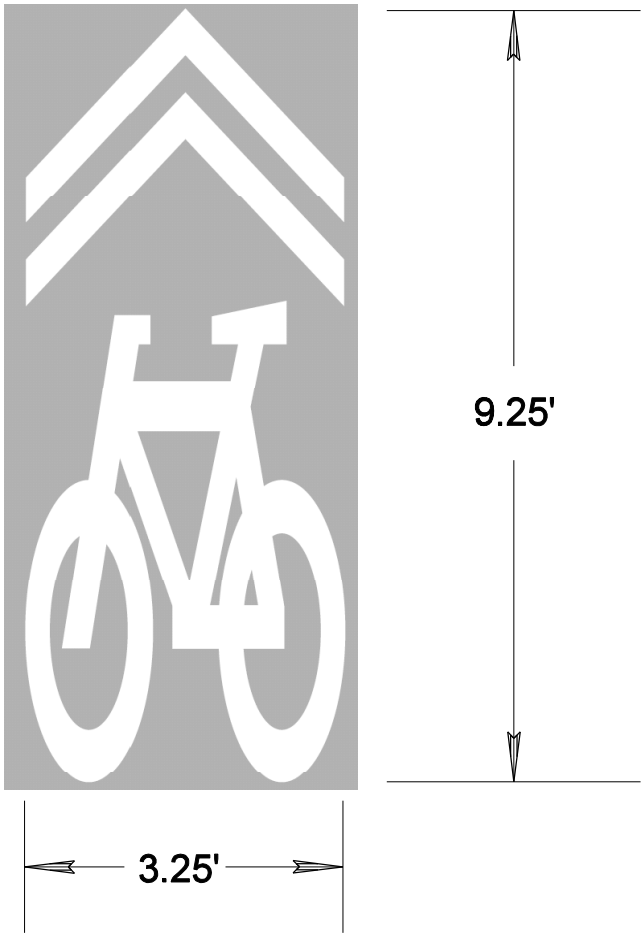
2. Symbols are at the discretion of the Traffic Engineer.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Lane - Use Arrow and Symbols Details**		SHEET NO. **2-9**

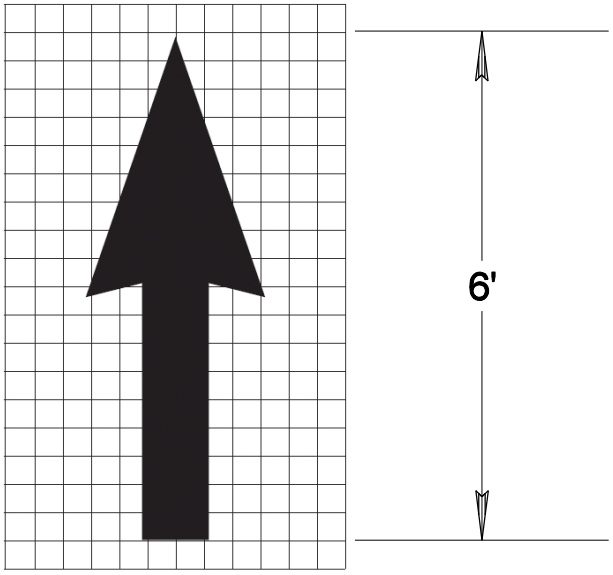


Bike Legend

□ = 100 mm x 100 mm
(4 in x 4 in)



Shared-Lane Marking



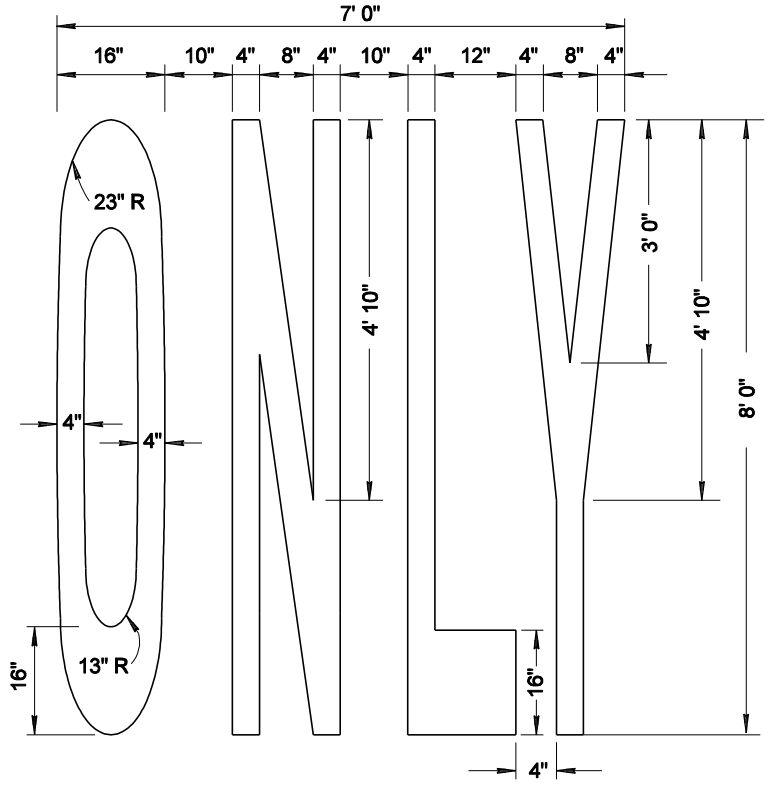
Bike Directional arrow

Refer to MUTCD section 9C.04
for usage.

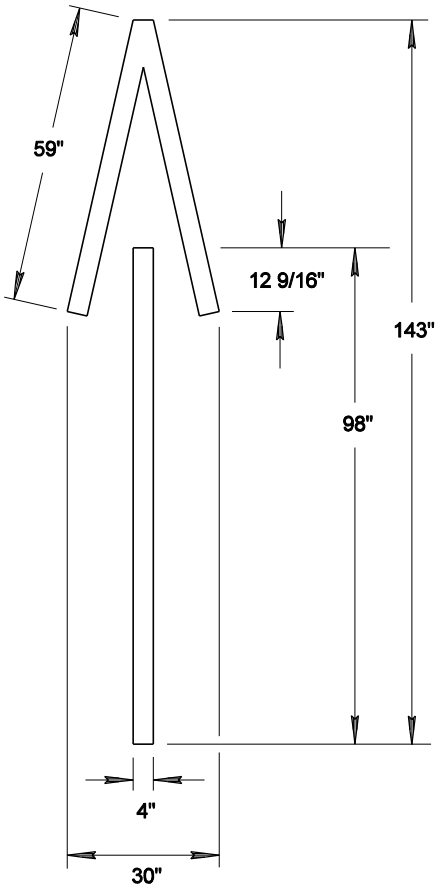
Note: 1. All arrows shall be white.

2. Symbols are at the discretion of the Traffic Engineer.

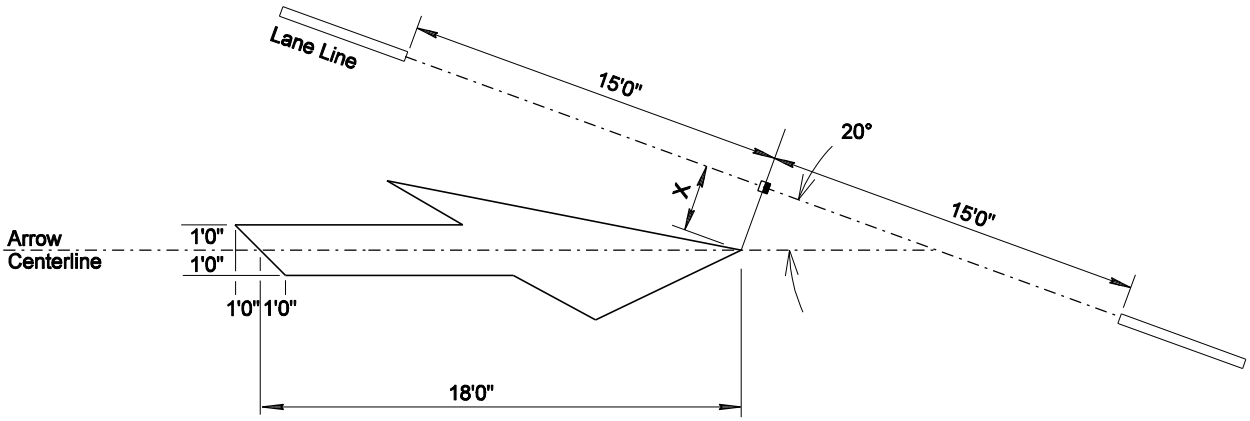
ISSUED August 2008 REVISED		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Pavement Markings for Bicycle Facilities Details**		SHEET NO. **2-9.1**



"ONLY" LEGEND



WRONG-WAY ARROW



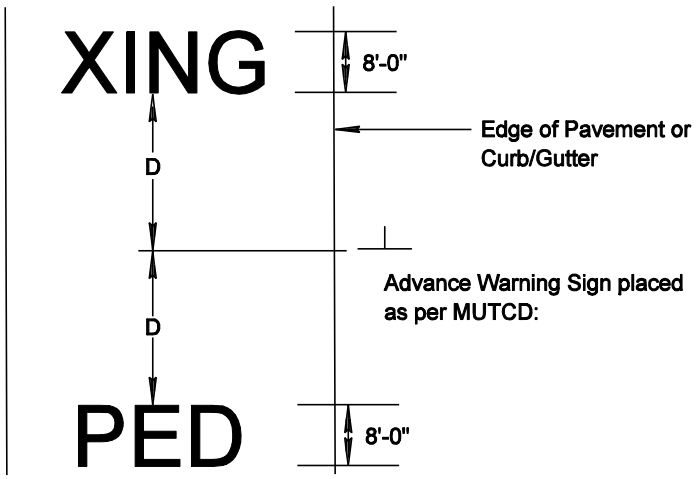
NOTE:

1. All arrows and legends shall be white.
2. Distance X from arrow tip to lane line is 3' for first arrow, 2' for second arrow, and 1' for third arrow.
3. Merge right arrow mirrors merge left arrow.

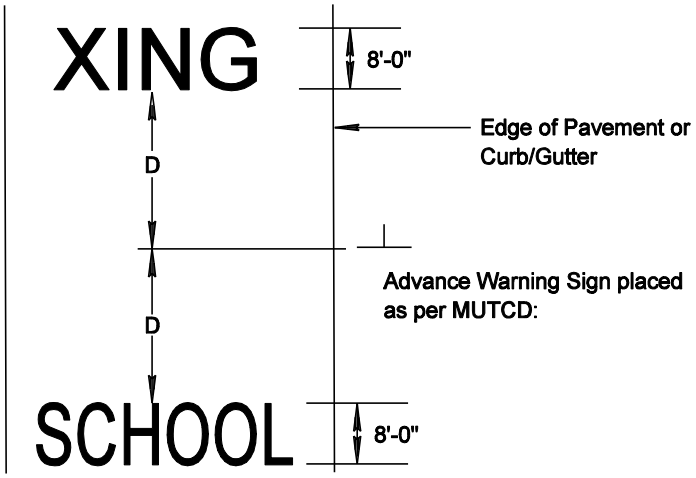
MERGE LEFT ARROW

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Wrong-Way Arrow, Merge Arrows, and "ONLY" Details**	SHEET NO. **2-10**

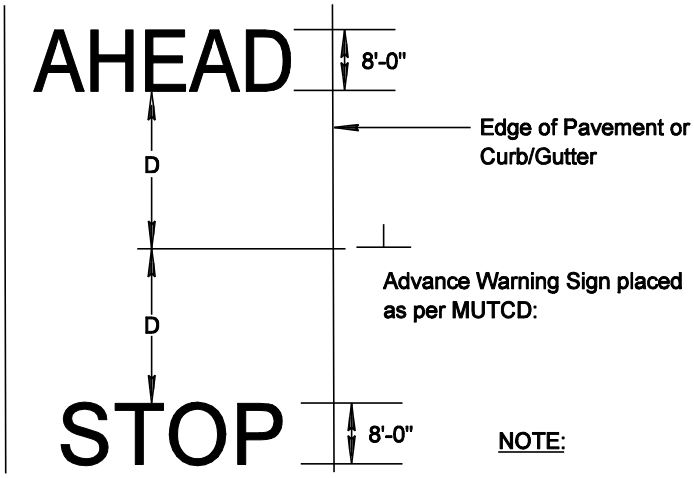
PED XING



SCHOOL XING



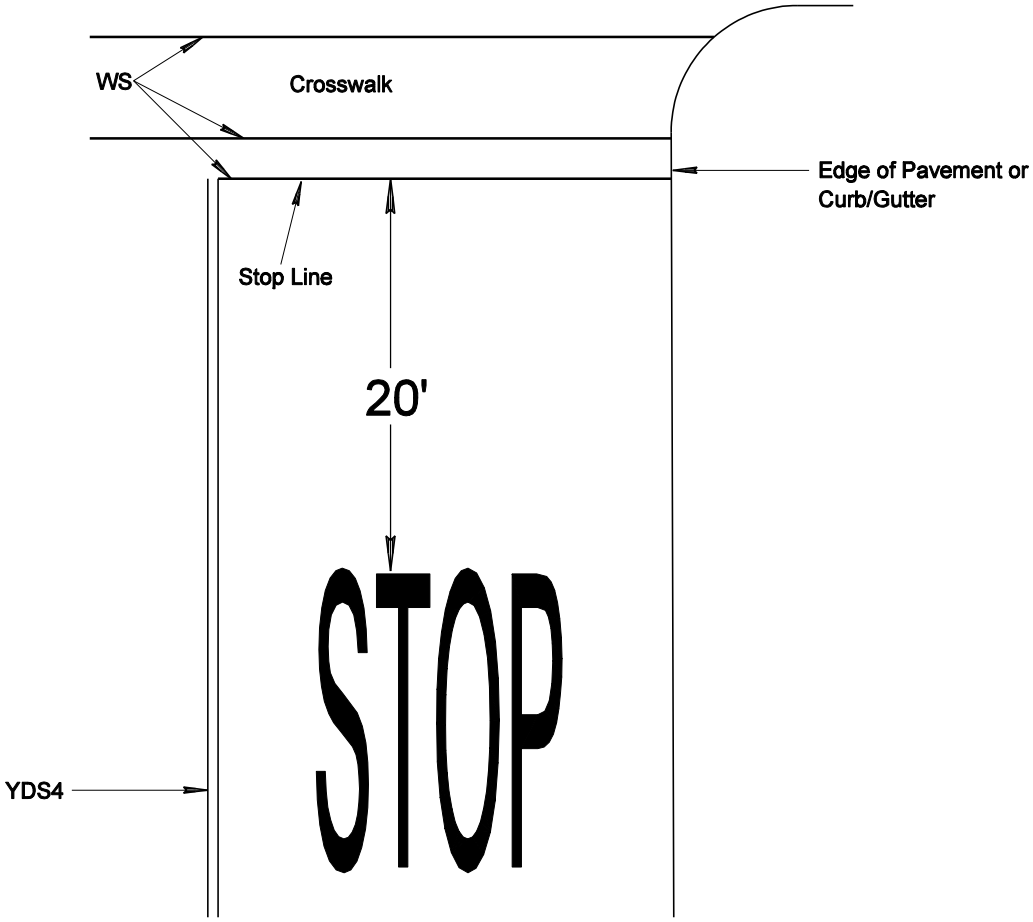
STOP AHEAD



NOTE:

1. D = 20' for speed limit 25-40 mph.
   D = 30' for speed limit > 45 mph.
2. If modification is needed to the value 'D' in Note #1, refer to section 3B-19 of the MUTCD or as directed by the Traffic Engineer.
3. See Appendix Sheet A4 for pavement symbols and words listing.
4. Letters shall be 8 ft high.

ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Pavement Words Details**	CITY OF FOUNDED 1776 TUCSON	SHEET NO. **2-11**



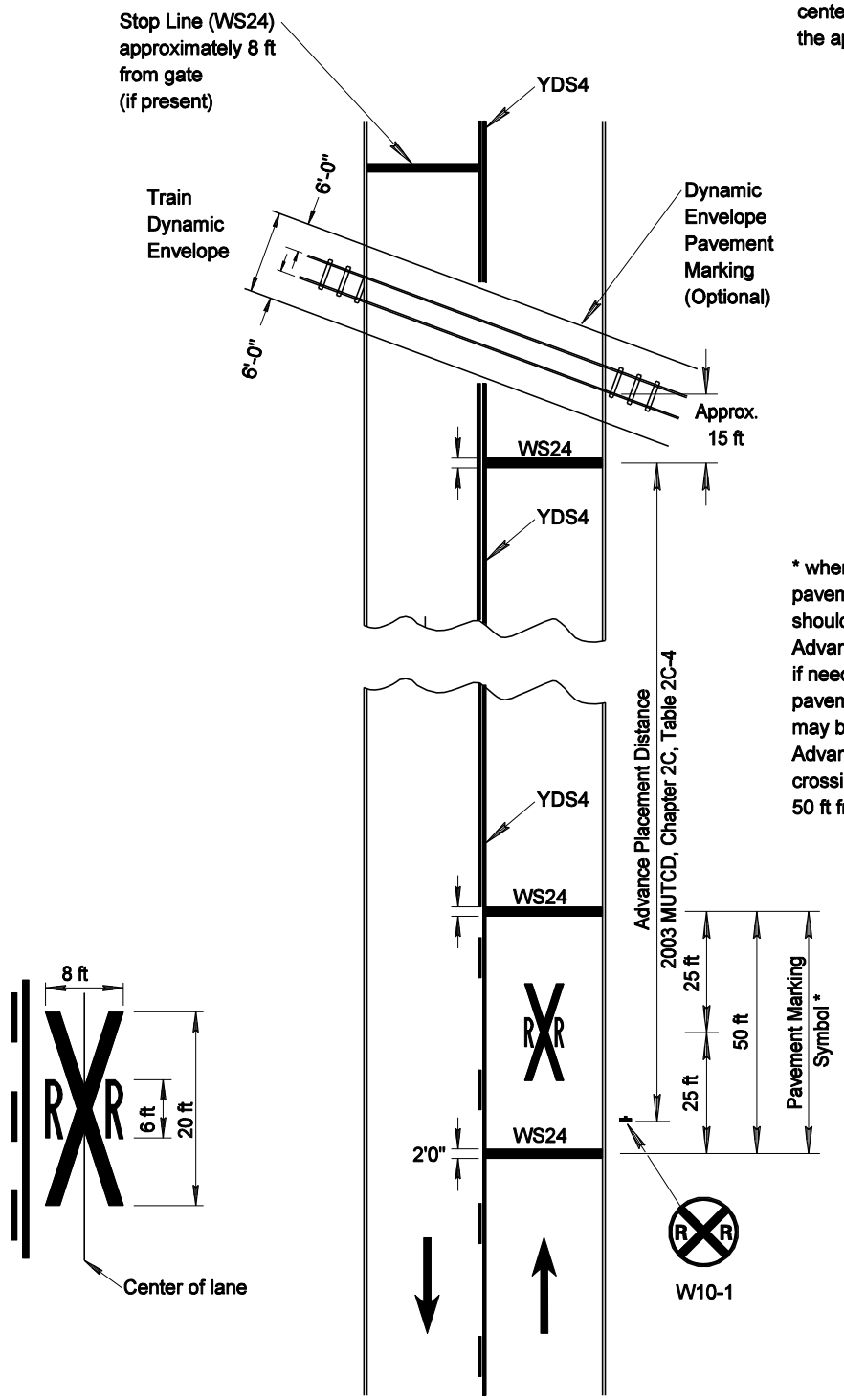
NOTE:

1. See Appendix Sheet A4 for pavement symbols and word listing.

2. For size, spacing, and other information of pavement words refer to the MUTCD section 3B-19.

ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Stop Word Detail		SHEET NO. 2-12

A three-lane roadway should be marked with a centerline for two-lane approach operation on the approach to a crossing.



* when used, a portion of the pavement marking symbol should be directly opposite the Advance Warning Sign (W10-1) if needed, supplemental pavement marking symbol(s) may be placed between the Advance Warning Sign and the crossing, but should be at least 50 ft from the stop line.

Note:

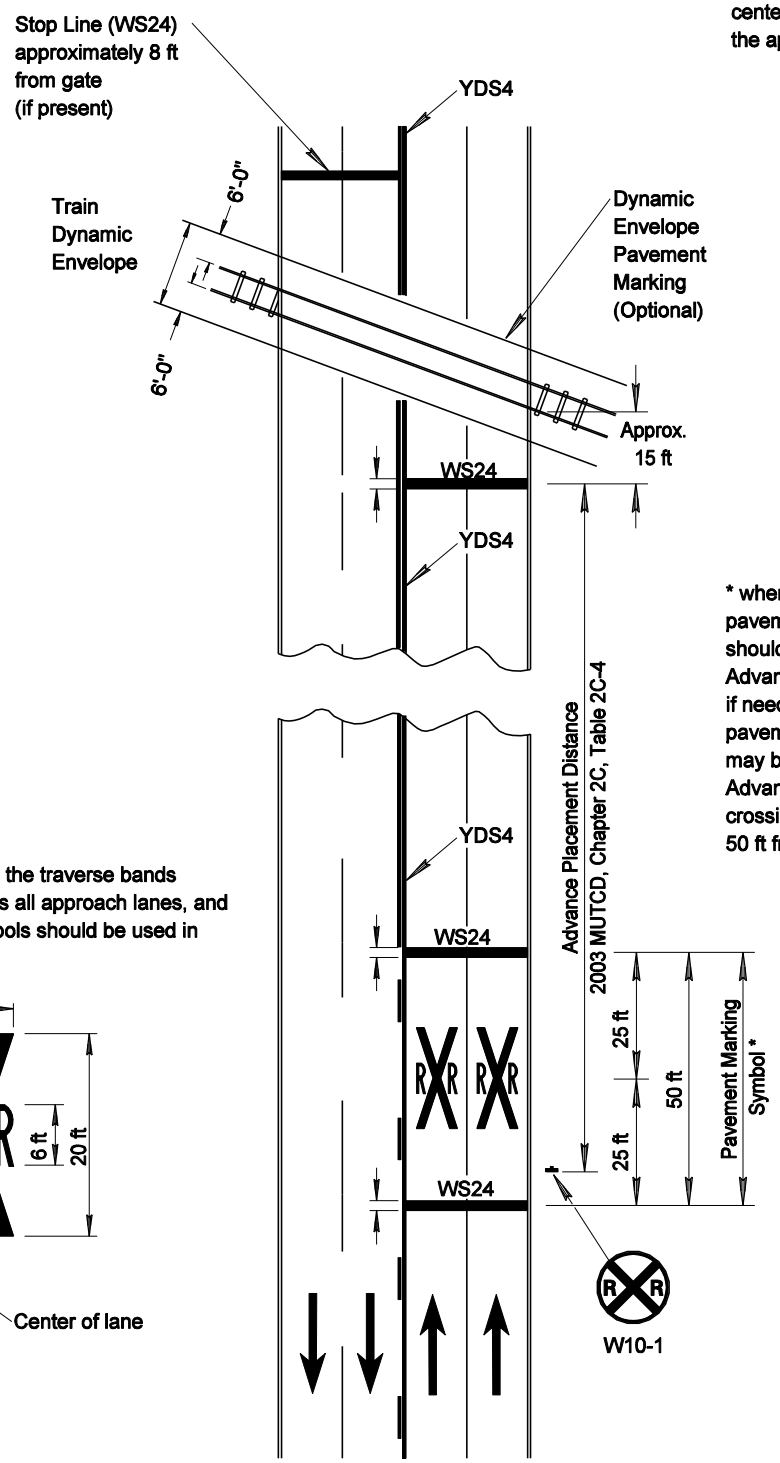
1. In an effort to simplify the figure to show warning sign and pavement placement, not all required traffic control devices are shown.
2. For more details refer to the MUTCD Section 8B.16.

LEGEND

→ Direction of travel

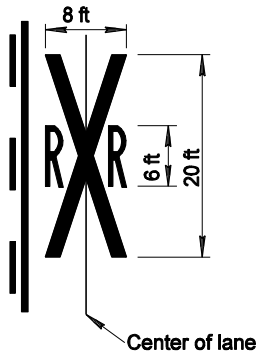
ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS RR Legend Details - Single Lane	SHEET NO. 2-13

A five-lane roadway should be marked with a centerline for two-lane approach operation on the approach to a crossing.



* when used, a portion of the pavement marking symbol should be directly opposite the Advance Warning Sign (W10-1) if needed, supplemental pavement marking symbol(s) may be placed between the Advance Warning Sign and the crossing, but should be at least 50 ft from the stop line.

On multi-lane roads, the traverse bands should extend across all approach lanes, and individual RXR symbols should be used in each approach lane.



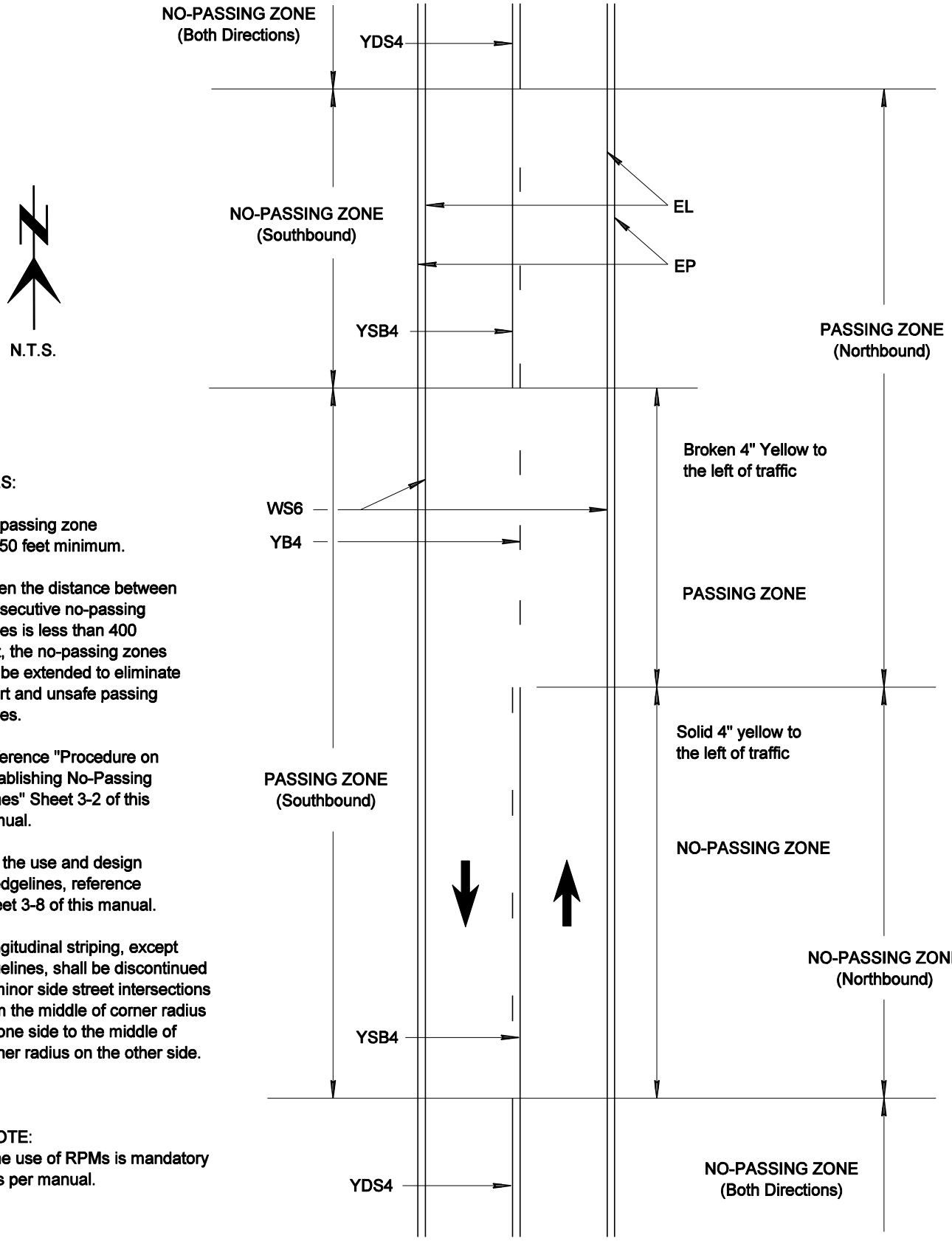
Note:

1. In an effort to simplify the figure to show warning sign and pavement placement, not all required traffic control devices are shown.
2. For more details refer to the MUTCD Section 8B.16.

LEGEND

→ Direction of travel

ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS RR Legend Details - Multi Lane	SHEET NO. 2-14



NOTES:

1. No-passing zone is 550 feet minimum.
2. When the distance between consecutive no-passing zones is less than 400 feet, the no-passing zones will be extended to eliminate short and unsafe passing zones.
3. Reference "Procedure on Establishing No-Passing Zones" Sheet 3-2 of this manual.
4. For the use and design of edgelines, reference Sheet 3-8 of this manual.
5. Longitudinal striping, except edgelines, shall be discontinued at minor side street intersections from the middle of corner radius on one side to the middle of corner radius on the other side.

NOTE:
The use of RPMs is mandatory as per manual.

ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
October 2000		PAVEMENT MARKING STANDARDS		3-1
REVISED		Typical Detail for 2-Lane Roadways with Passing and No-Passing Zones		
August 2008				

PROCEDURE ON ESTABLISHING NO-PASSING ZONES

This policy is intended for use when establishing no-passing zones on unmarked roads. To establish a no-passing zone, the 2-car procedure is to be used. This procedure consists of a trail car, and lead car, each car being properly equipped with radios, flashing lights and sighting targets adjustable for height. For this procedure, the targets (height of eye and height of object) are to be 3.5 feet above the pavement corresponding to the requirements of 2003 MUTCD Section 3B.02 on page 3B-1. The target on the lead car must be visible up to 1200 feet away.

85th Percentile Speed (mph) or Posted Speed Limit +5 mph	Minimum Passing Sight Distance (ft)
25	450
30	500
35	550
40	600
45	700
50	800
55	900
60	1,000
65	1,100
70	1,200

After the minimum passing sight distance is chosen from the table above, (See MUTCD, Table 3B-1) or Appendix A3 the procedure is begun by having the lead car layout a string line corresponding to the distance shown in the table above. While this is being done, the trail car remains stationary at the starting point. When the distance between the vehicles (measured with the string line) is correct, the lead car on command from the trail car begins to move forward. The trail car moves forward at the same rate using the string line to maintain proper spacing.

As the vehicles proceed to travel slowly ahead maintaining the proper spacing, should the lead car disappear from the view of the trail car, the command to stop is given by the trail car. Both cars then stop while the trail car driver marks the pavement. This is the beginning of the no-passing zone. The cars resume movement and when the lead car reappears, the command to stop is given and the trail car operator again marks the pavement ending the no-passing zone. When a no-passing zone is less than the 550 feet long, minor adjustments must be made to extend the no-passing zone to a minimum of 550 feet. If extended, the addition will be made at the beginning of the no-passing zone.

A check must be made to see that the distance between two consecutive no-passing zones is not less than 400 feet. When the distance between consecutive no-passing zones is less than 400 feet, the no-passing zones will be extended thus eliminating short and unsafe passing zones.

When layout is completed for one direction of travel, the procedure is then repeated for the opposite direction.

When both directions are complete the following conditions must have been satisfied before striping can proceed:

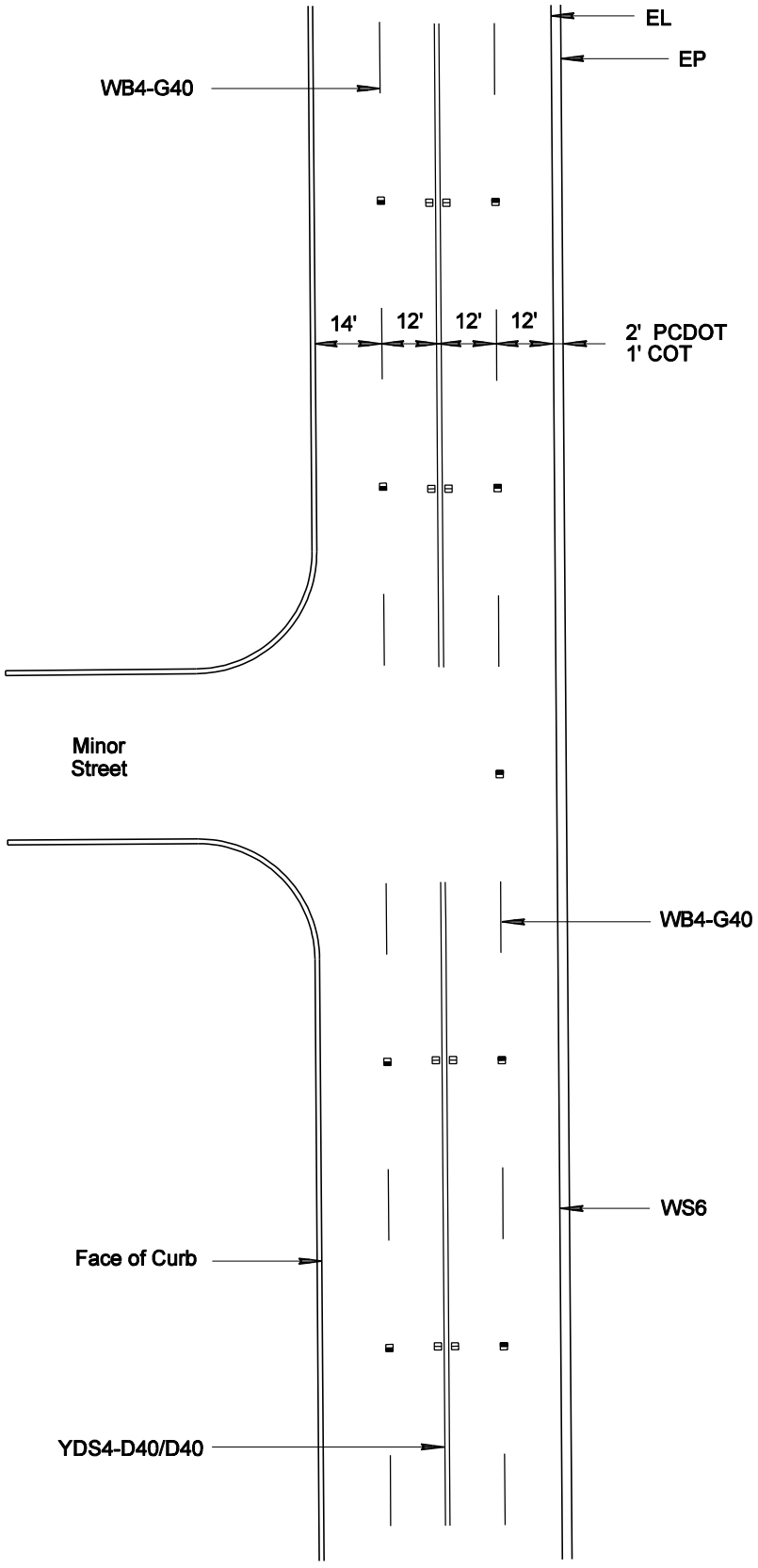
1. The begining of the no-passing zone will be that point where the sight distance becomes less than required.
2. The end of the no-passing zone will be that point where the sight ditance again becomes greater than required.
3. The no-passing zones shall not be shorter than 550 feet.

The distance between consecutive no-passing zones shall be at least 400 feet.

Special consideration must be given to "dips" in the roadway profile. Vehicles hidden in dips are not a normal driver expectancy and the unsuspecting passing motorist can be caught unaware when approaching these locations. To be safe, the approaches to dips should be preceded with no-passing zones except at those locations where vehicle identification is continous under all circumstances.

Communications between vehicles during the 2-car procedure are to be conducted on a radio frequency that does not go through the repeater station. This can be done by using instruments equipped with hand held radios.

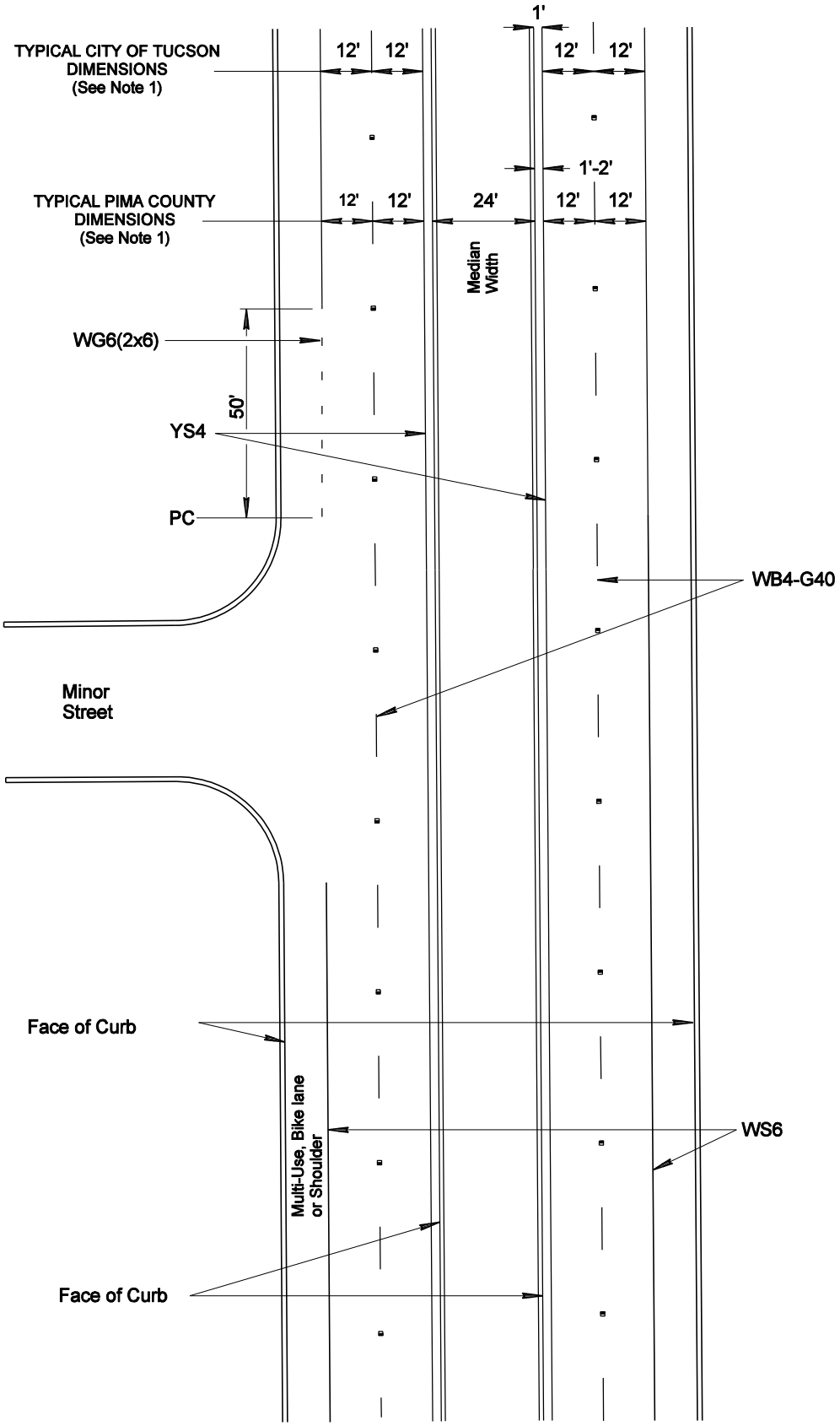
The foregoing procedure contains basic concepts pertaining to the 2-car procedure for laying out no-passing zones. A more complete and comprehensive discussion is contained in ADOT'S Traffic Policy and Procedures Manual.



NOTES:

1. Typical lane widths may vary to allow bike lanes.
2. For the use and design of edgelines, reference Sheet 3-8 of this manual.
3. Longitudinal striping, shall be discontinued at minor side street intersections from the middle of corner radius on one side to the middle of corner radius on the other side.
4. Reference Chapter 5 of this manual for pavement marking configurations at various intersection types.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical 4 - Lane Roadway** **Pavement Marking Detail**		SHEET NO. **3-3**



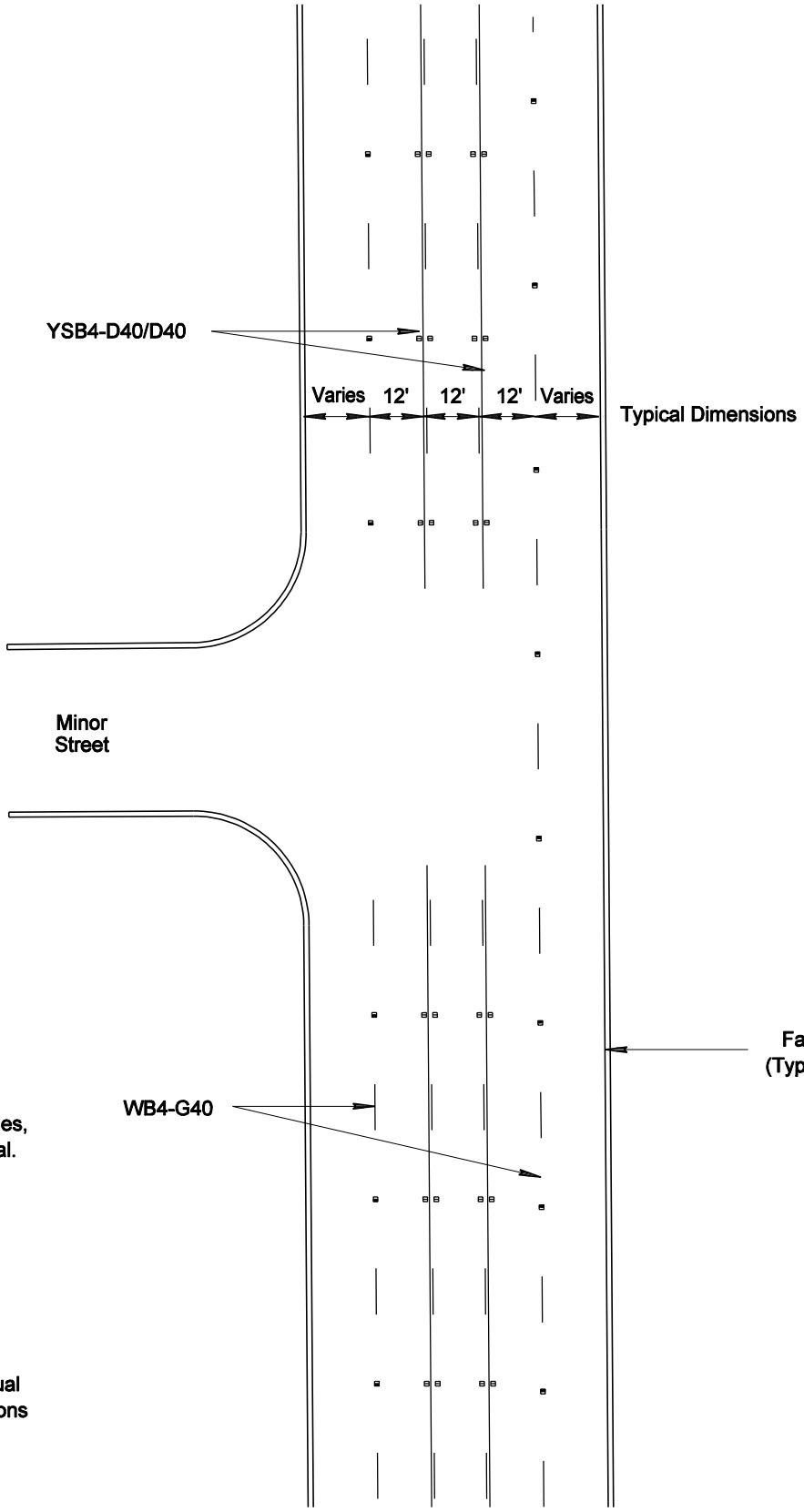
NOTES:

1. Typical lane widths are shown for both Pima County and City of Tucson.
   Lane widths may vary.
   For City of Tucson, the offset of the median yellow edgeline from the face of curb is typically 1'-0".
   For Pima County, the offset of the median yellow edgeline is 1 ft for a median without a gutter pan or 2 ft if there is a gutter pan.
   For Pima County, typical lane width for an outside travel lane without a bike lane is 12 ft plus 2 ft shy distance from edge of pavement or curb.

2. For the use and design of edgelines, reference Sheet 3-8 of this manual.

3. Reference Chapter 5 of this manual for pavement marking configurations at various intersection types.

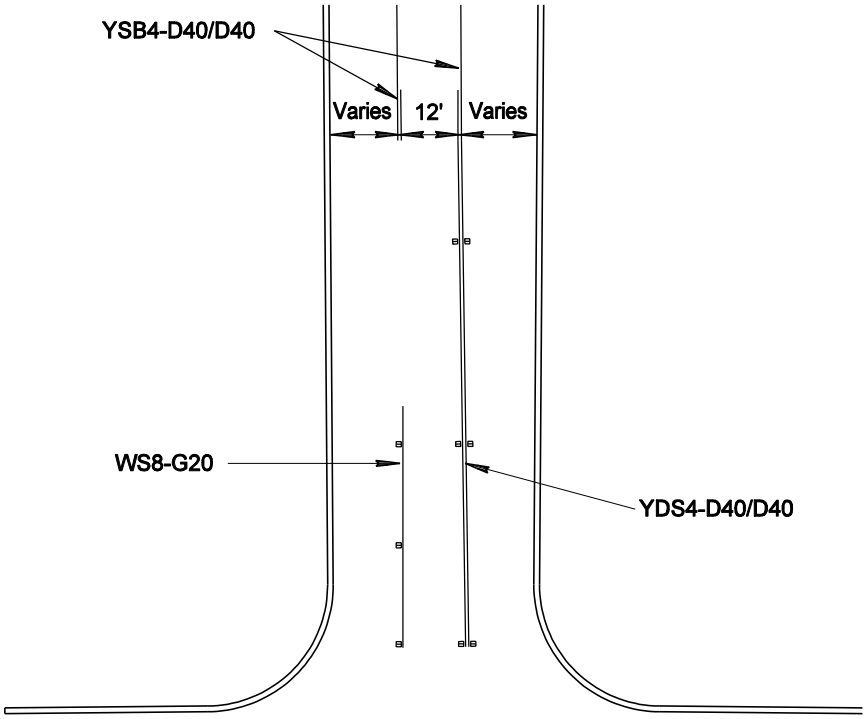
ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Divided Roadway Pavement Marking Detail**	CITY OF FOUNDED 1776 TUCSON	SHEET NO. **3-4**



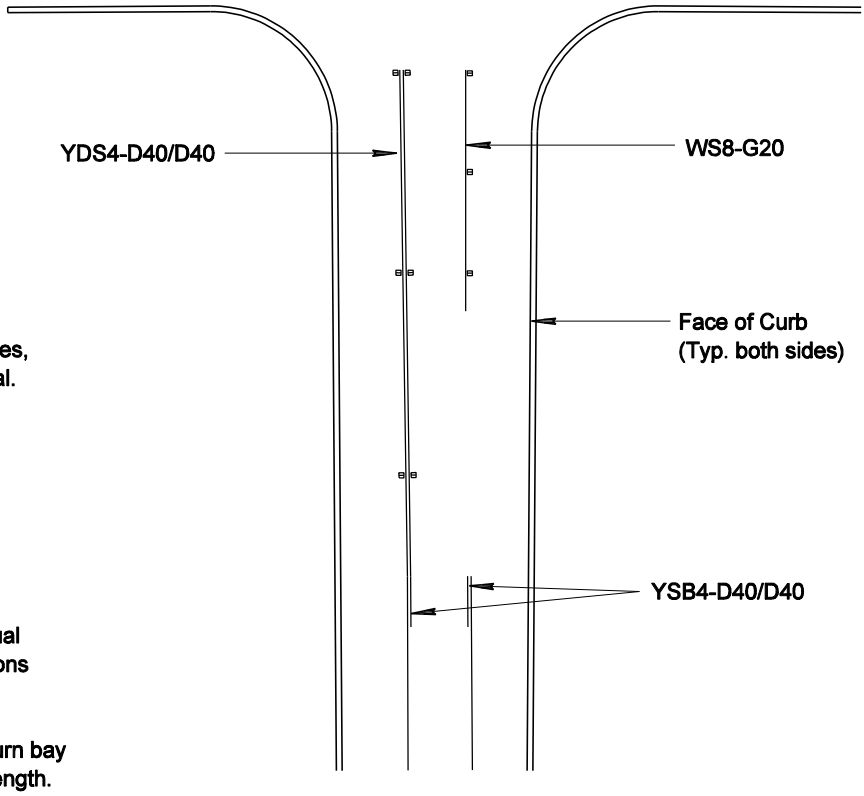
NOTES:

1. Typical lane widths are shown. Lane widths may vary.
2. For the use and design of edgelines, reference Sheet 3-8 of this manual.
3. Longitudinal striping shall be discontinued at minor side street intersections from the middle of corner radius on one side to the middle of corner radius on the other side.
4. Reference Chapter 5 of this manual for pavement marking configurations at various intersection types.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical TWLTL** **Pavement Marking Detail**		SHEET NO. **3-5**



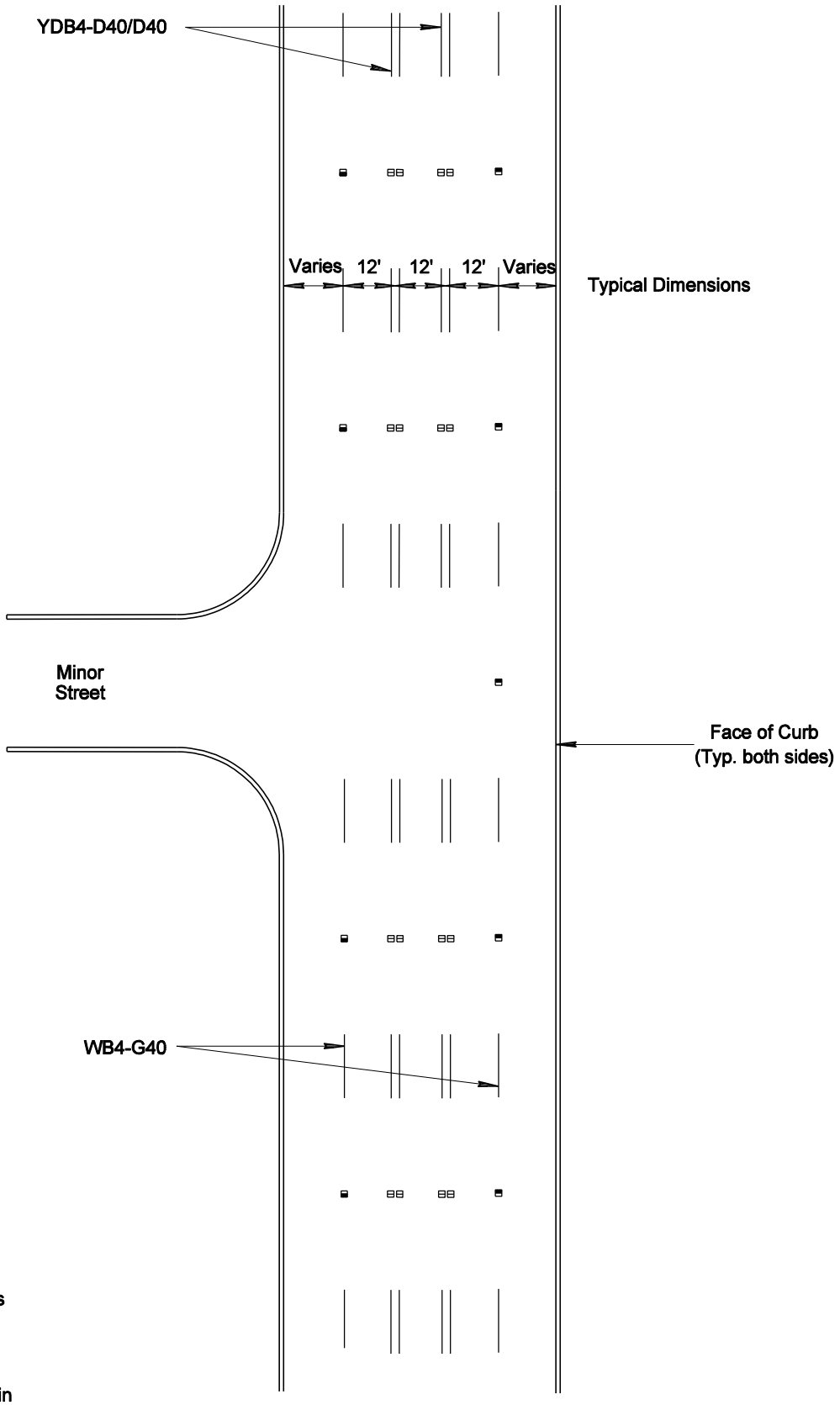
Minor
Street



NOTES:

1. Typical lane widths are shown. Lane widths may vary.
2. For the use and design of edgelines, reference Sheet 3-8 of this manual.
3. Longitudinal striping shall be discontinued at minor side street intersections from the middle of corner radius on one side to the middle of corner radius on the other side.
4. Reference Chapter 5 of this manual for pavement marking configurations at various intersection types.
5. Refer to Sheet 4-6 for design of turn bay openings and minimum storage length.

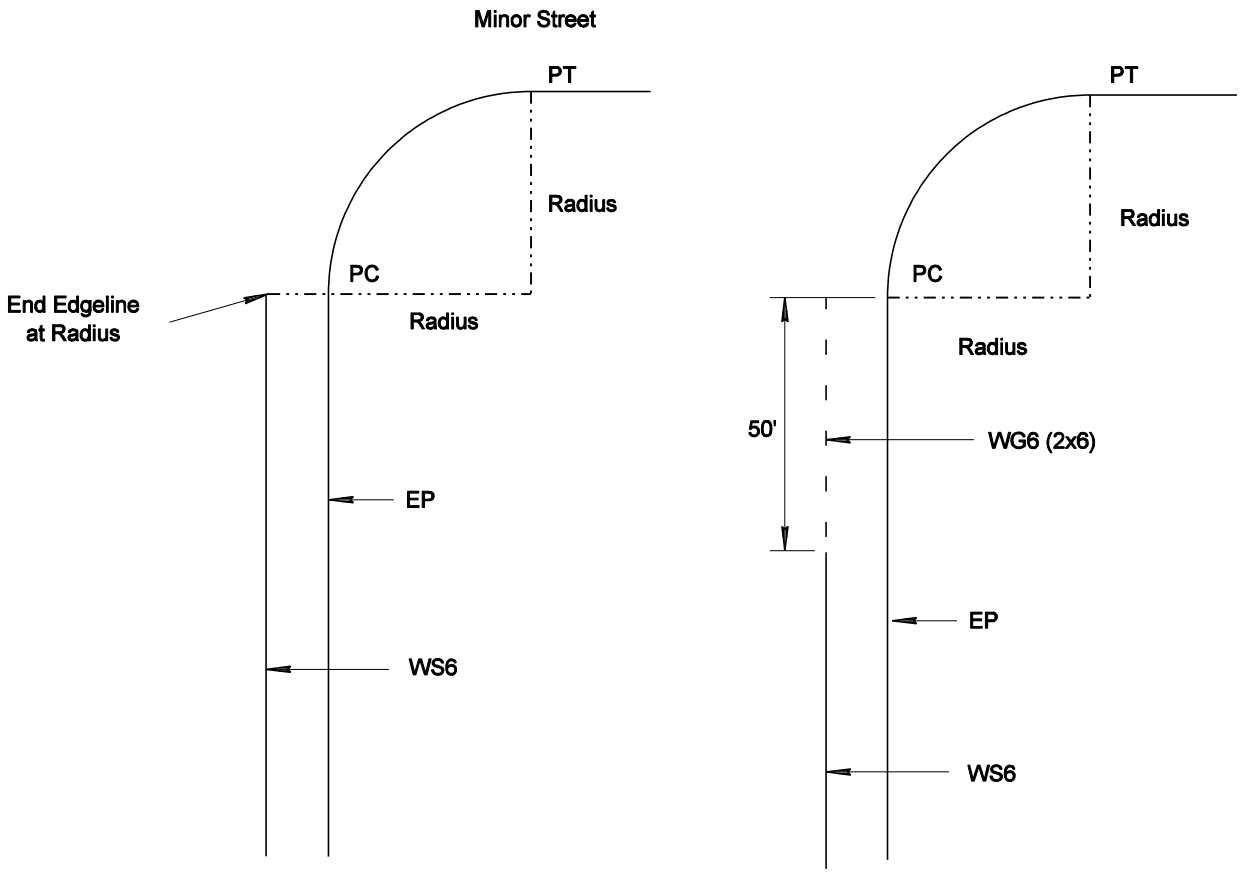
ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical TWLTL with Exclusive turn at Intersection Pavement Marking Detail**	CITY OF FOUNDED 1776 TUCSON	SHEET NO. **3-6**



NOTES:

1. Typical lane widths are shown. Lane widths may vary.
2. For the use and design of edgelines, reference Sheet 3-8 of this manual.
3. Longitudinal striping shall be discontinued at minor side street intersections from the middle of corner radius on one side to the middle of corner radius on the other side.
4. Reference Chapter 5 of this manual for pavement marking configurations at various intersection types.
5. Do not use pavement words or legends where reversible lanes are in operation.

ISSUED				
October 2000		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
REVISED		PAVEMENT MARKING STANDARDS		
August 2008		Typical Reversible Lane Pavement Marking Detail		3-7



DETAIL "A"

White Edgeline with
Paved Shoulder <4'-0"

DETAIL "B"

White Edgeline with Paved
Multi-use lane, Bike lane or
Shoulder ≥4'-0"

NOTES:

1. All white edgelines shall be 6" wide. All yellow edgelines shall be 4" wide.

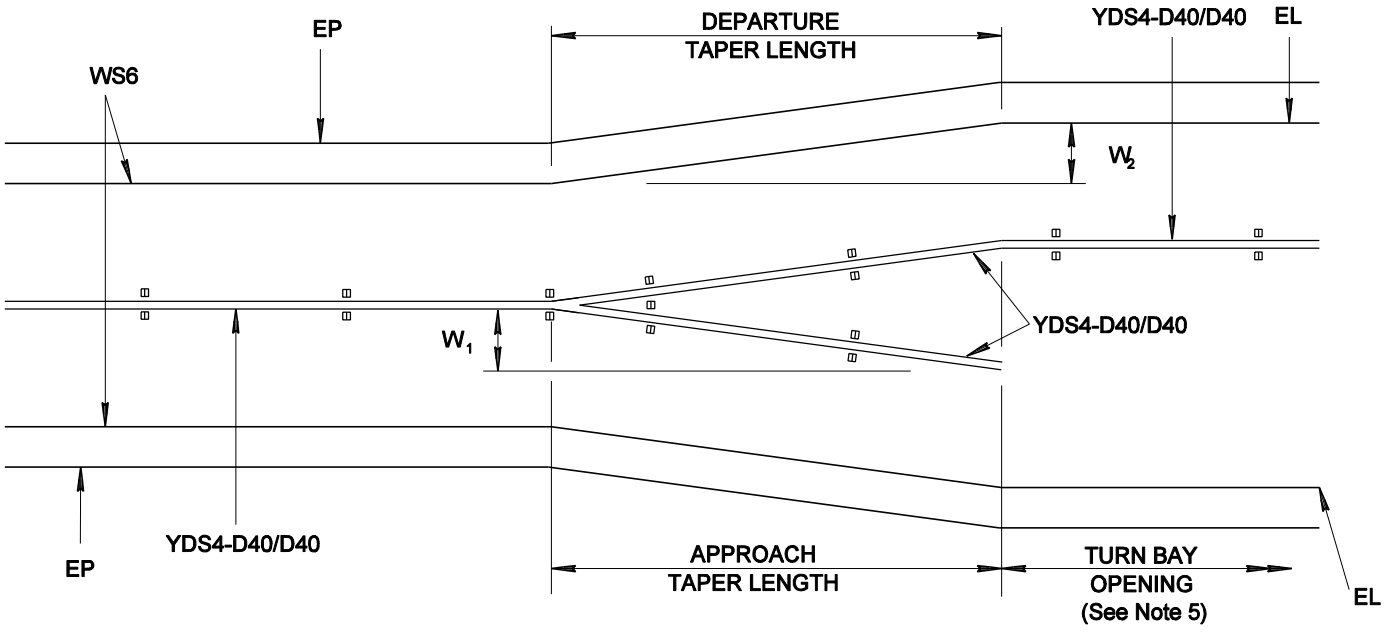
2. White edgelines are typically not installed on roadways with continuous curbing unless a multi-use lane, bicycle lane, bike route with striped shoulder, or other special use lane is located to the right of the rightmost travel lane.

3. Yellow edgelines are typically installed to delineate the left edge of a divided roadway, a one-way road, or a ramp.

4. For yellow edgeline markings at median openings, refer to Sheets 5-13 and 5-14 of this manual.

$L = \frac{W_2 S^2}{60}$ FOR 40 MPH OR LESS L = TAPER LENGTH (FT)

$W_2 S$ FOR 45 MPH OR MORE S = POSTED SPEED LIMIT (MPH)

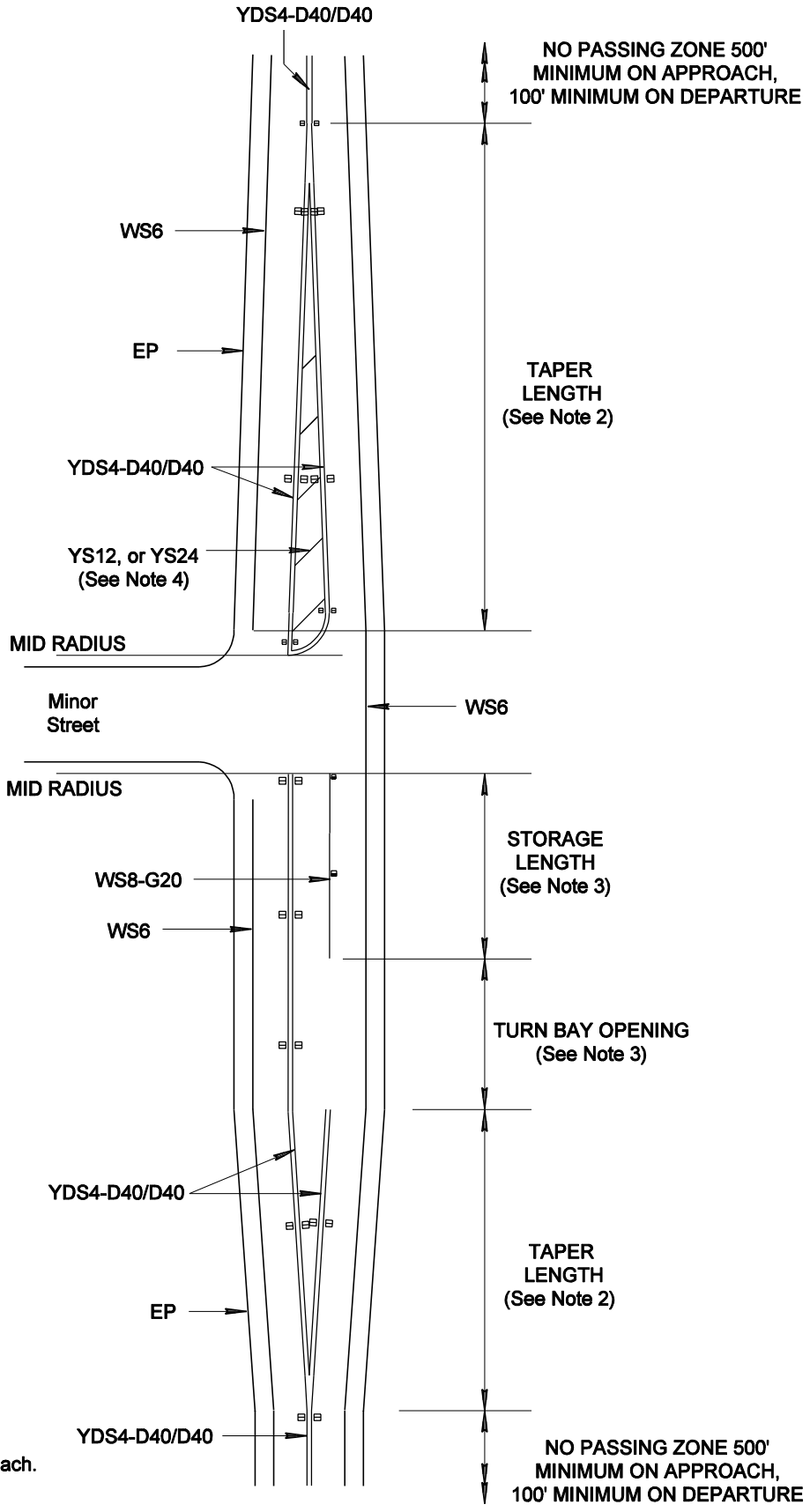


$L = \frac{W_1 S^2}{60}$ FOR 40 MPH OR LESS L = TAPER LENGTH (FT)

$W_1 S$ FOR 45 MPH OR MORE S = POSTED SPEED LIMIT (MPH)

NOTES:

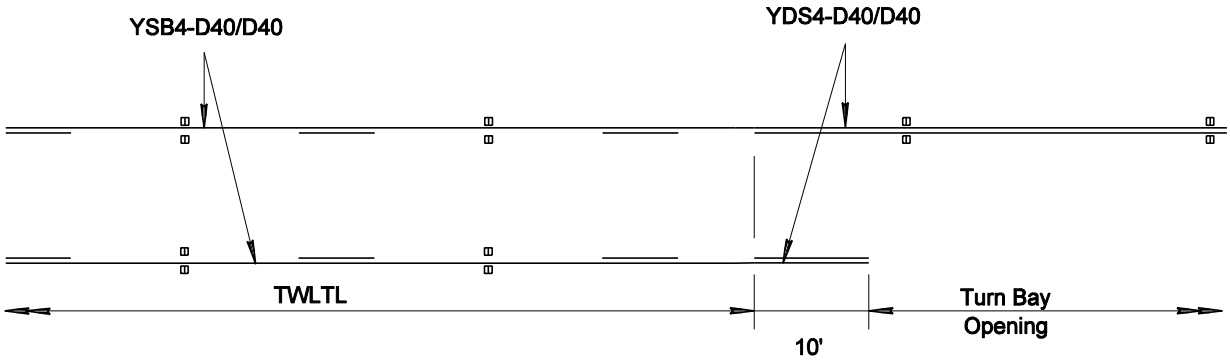
1. The approach taper length is based on the W_1 dimension, and applies to the tapers of the approach edgeline, and the approach centerline. For urban conditions where traffic is not merging, a shorter taper length of approximately 1/2 L may be considered at the discretion of the Engineer.
2. The departure taper length is based on the W_2 dimension, and applies to the taper of the departure edgeline. For urban conditions where traffic is not merging, a shorter taper length may be considered at the discretion of the Engineer.
3. The departure taper may be greater, but not less than, the approach taper for typical conditions.
4. The beginning of the departure taper shall be located at the end of the approach taper for typical conditions.
5. For the design of the turn bay opening, see Sheet 4-6.
6. Spacing of Type D RPMs in the taper areas is typically 40' but may be reduced to 20' at the discretion of the Traffic Engineer.
7. Refer to the Pima County Roadway Design Manual for geometric design issues.



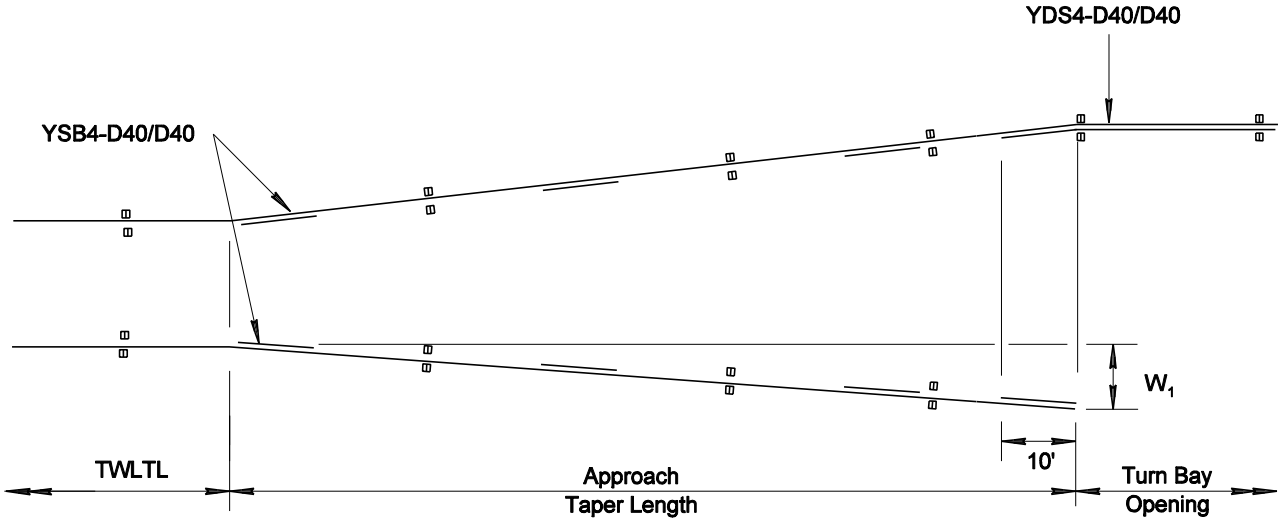
NOTES:

1. Similar transition striping applies to multi-lane roadways, and transitions for cross-sections with TWLTLs.
2. For design of taper lengths see sheet 4-1. For urban conditions where traffic is not merging, a shorter taper length of approximately 1/2 L may be considered at the discretion of the Engineer.
3. For design of the turn bay opening and the storage length, see Sheet 4-6.
4. Diagonal hatching is optional. Use YS12 when Speed Limit <40 mph and YS24 when Speed Limit >45 mph. See Detail 2, Sheet 4-4 for typical cross-hatch striping dimensions.
5. The minimum No Passing Zone length shall be 100' on the departure and 500' on the approach.
6. Spacing of Type D RPMs in the taper areas is typically 40' but may be reduced to 20' at the discretion of the Traffic Engineer.

ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
October 2000		PAVEMENT MARKING STANDARDS		4-2
REVISED August 2008		Typical Transition for a Left-Turn Lane (Symmetrical Widening)		



DETAIL 1 - SINGLE LEFT-TURN LANE TRANSITION

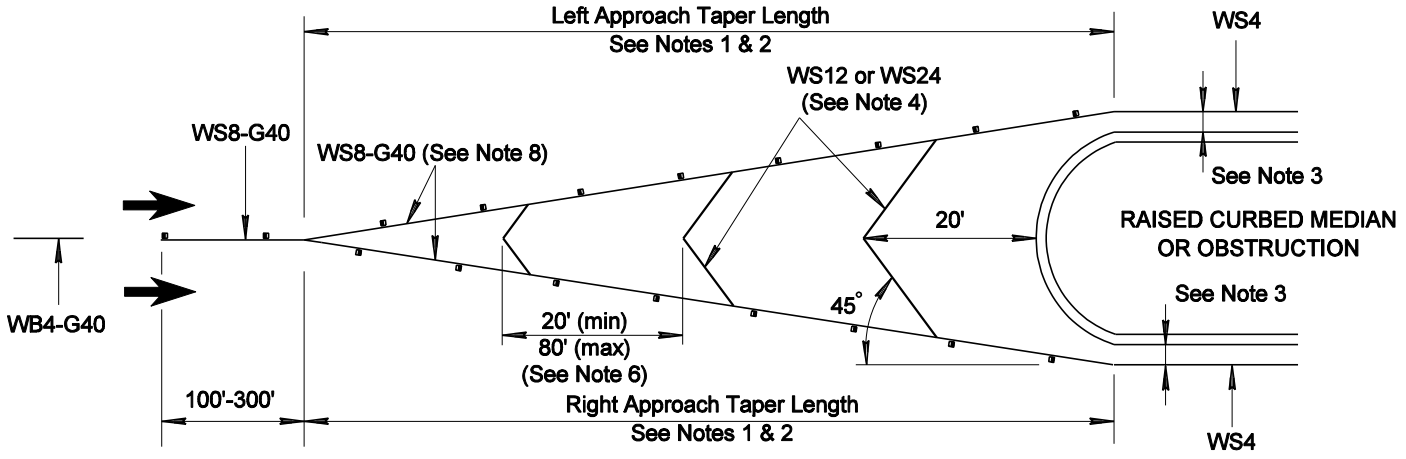


DETAIL 2 - DUAL LEFT-TURN LANE TRANSITION

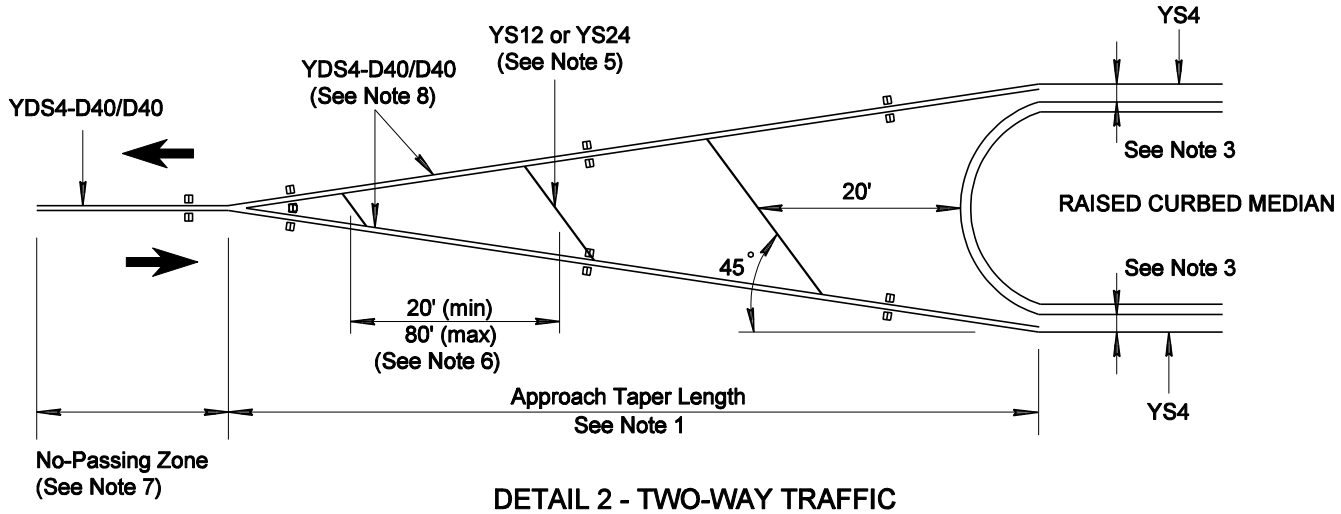
NOTES:

1. For design of left turn lanes see Sheets 4-6 and 4-8.
2. Approach and departure taper lengths shall be designed based on the criteria described on Sheet 4-1.

ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Transitions from TWLTLs to Exclusive LT Lanes**	CITY OF FOUNDED 1776 TUCSON	SHEET NO. **4-3**



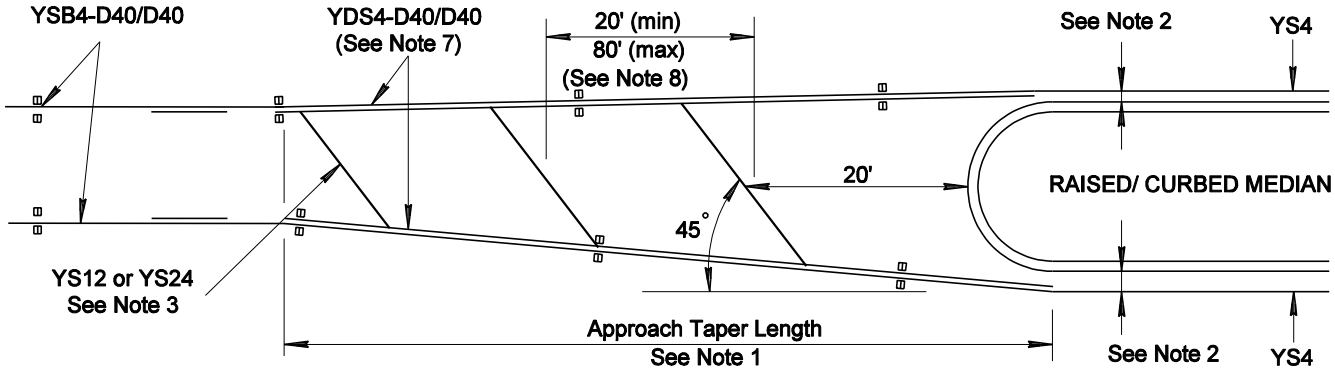
DETAIL 1 - ONE-WAY TRAFFIC



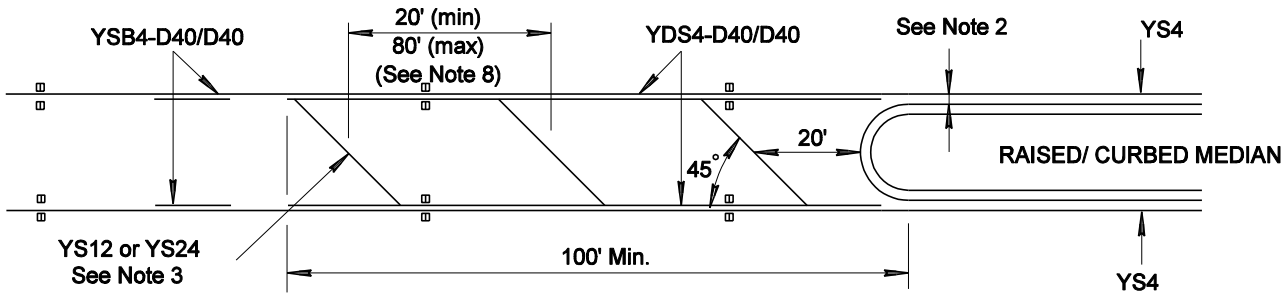
DETAIL 2 - TWO-WAY TRAFFIC

NOTES:

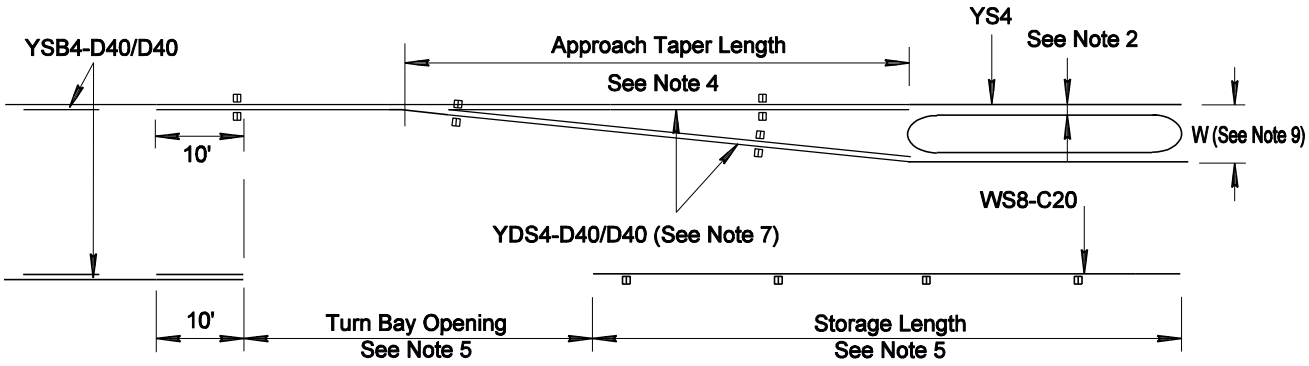
1. Calculation and design of the approach taper shall be determined using the criteria on Sheet 4-1.
2. For asymmetrical taper designs, the larger value of the calculated right and left approach taper length shall be used for the design of both tapers. Therefore, the right taper will always equal the left taper.
3. The offset of the edgeline from the face of curb, or obstruction, shall be 1'-0" for City of Tucson roadways and 2'-0" for Pima County roadways.
4. For Chevrons use WS12 for speed limit ≤40 mph and WS24 for speed limit ≥45 mph.
5. For diagonal hatching use YS12 for speed limit ≤40 mph and YS24 for speed limit ≥45 mph.
6. Number of Chevrons and diagonal hatching vary based on taper length and speed. Spacing shall be 20' for speed limit ≤40 mph and 80' for speed limit ≥45 mph.
7. The minimum no-passing zone length shall be 100' on the departure and 500' on the approach.
8. Spacing of Type D/G RPMs in the taper areas is typically 40' but may be reduced to 20' at the discretion of the Traffic Engineer.
9. Chevron or diagonal hatching spacing is measured along the roadway centerline.



DETAIL 1 - TRANSITION FROM TWLTL TO WIDE MEDIAN



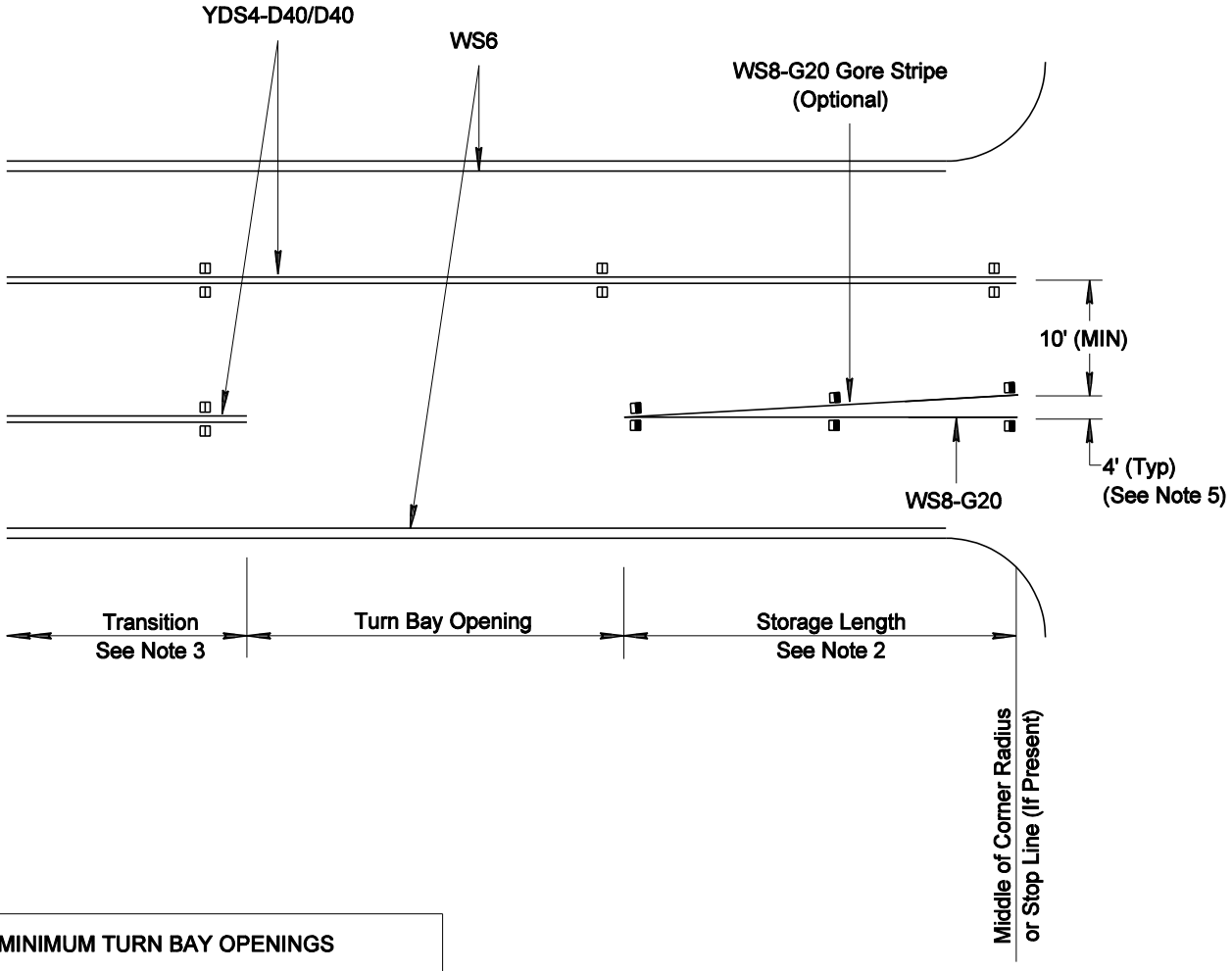
DETAIL 2 - TRANSITION FROM TWLTL TO MEDIAN W/ SAME WIDTH



DETAIL 3 - GORE TRANSITION FROM TWLTL TO PEDESTRIAN REFUGE ISLAND

NOTES:

1. Calculation and design of the approach taper shall be determined using the criteria on Sheet 4-1.
2. The offset of the edgeline from the face of curb, or obstruction, shall be 1'-0" for City of Tucson roadways and 2'-0" for Pima County roadways.
3. For diagonal hatching use YS12 for speed limit ≤40 mph and YS24 for speed limit ≥45 mph.
4. The minimum approach taper length in Detail 3 is equal to 15W.
5. For the design of the turn bay opening and the storage length, see Sheet 4-6.
6. Diagonal hatching spacing is measured along the roadway centerline.
7. Spacing of Type D RPMs in the taper areas is typically 40' but may be reduced to 20' at the discretion of the Traffic Engineer.
8. Number of diagonal hatching shall vary based on taper, length and speed. Spacing shall be 20' for speed limit ≤40 mph and 80' for speed limit of ≥45 mph.
9. If median is ≥6' wide diagonal x-hatching are required.

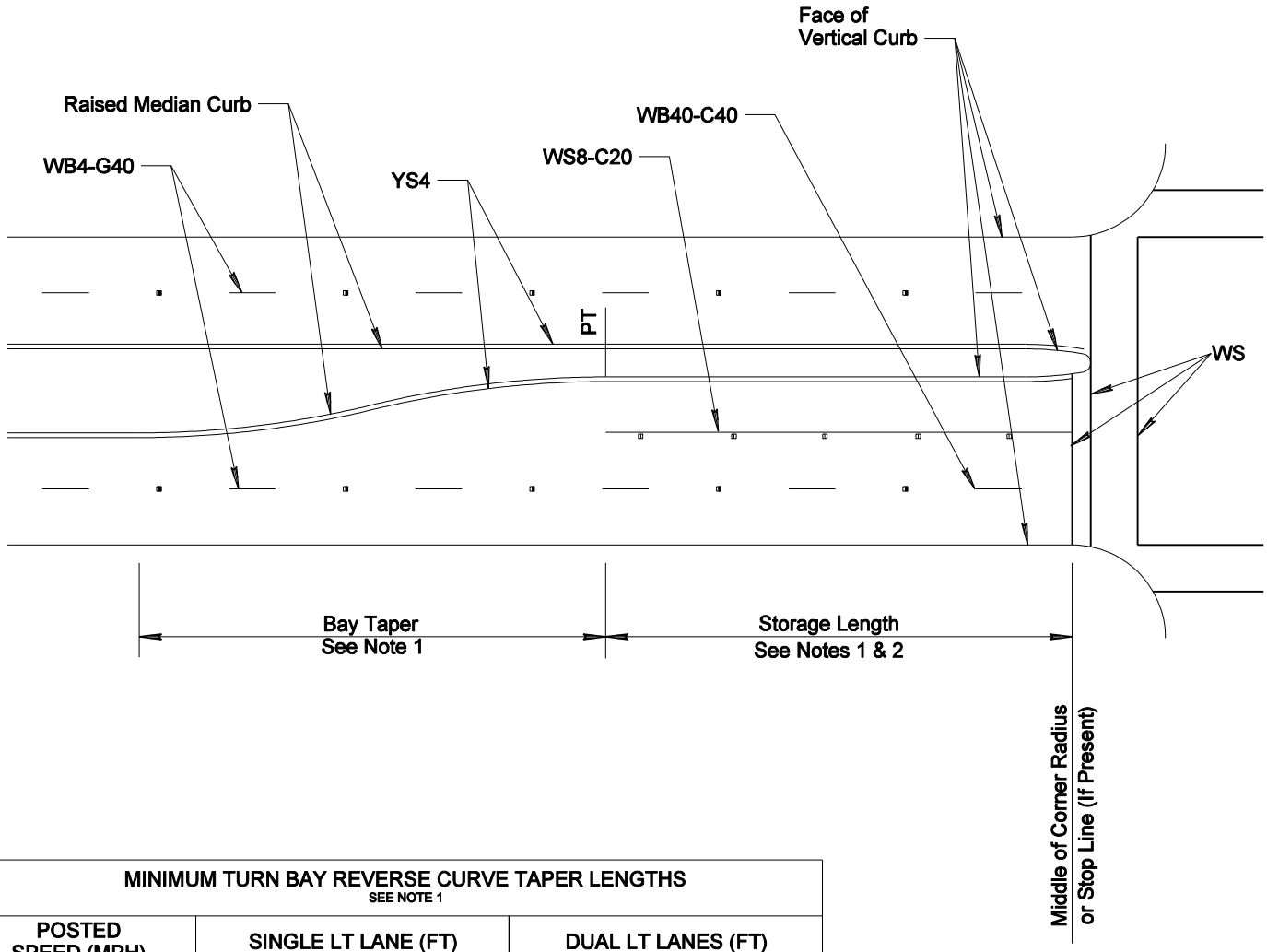


MINIMUM TURN BAY OPENINGS	
POSTED SPEED (MPH)	MINIMUM OPENING (FT)
25-35	60'
40-45	90'
50-55	120'

MINIMUM STORAGE LENGTH	
POSTED SPEED (MPH)	MINIMUM LENGTH (FT)
40 OR LESS	110'
45 OR MORE	150'

NOTES:

1. Design speed minus 5 mph may be used instead of posted speed limit.
2. Storage lengths longer than the minimums listed on this drawing may be determined using engineering judgment or approximate calculations.
3. For the design of transitions, see Sheets 4-1, 4-2, 4-3, and 4-4 of this manual.
4. For the placement of pavement arrows and "ONLY" legend, see Sheet 4-12.
5. Gore is optional. If gore is ≥6' wide, chevrons are required.
6. In urban areas, the minimum storage length may be reduced at the discretion of the Traffic Engineer.

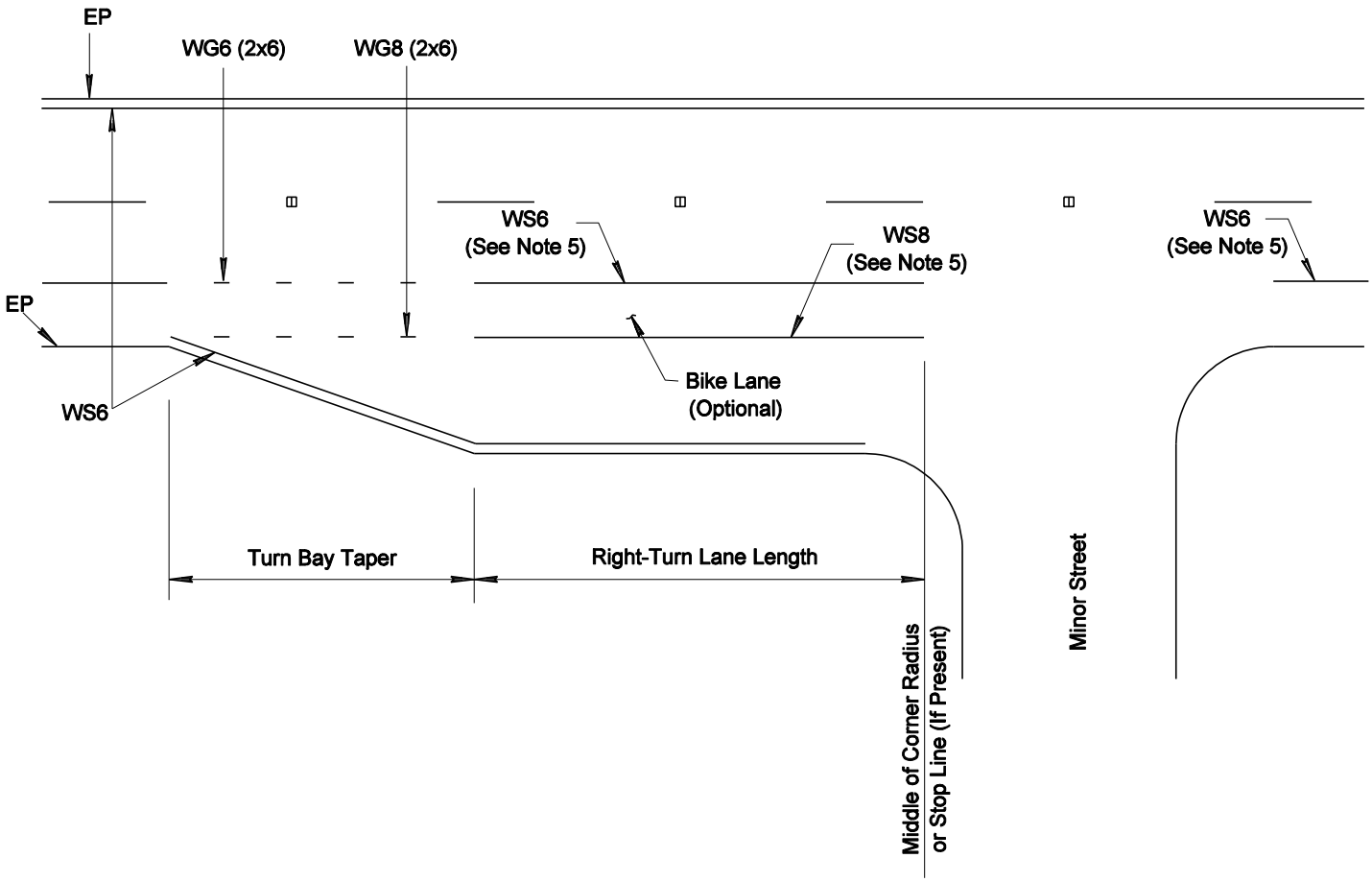


MINIMUM TURN BAY REVERSE CURVE TAPER LENGTHS SEE NOTE 1		
POSTED SPEED (MPH)	SINGLE LT LANE (FT) SEE NOTE 3	DUAL LT LANES (FT)
25-35	100'	175'
40-45	100'	175'
50-55	150'	250'

MINIMUM STORAGE LENGTH SEE NOTE 1, 2 & 3	
POSTED SPEED (MPH)	MINIMUM LENGTH (FT)
40 OR LESS	110'
45 OR MORE	150'

NOTES:

1. Design speed minus 5 mph may be used instead of posted speed limit.
2. Storage lengths longer than the minimums listed on this drawing will be determined using engineering calculations to determine the storage need.
3. The dimensions given in the minimum length tables on this sheet are also applicable for single right turn lanes.
4. Refer to Sheets 4-9 and 4-11 for pavement marking details.
5. In urban areas, the minimum storage length may be reduced at the discretion of the Traffic Engineer.

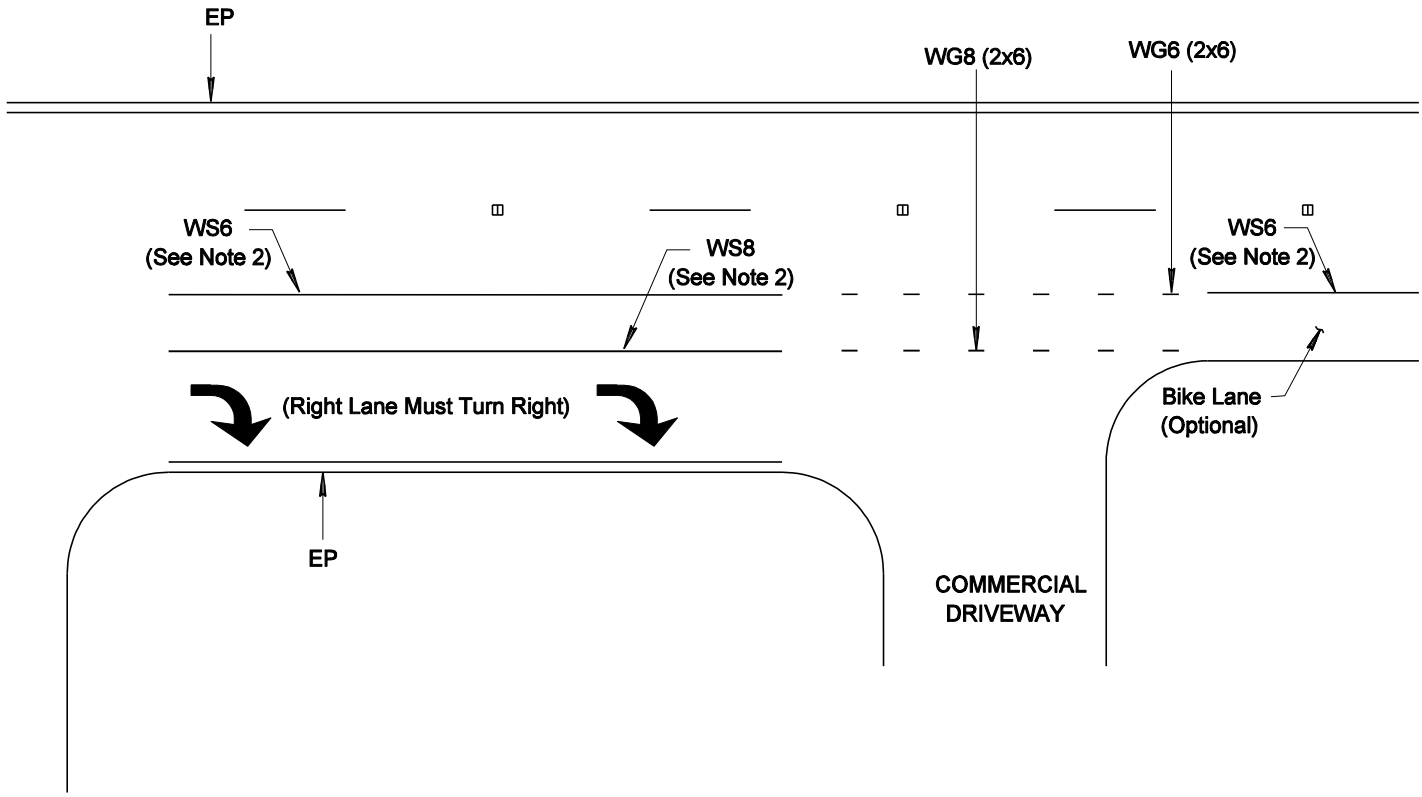


MINIMUM TURN BAY TAPER RATES	
POSTED SPEED (MPH)	RATE (Length/Offset)
30 OR LESS	8:1
35 OR MORE	15:1

MINIMUM RIGHT TURN LANE LENGTH	
POSTED SPEED (MPH)	LENGTH (FT)
40 OR LESS	110'
45 OR MORE	150'

NOTES:

1. Design speed minus 5 mph may be used instead of posted speed limit.
2. Taper Rate refers to the ratio of length of taper to the lateral offset of the edgeline.
3. Storage lengths longer than the minimums listed on this drawing may be determined using engineering judgment or approximate calculations.
4. For the placement of pavement arrows and "ONLY" legends, see Sheet 4-12.
5. RPMs shall not be used on lane lines adjacent to bike lanes, per 2003 MUTCD, Section 9C.04.
6. In urban area, the minimum storage length may be reduced at the discretion of the Traffic Engineer.



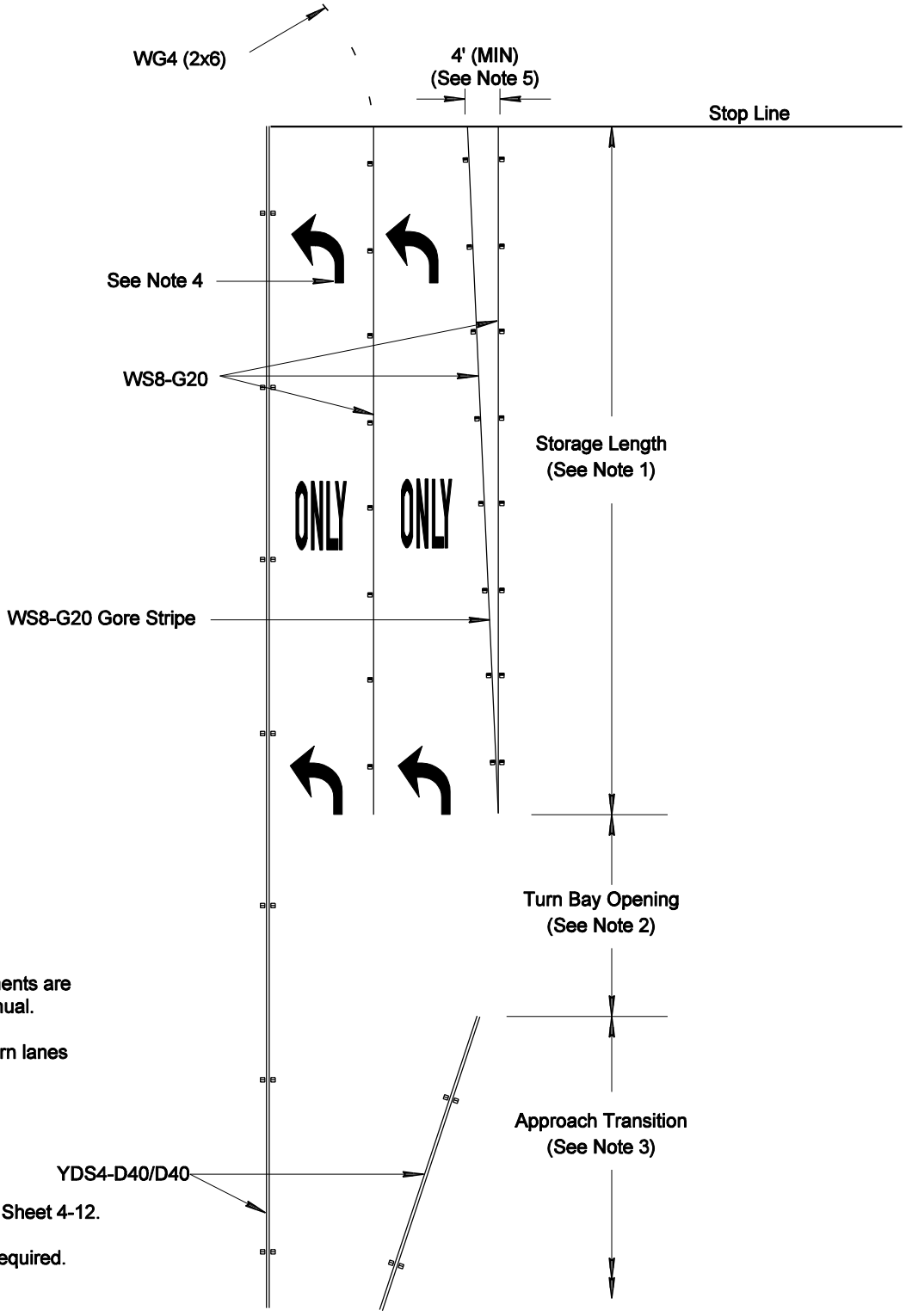
NOTES:

1. In areas without bike lanes, RPMs G20 may be required along lane line divider of Right Turn Bay at the discretion of the Traffic Engineer.

2. RPMs shall not be used on lane lines adjacent to bike lanes, per 2003 MUTCD, Section 9C.04.

3. See Sheet 4-12 for turn lane marking detail.

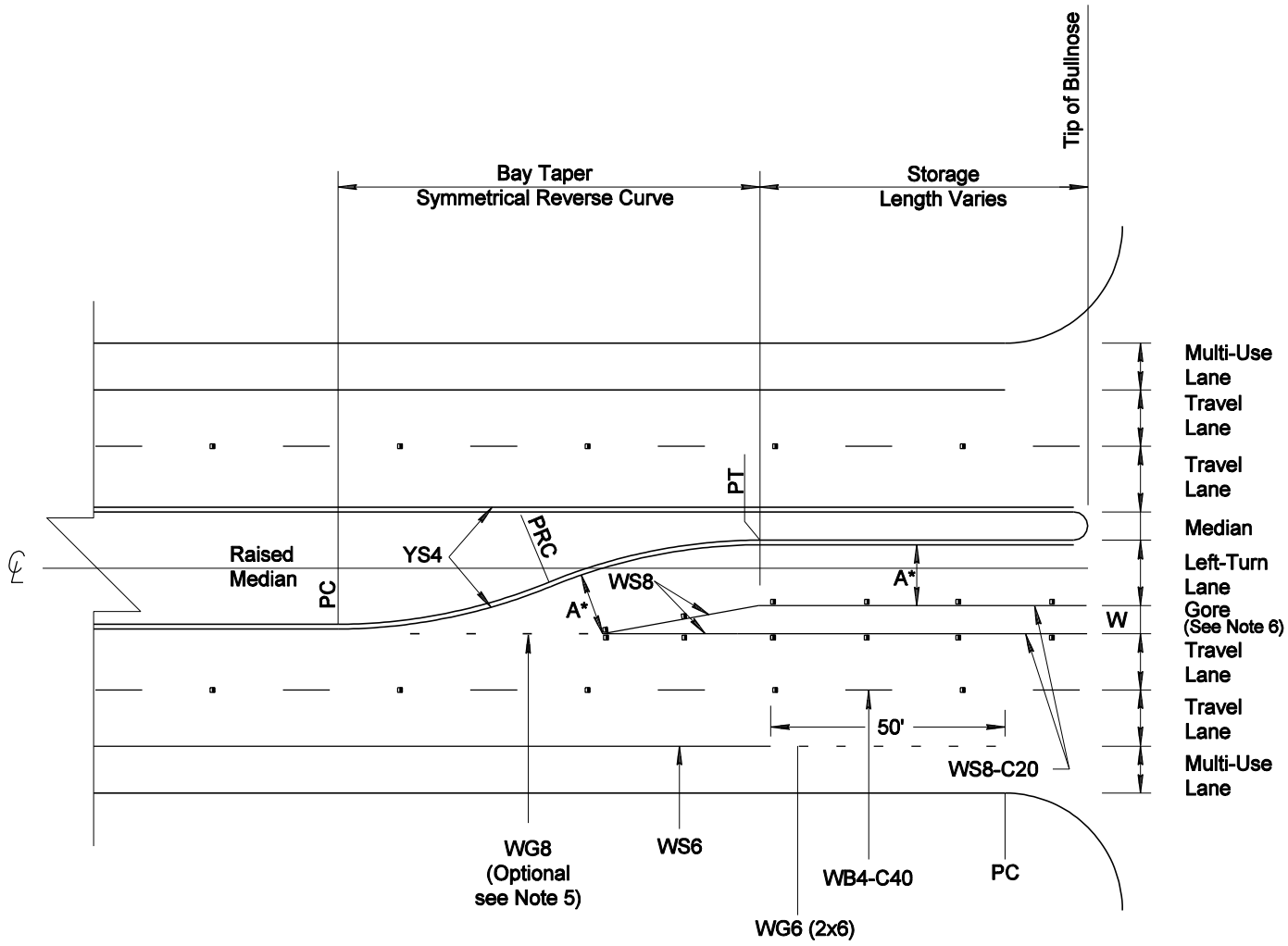
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Trap Right Lane after a major intersection**		SHEET NO. **4-7.1**



Notes:

1. Minimum storage length requirements are provided on Sheet 4-6 of this manual.
2. Turn Bay openings for dual left-turn lanes shall be 120' minimum.
3. For Approach Transitions, see Sheets 4-1.
4. For the placement of pavement arrows and "ONLY" legends, see Sheet 4-12.
5. If Gore is ≥6' wide chevrons are required. (See Sheet 4-4)
6. Pavement Legends are required for dual left turn lanes.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Signalized Dual LT Lane Design Detail**		SHEET NO. **4-8**

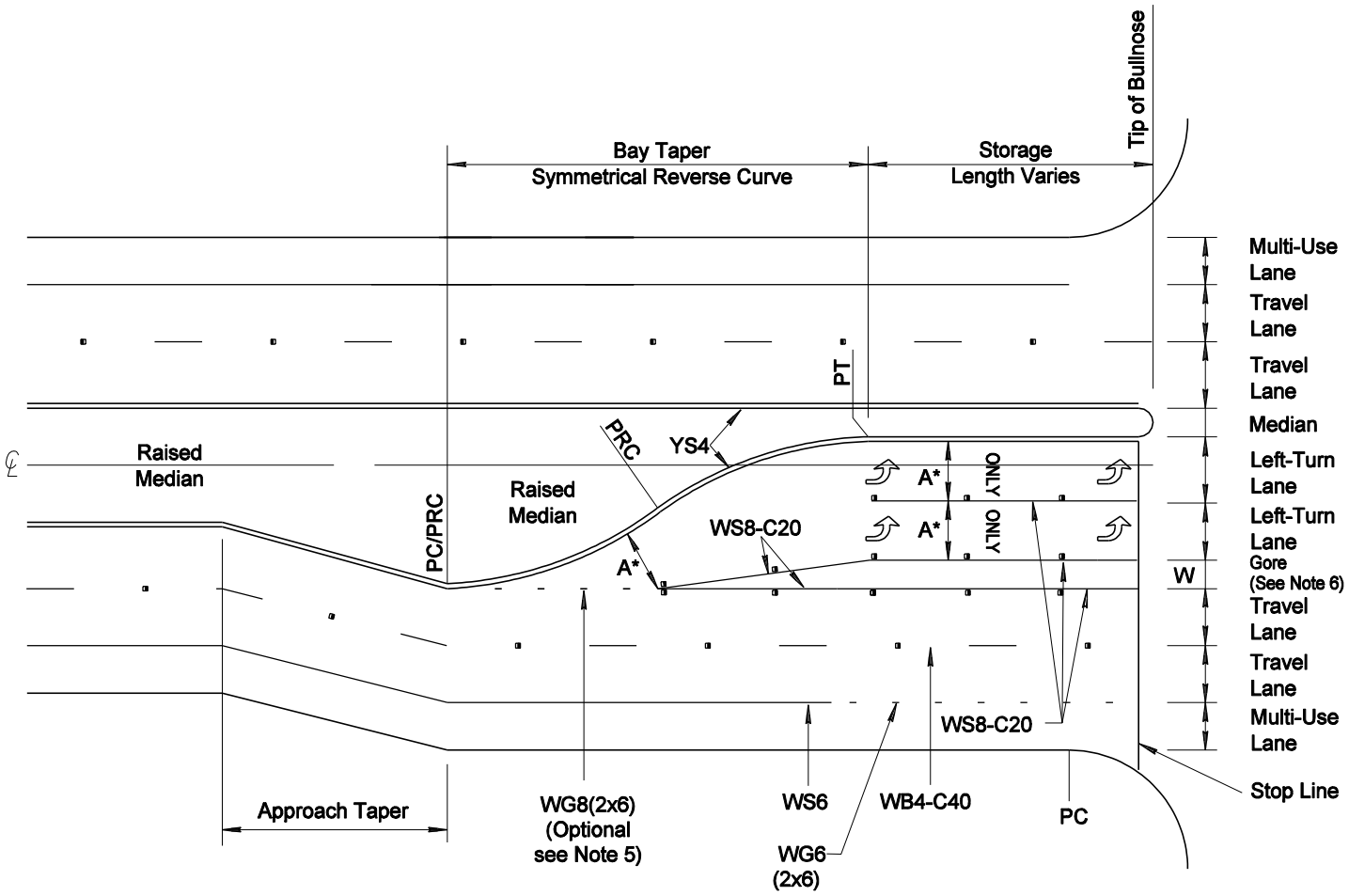


NOTES:

1. For Median Bullnose Markings, see Sheets 5-13 and 5-14.
2. All white reflective RPMs on approach shall be type C (white/red) RPMs for a distance equal to the longest turn bay length (left or right). The spacing of the Type C RPMs shall be every 20 feet for solid white lines and every 40 ft on broken white lines.
3. For typical lane and edgeline dimensions, refer to Sheet 3-4 of this manual and the Pima County Roadway Design Manual.
4. For placement of pavement arrows and "ONLY" legend, see Sheet 4-12.
5. Guide stripe across turn bay opening (2X6) is intended for use on horizontal curves and in areas where extra guidance may be needed, as determined by the Traffic Engineer.
6. Chevrons are required for gore areas ≥6' wide. (See Sheet 4-4.)

* The tapered end of the gore shall be designed so that the width of the lane opening, A, equals the width of the turn lane.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Unsignalized Median Left-Turn Lane Design Detail**		SHEET NO. **4-9**

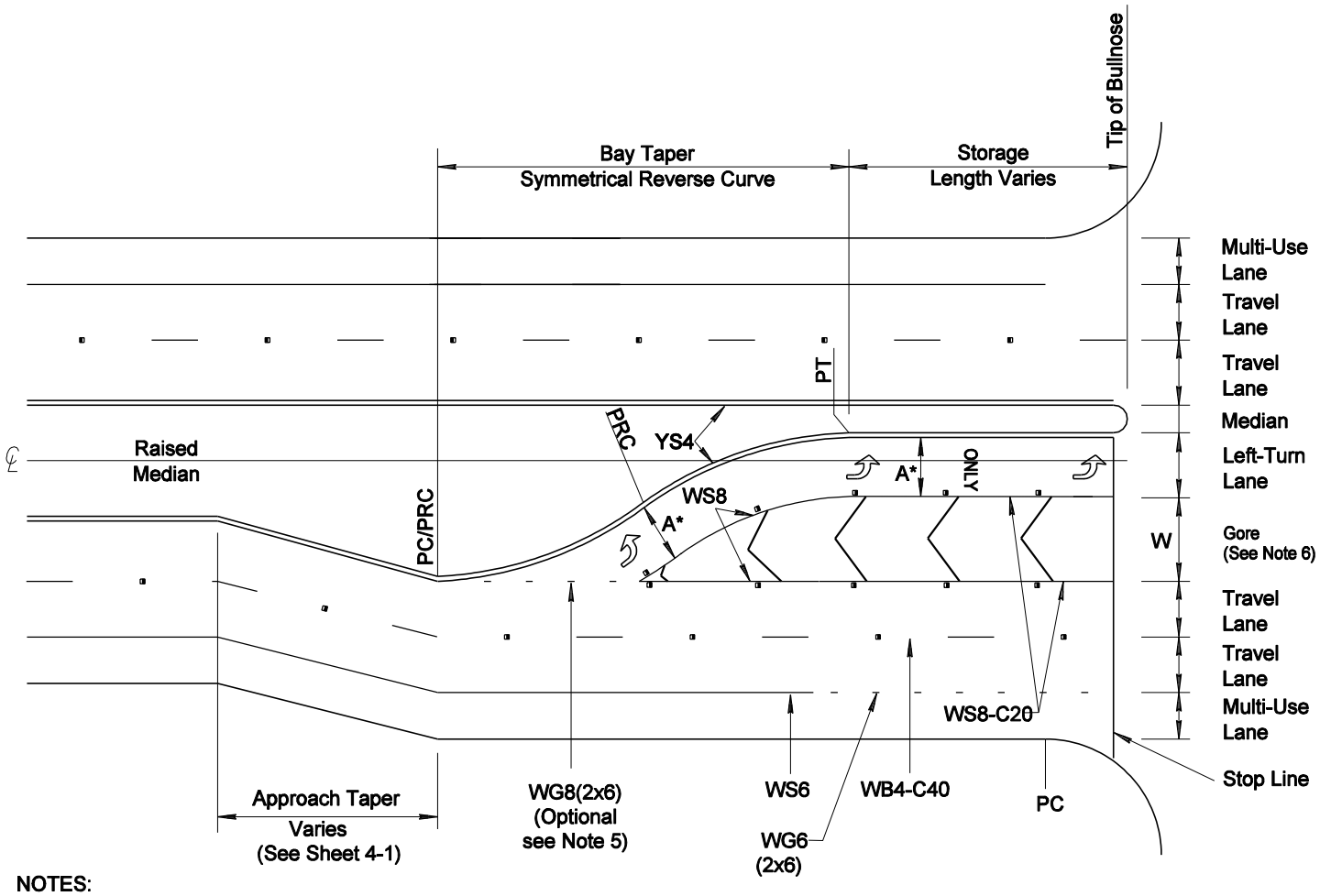


NOTES:

1. For Median Bullnose Markings, see Sheets 5-13 and 5-14.
2. All white reflective RPMs on approach shall be type C (white/red) RPMs for a distance equal to the longest turn bay length (left or right). The spacing of the Type C RPMs shall be every 20 feet for solid white lines and every 40 ft on broken white lines.
3. For typical lane and edgeline dimensions, refer to Sheet 3-4 of this manual and the Pima County Roadway Design Manual.
4. For placement of pavement arrows and "ONLY" legend, see Sheet 4-12. Pavement legends are required for dual left turn bays.
5. Guide stripe across turn bay opening (2X6) is intended for use on horizontal curves and in areas where extra guidance may be needed, as determined by the Traffic Engineer.
6. The minimum gore width for dual left turn lanes shall be 4 ft. Chevrons are required for gore areas >6' wide. (See Sheet 4-4.)

* The tapered end of the gore shall be designed so that the width of the lane opening, A, equals the width of one turn lane.

ISSUED October 2000		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
REVISED August 2008		PAVEMENT MARKING STANDARDS		4-10
		Signalized Dual Left-Turn Lane with Median Design Detail		



NOTES:

1. For Median Bullnose Markings, see Sheets 5-13 and 5-14.
2. All white reflective RPMs on approach shall be type C (white/red) RPMs for a distance equal to the longest turn bay length (left or right). The spacing of the Type C RPMs shall be every 20 feet for solid white lines and every 40 ft on broken white lines.
3. For typical lane and edgeline dimensions, refer to Sheet 3-4 of this manual and the Pima County Roadway Design Manual.
4. For placement of pavement arrows and "ONLY" legend, see Sheet 4-12.
5. Guide stripe across turn bay opening (2X6) is intended for use on horizontal curves and in areas where extra guidance may be needed, as determined by the Traffic Engineer.
6. Chevrons are required for gore areas $\geq$ 6' wide. (See Sheet 4-4.)
7. If second Left Turn Lane is striped out, add one additional left turn arrow at begining of the gore, as shown.

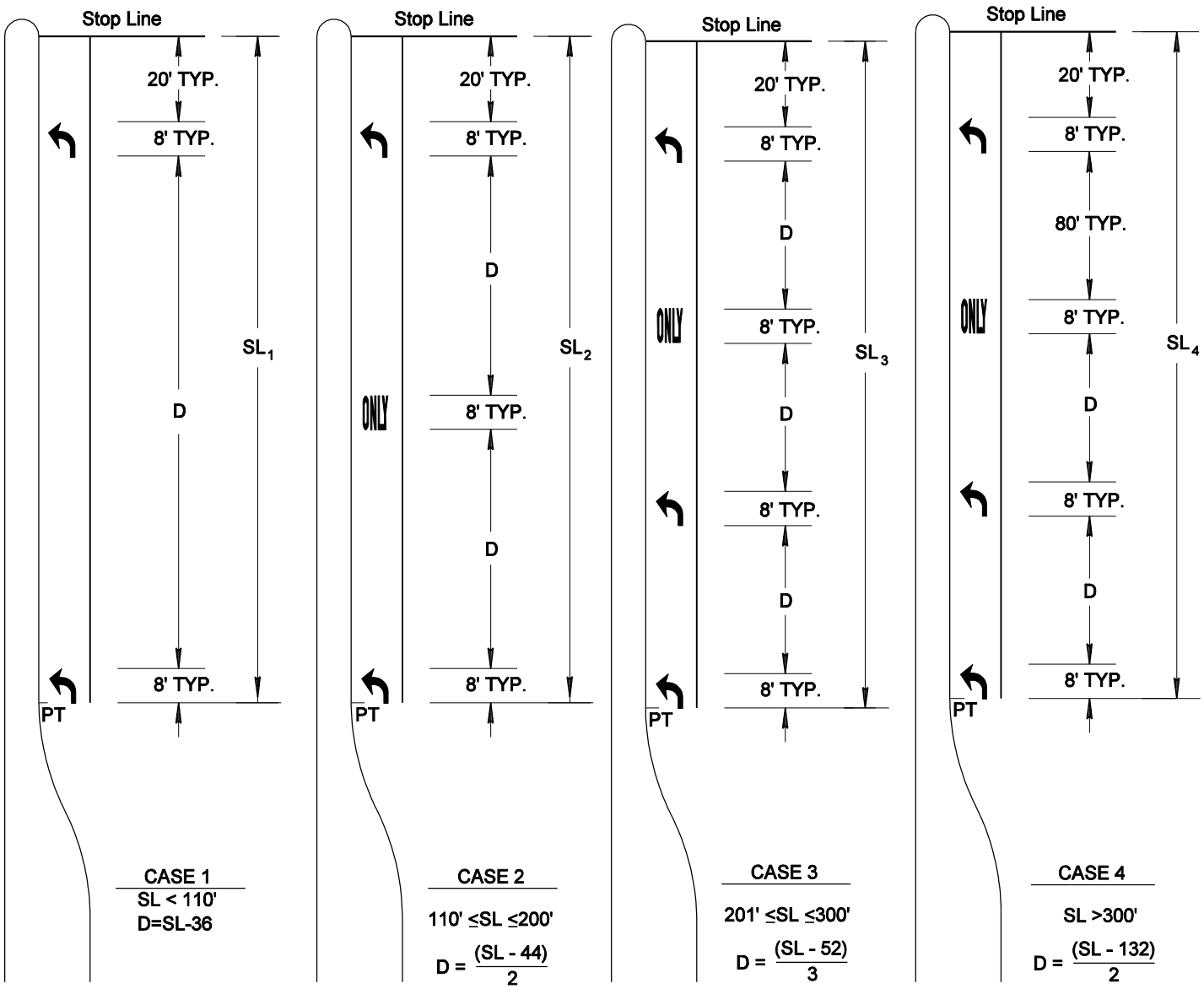
* The tapered end of the gore shall be designed so that the width of the lane opening, A, equals the width of the turn lane.

ISSUED October 2000 **REVISED** August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Signalized Dual Left-Turn Lane with one Left Turn Lane Marked Out**		**SHEET NO.** 4-11

KEY:

SL - Storage Length (feet)

D - Distance between Arrows and Legends (feet)



NOTES:

1. These details also apply to right-turn lanes.
2. For dual turn lanes, dimensions shall be the same for each lane.
3. SL dimension is from stop line to end of turn lane.
4. Pavement arrows and "ONLY" legend markings shall be used at signalized intersections with dual left turn bays. Pavement legends shall be used at single left turn bays at signalized intersections within County jurisdiction. Pavement legends may be used at single left turn bays within City jurisdiction at the discretion of the Traffic Engineer.
5. Right turn bays equal to 50' or less may use single arrow legend 20' from stop line.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Spacing between Pavement Arrows and "ONLY" Legend for Turn Lanes**		SHEET NO. **4-12**

NOTES:

1. D is the distance from the beginning of the turn lane to the W9-2 sign. D is the Advance Placement Distance for Condition A in Table 2C-4 of the 2009 MUTCD (based on the December 2007 Notice of Proposed Amendments to the MUTCD). (See table below or Appendix A1 of this manual.)

2. Design speed minus 5 mph may be substituted for posted speed limit.

3. Ensure that proper advance warning distance for signing is attained. If presence of intersections reduces pavement length, use available distance proportionally for merge arrow placement. See Note 4.

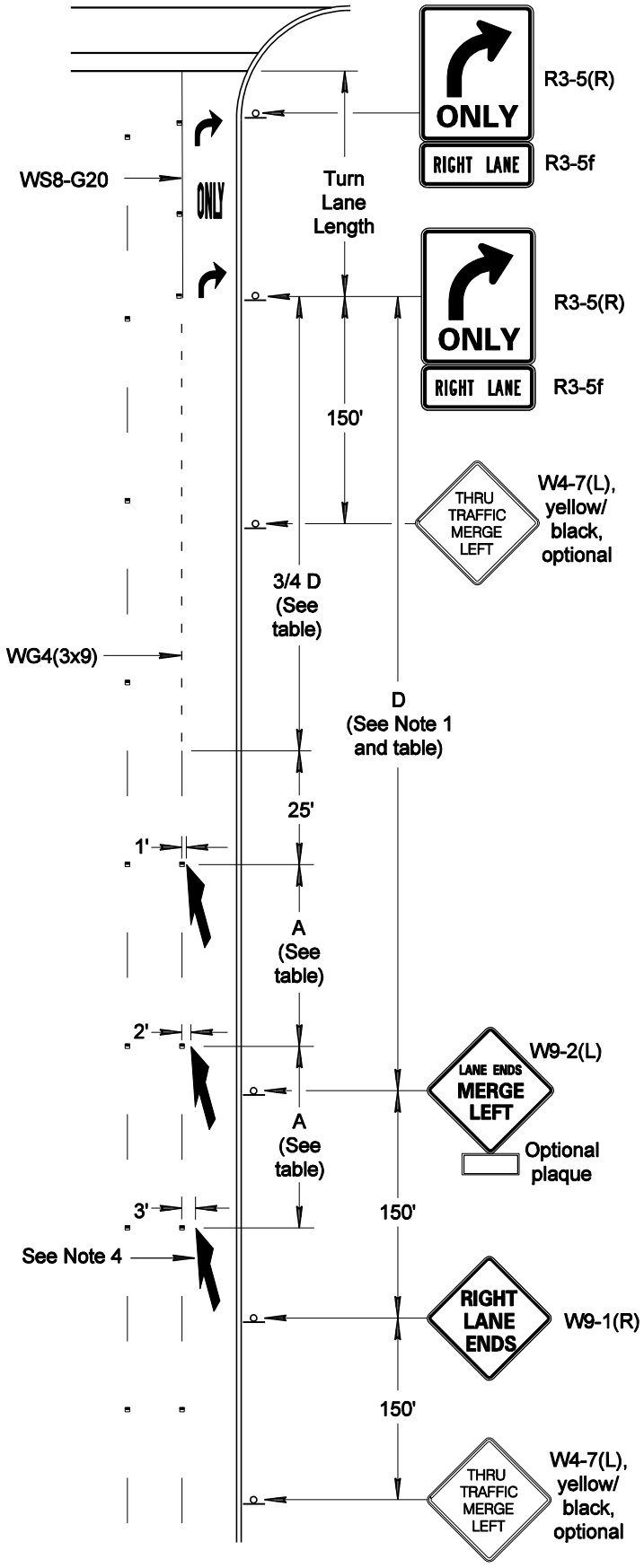
4. A minimum of two merge arrows should be installed. However, the standard is three arrows.

5. See Merge Arrow Detail, Sheet 2-10. Merge Arrows should point halfway between painted portions of broken lane lines.

6. RPMs G20 may be required along lane divider of Turn Bay at the discretion of the Traffic Engineer, providing there is no multi-use / bike lane or bike shoulder. See Sheet 4-13.2 for trap lane with multi-use / bike lane.

Posted speed (mph)	Advance Placement Distance, D (ft)	Merge arrow spacing, A (ft)	
25	325	40	*
30	460	40	
35	565	40	
40	670	80	*
45	775	80	
50	885	80	
55	990	120	*
60	1100	120	
65	1200	120	

* Merge arrows will begin before W9-2 sign.



ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
October 2000		PAVEMENT MARKING STANDARDS		4-13
REVISED August 2008		Right Trap Lane Markings and Signing		

NOTES:

1. D is the distance from the beginning of the turn lane to the W9-2 sign. D is the Advance Placement Distance for Condition A in Table 2C-4 of the 2009 MUTCD (based on the December 2007 Notice of Proposed Amendments to the MUTCD). (See table below or Appendix A1 of this manual.)

2. Design speed minus 5 mph may be substituted for posted speed limit.

3. Ensure that proper advance warning distance for signing is attained. If presence of intersections reduces pavement length, use available distance proportionally for merge arrow placement. See Note 4.

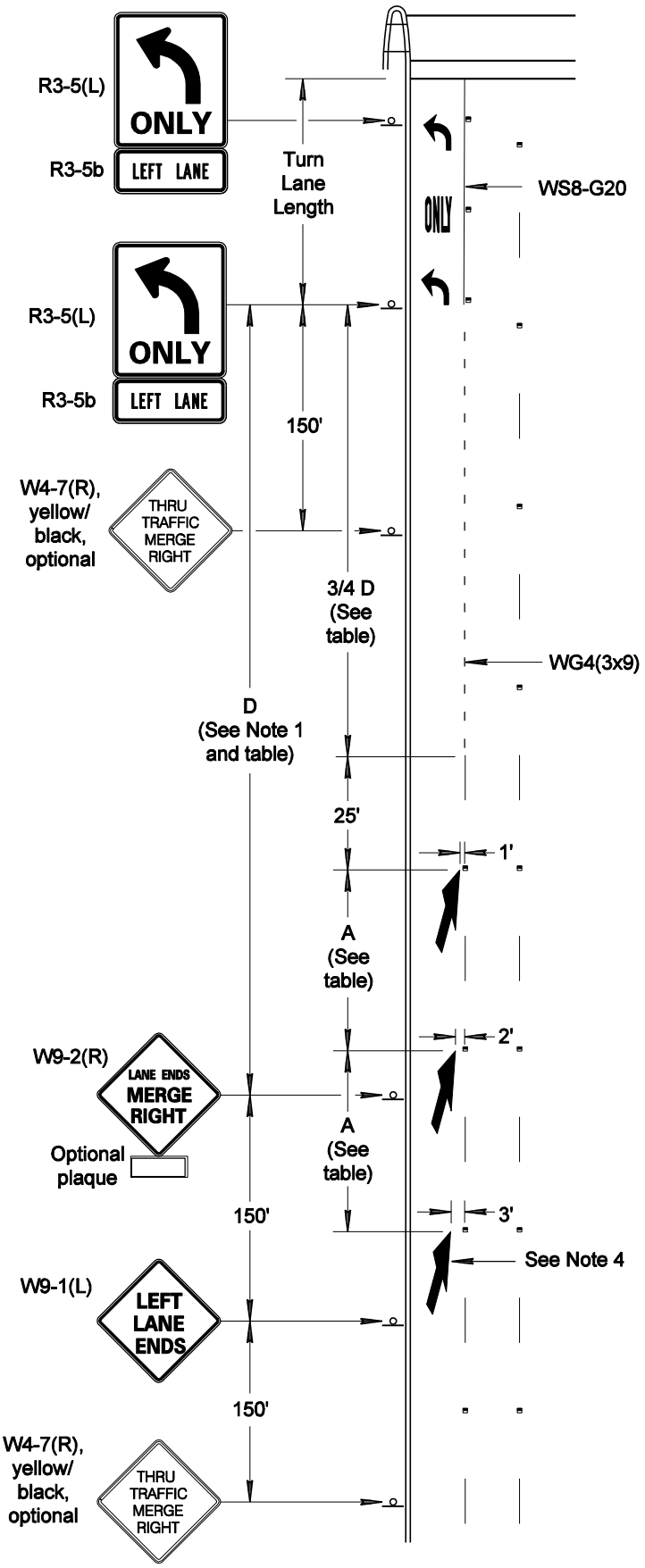
4. A minimum of two merge arrows should be installed. However, the standard is three arrows.

5. See Merge Arrow Detail, Sheet 2-10. Merge Arrows should point halfway between painted portions of broken lane lines.

6. RPMs G20 may be required along lane divider of Turn Bay at the discretion of the Traffic Engineer.

Posted speed (mph)	Advance Placement Distance, D (ft)	Merge arrow spacing, A (ft)	
25	325	40	*
30	460	40	
35	565	40	
40	670	80	*
45	775	80	
50	885	80	
55	990	120	*
60	1100	120	
65	1200	120	

* Merge arrows will begin before W9-2 sign.



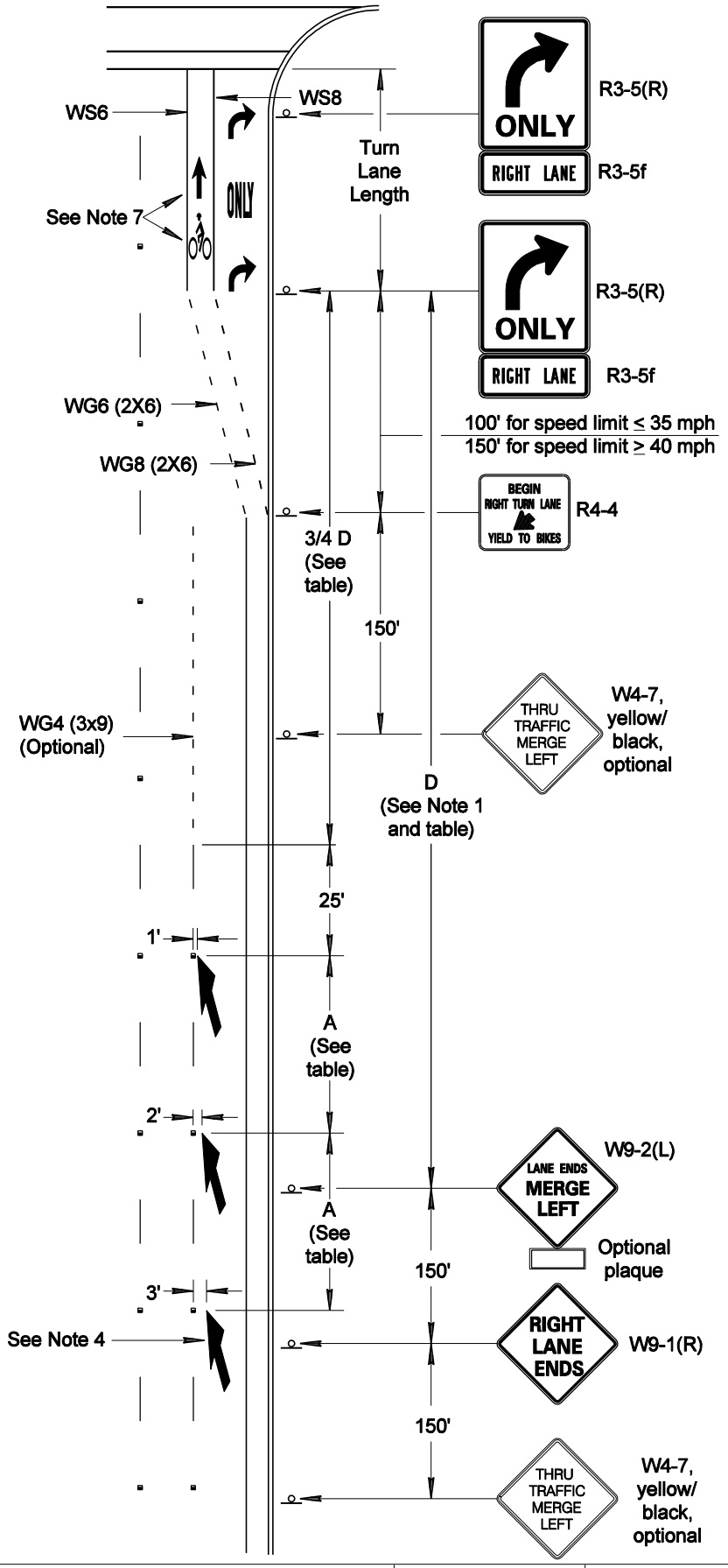
ISSUED August 2008 REVISED		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Left Trap Lane Markings and Signing	SHEET NO. 4-13.1

NOTES:

1. D is the distance from the beginning of the turn lane to the W9-2 sign. D is the Advance Placement Distance for Condition A in Table 2C-4 of the 2009 MUTCD (based on the December 2007 Notice of Proposed Amendments to the MUTCD). (See table below or Appendix A1 of this manual.)
2. Design speed minus 5 mph may be substituted for posted speed limit.
3. Ensure that proper advance warning distance for signing is attained. If presence of intersections reduces pavement length, use available distance proportionally for merge arrow placement. See Note 4.
4. A minimum of two merge arrows should be installed. However, the standard is three arrows.
5. See Merge Arrow Detail, Sheet 2-10. Merge Arrows should point halfway between painted portions of broken lane lines.
6. Do not use RPMs on lane lines adjacent to bike lanes, per 2003 MUTCD, section 9C.04.
7. Bike-lane symbols are optional.

Posted speed (mph)	Advance Placement Distance, D (ft)	Merge arrow spacing, A (ft)	
25	325	40	*
30	460	40	
35	565	40	
40	670	80	*
45	775	80	
50	885	80	
55	990	120	*
60	1100	120	
65	1200	120	

* Merge arrows will begin before W9-2 sign.



ISSUED August 2008 REVISED		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Trap Lane with Multi-Use / Bike Lane	SHEET NO. 4-13.2

NOTES:

1. D is the distance from Taper Angle Point or PC to the W9-2 sign. D is the Advance Placement Distance for Condition A in Table 2C-4 of the 2009 MUTCD (based on the December 2007 Notice of Proposed Amendments to the MUTCD). (See table below or Appendix A1 of this manual.)

2. Design speed minus 5 mph may be substituted for posted speed limit.

3. Ensure that proper advance warning distance for signing is attained. If presence of intersections reduces pavement length, use available distance proportionally for merge arrow placement. See Note 4.

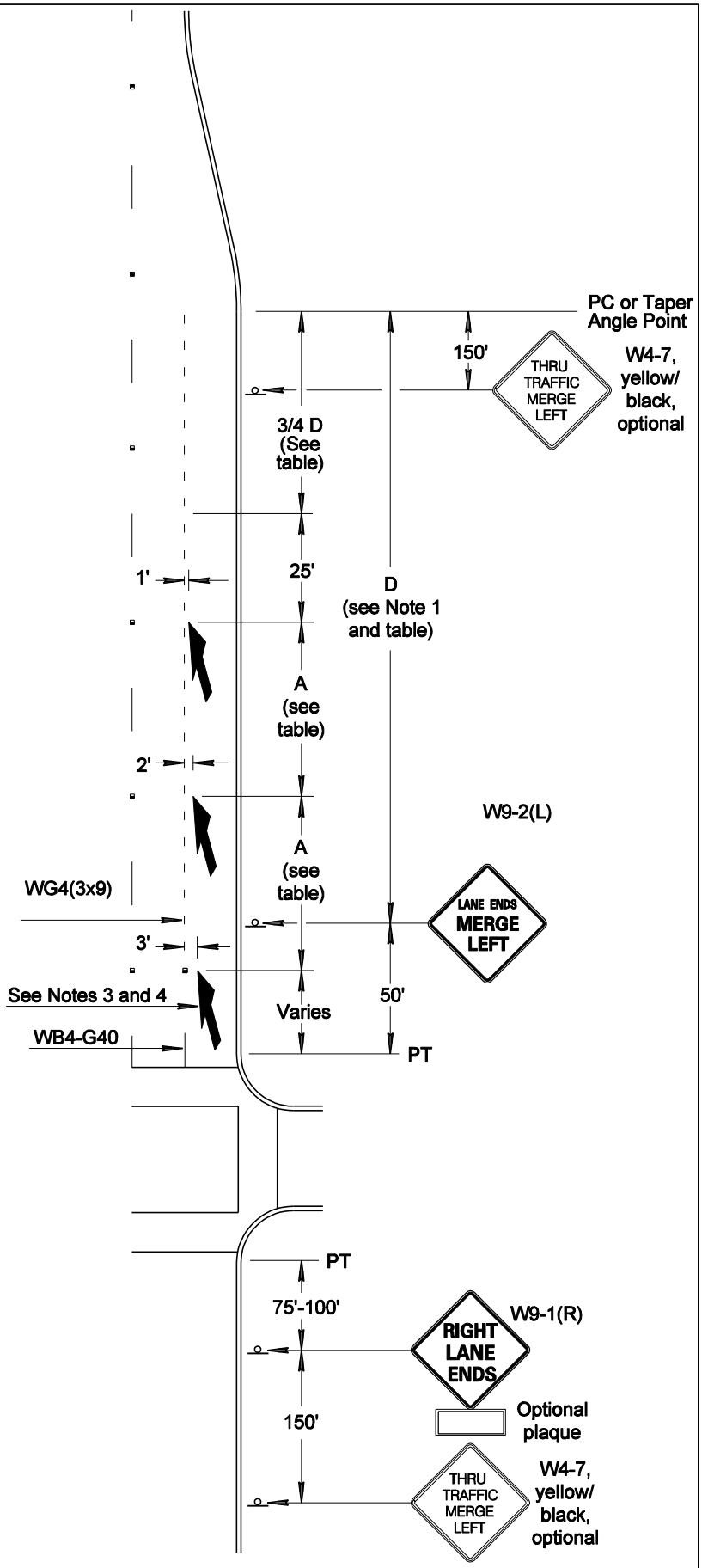
4. A minimum of two merge arrows should be installed. However, the standard is three arrows.

5. See Merge Arrow Detail, Sheet 2-10. Merge Arrows should point halfway between painted portions of broken lane lines.

6. Except for low-speed urban roadways, where curbs clearly define the roadway edge in the lane reduction transition, edge line markings should be installed from the location of the warning sign to beyond the beginning of the narrower roadway.

Posted speed (mph)	Advance Placement Distance, D (ft)	Merge arrow spacing, A (ft)	
25	325	40	*
30	460	40	
35	565	40	
40	670	80	*
45	775	80	
50	885	80	
55	990	120	*
60	1100	120	
65	1200	120	

* Merge arrows will begin before W9-2 sign.



ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Lane Drop After an Intersection Marking and Signing Details	SHEET NO. 4-14

NOTES:

1. D is the distance from Taper Angle Point or PC to the W9-2 sign. D is the Advance Placement Distance for Condition A in Table 2C-4 of the 2009 MUTCD (based on the December 2007 Notice of Proposed Amendments to the MUTCD). (See table below or Appendix A1 of this manual.)

2. Design speed minus 5 mph may be substituted for posted speed limit.

3. Ensure that proper advance warning distance for signing is attained. If presence of intersections reduces pavement length, use available distance proportionally for merge arrow placement. See Note 4.

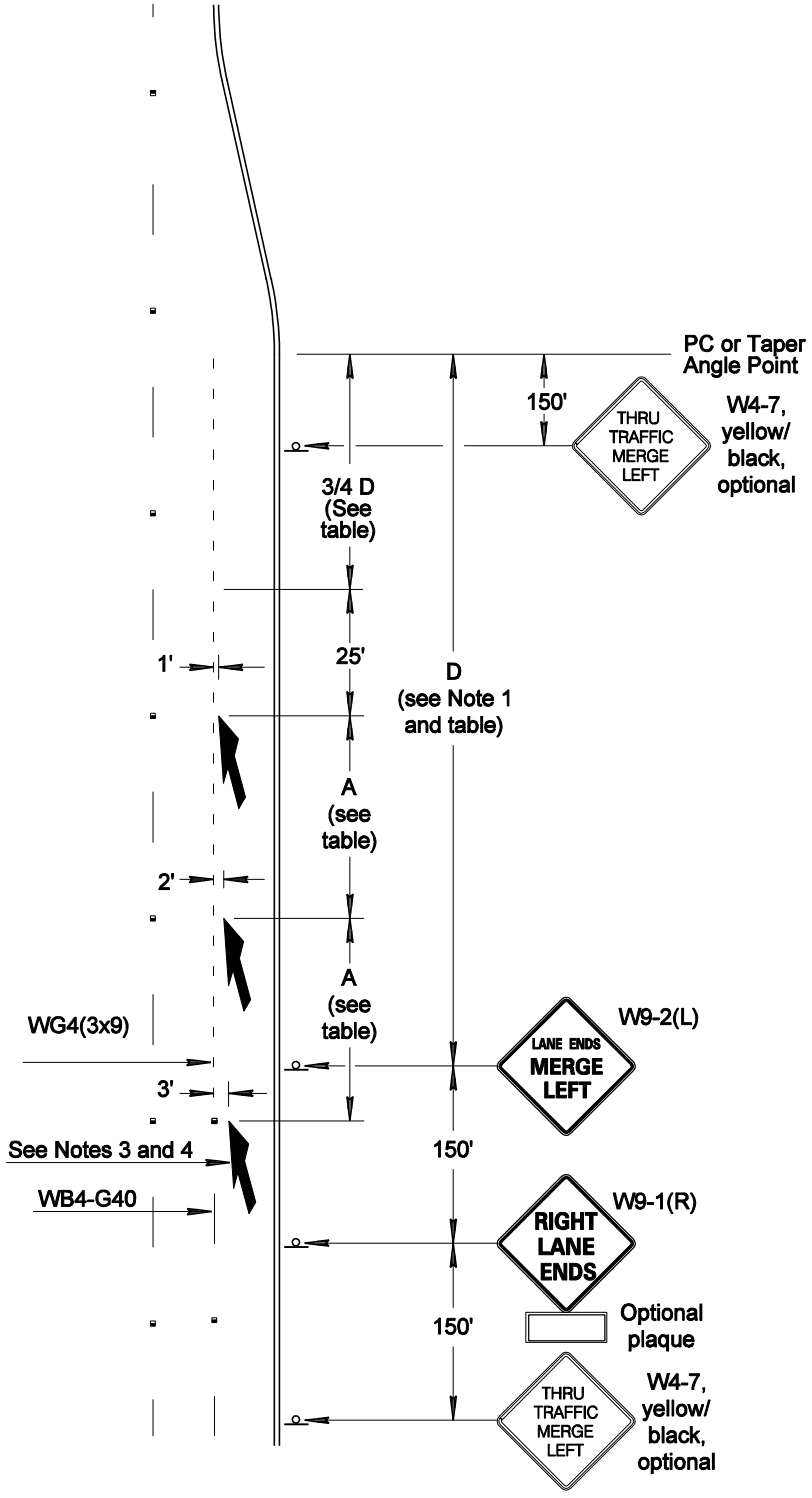
4. A minimum of two merge arrows should be installed. However, the standard is three arrows.

5. See Merge Arrow Detail, Sheet 2-10. Merge Arrows should point halfway between painted portions of broken lane lines.

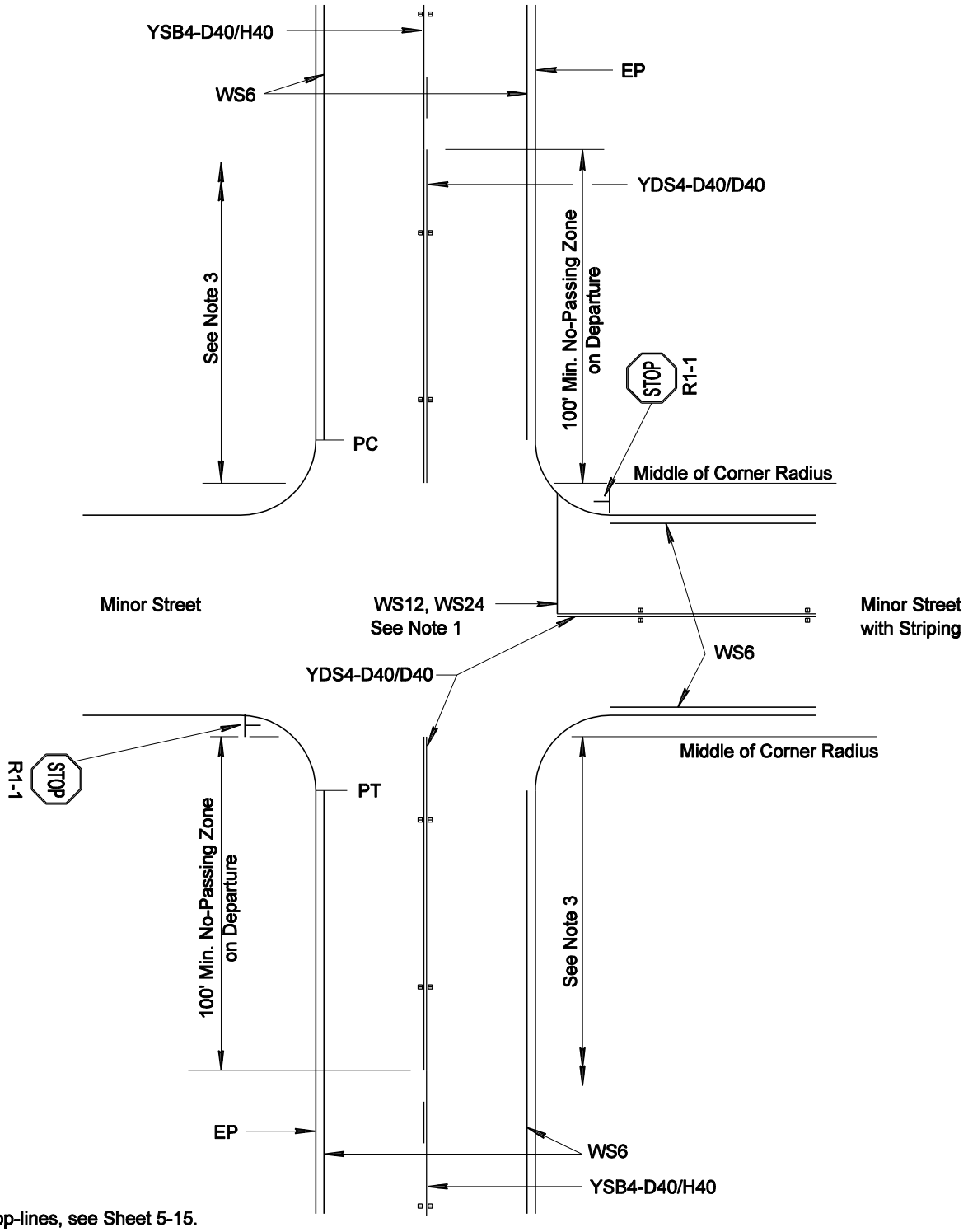
6. Except for low-speed urban roadways, where curbs clearly define the roadway edge in the lane reduction transition, edge line markings should be installed from the location of the warning sign to beyond the beginning of the narrower roadway.

Posted speed (mph)	Advance Placement Distance, D (ft)	Merge arrow spacing, A (ft)	
25	325	40	*
30	460	40	
35	565	40	
40	670	80	*
45	775	80	
50	885	80	
55	990	120	*
60	1100	120	
65	1200	120	

* Merge arrows will begin before W9-2 sign.



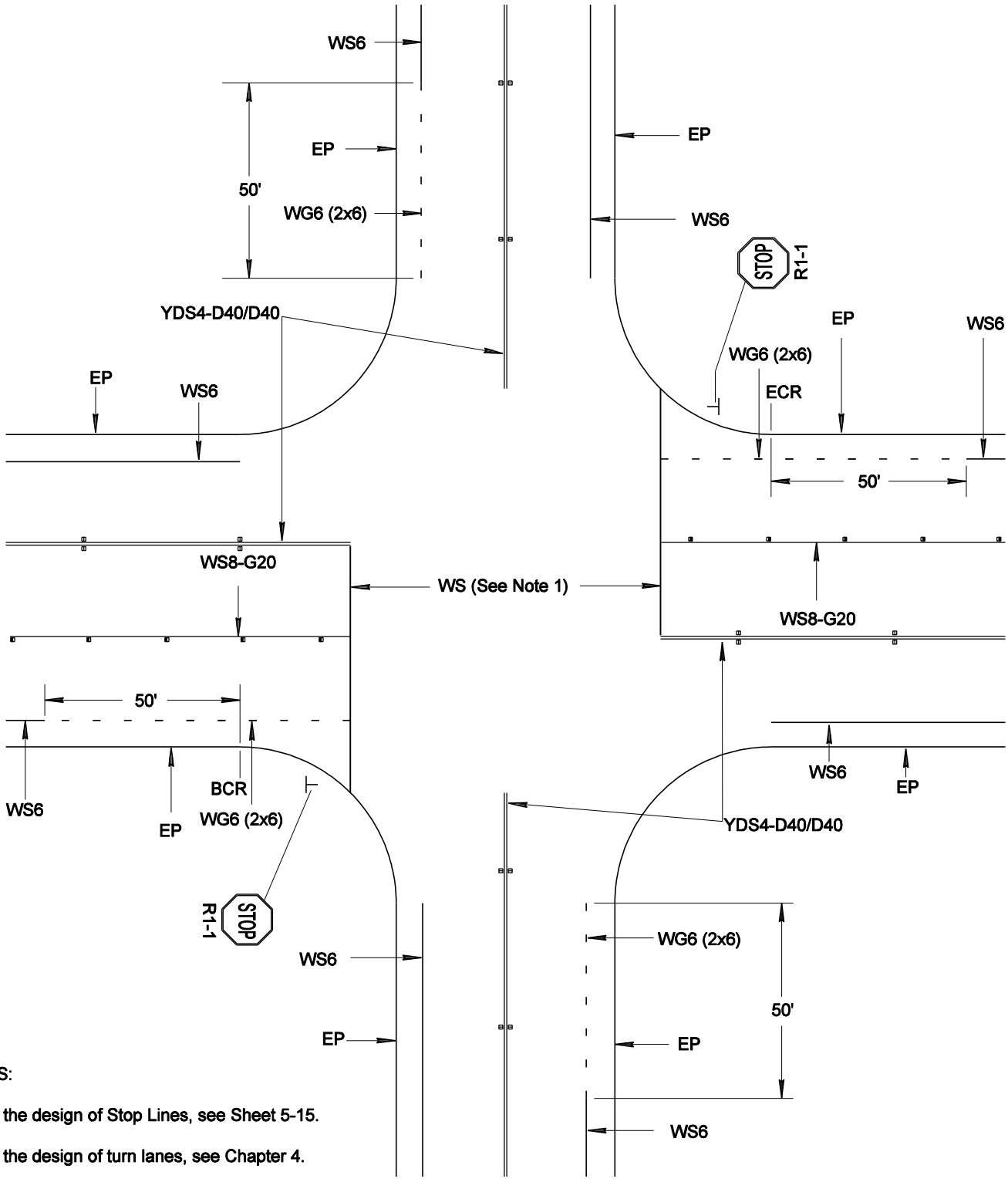
ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
October 2000		PAVEMENT MARKING STANDARDS		4-15
REVISED August 2008		Lane Drop Not After an Intersection Marking and Signing Details		



NOTES:

1. For design of stop-lines, see Sheet 5-15.
2. For the design of edgelines, see Sheet 3-8.
3. For the length of the No Passing Zone striping on the approach, see Appendix A-2.

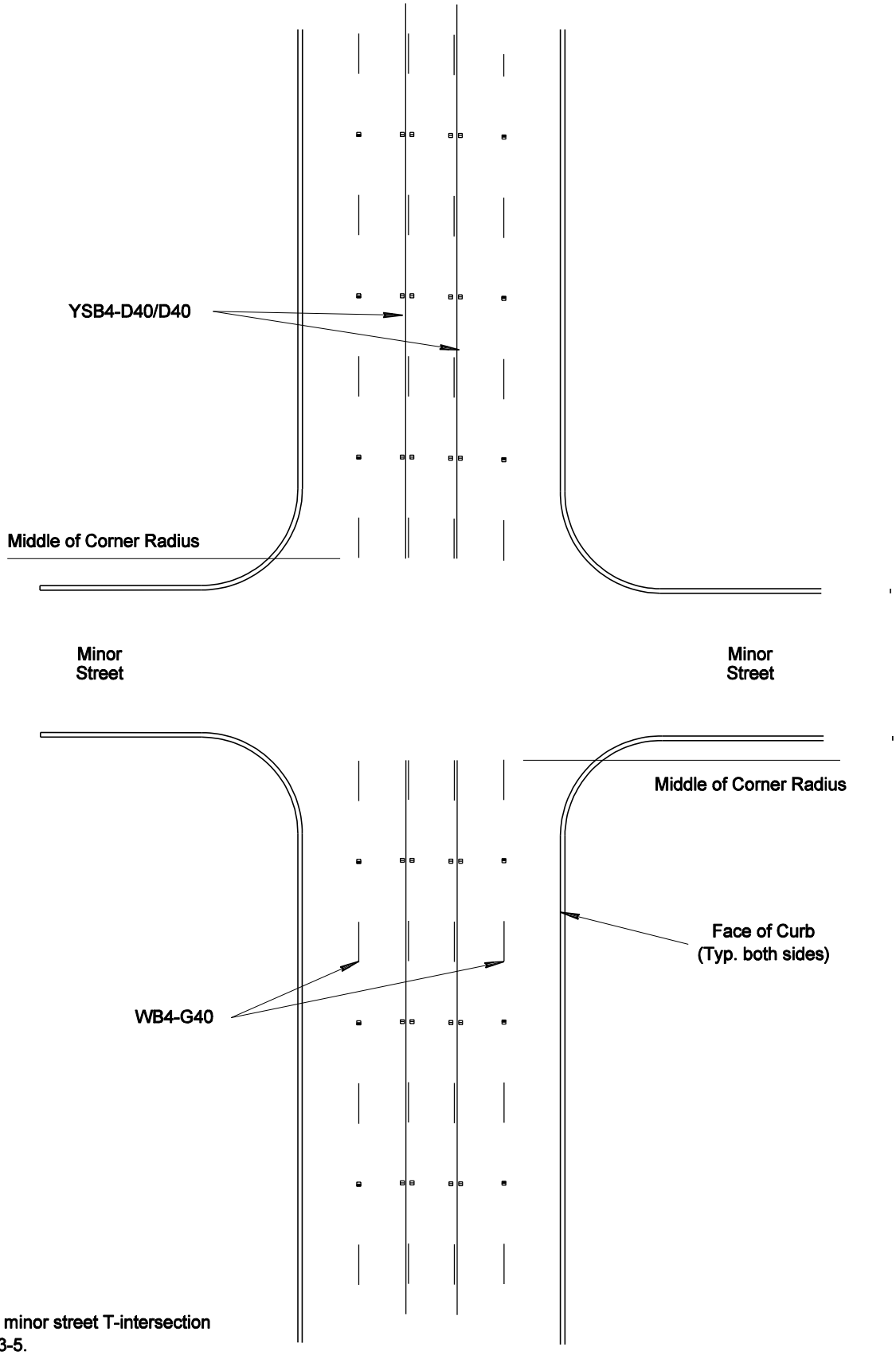
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Minor Street Intersection on a Two-Way Two-Lane Street**		SHEET NO. **5-1**



NOTES:

1. For the design of Stop Lines, see Sheet 5-15.
2. For the design of turn lanes, see Chapter 4.
3. For the design of edgelines, see Sheet 3-8.

ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
October 2000		PAVEMENT MARKING STANDARDS		5-2
REVISED August 2008		Typical 4-Legged Intersection with Two-Way Stop Sign Control		

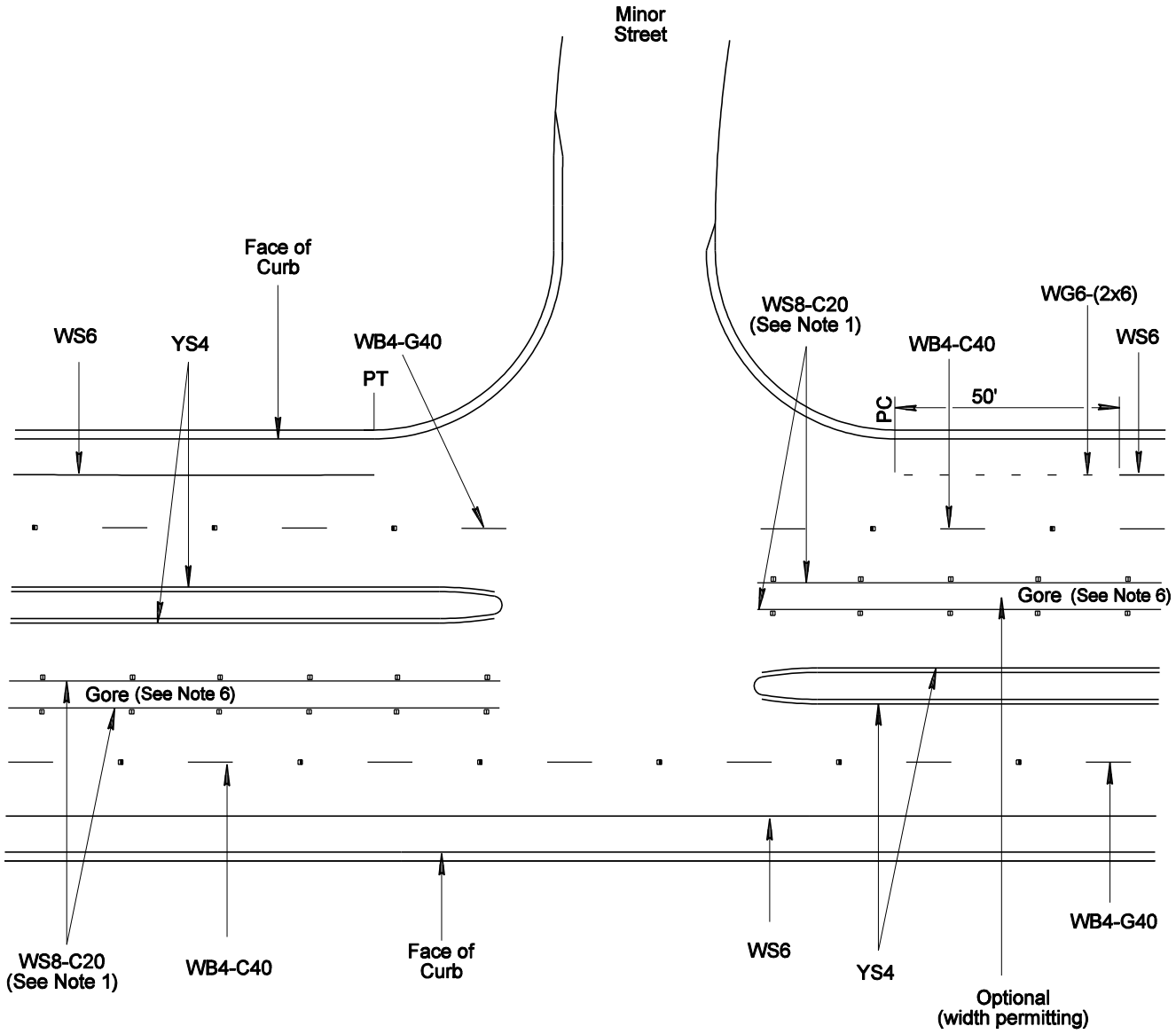


NOTES:

1. Typical marking for a minor street T-intersection are shown on Sheet 3-5.

2. If bike lane is present see sheet 3-8 Detail B.

ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Typical Minor Street Intersection on a Five-Lane Section		SHEET NO. 5-3



NOTES:

1. RPM placement begins at the start of the turn lane (direction of travel) and the number of RPMs depends on the length of the storage lanes.

2. All white reflective RPMs on the approach shall be Type C (White/Red) RPMs for a distance equal to the longest turn bay length (right or left). The spacing of the Type C RPMs shall be every 20 feet on solid white lines (WS8-C20) and every 40 feet on broken white lines (WB4-C40).

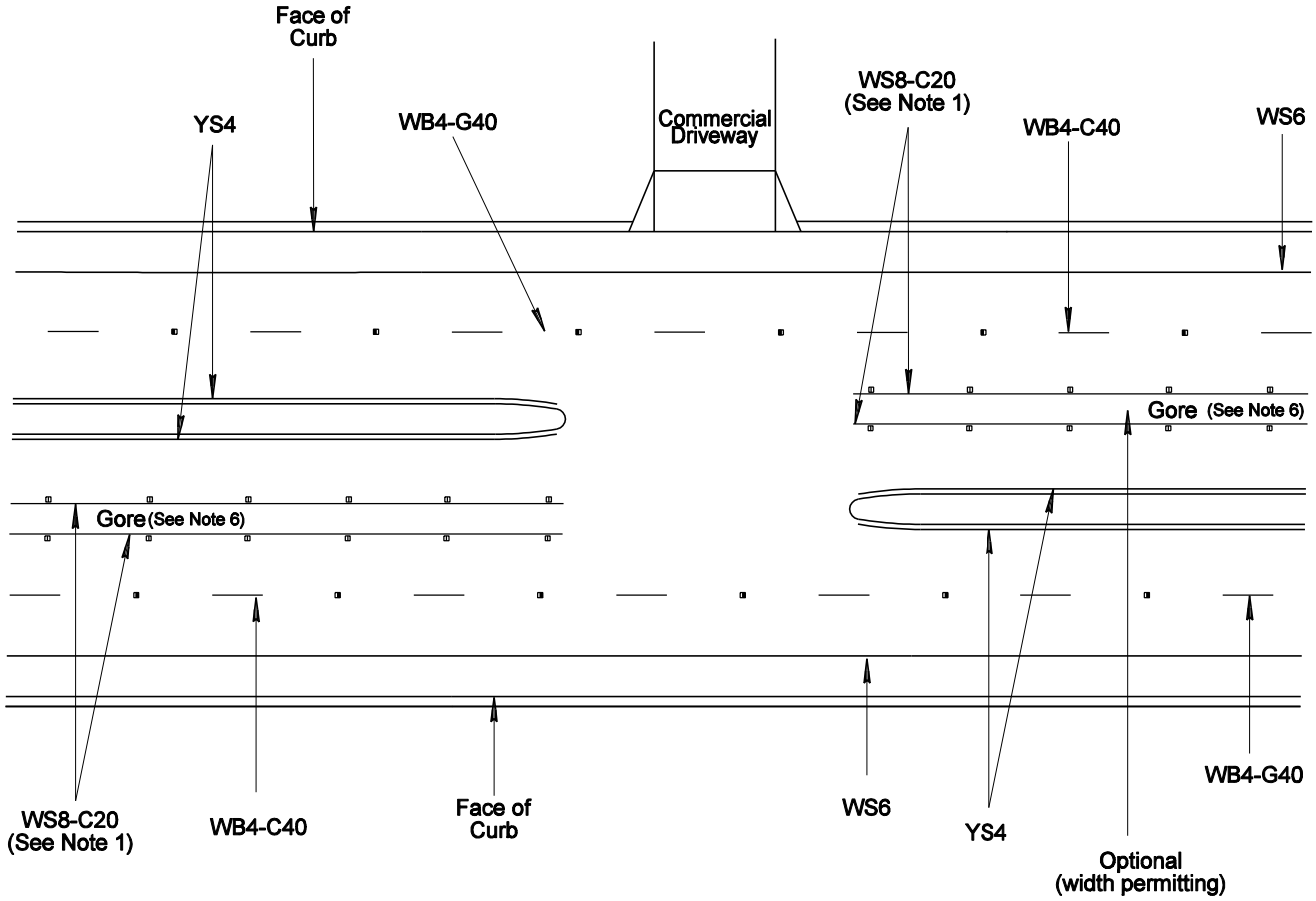
3. For the design of turn lanes and turn lane markings, see Chapter 4.

4. For the design of median end treatments, see Sheets 5-13 and 5-14.

5. For the design of edgelines, see Sheet 3-8.

6. Gore is optional if used and is ≥ 6' wide chevrons are required (See Sheet 4-4).

ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Typical Median Opening at Minor Side Street, T-Intersection		SHEET NO. 5-4



NOTES:

1. RPM placement begins at the start of the turn lane (direction of travel) and the number of RPMs depends on the length of the storage lanes.

2. All white reflective RPMs on the approach shall be Type C (White/Red) RPMs for a distance equal to the longest turn bay length (right or left). The spacing of the Type C RPMs shall be every 20 feet on solid white lines (WS8-C20) and every 40 feet on broken white lines (WB4-C40).

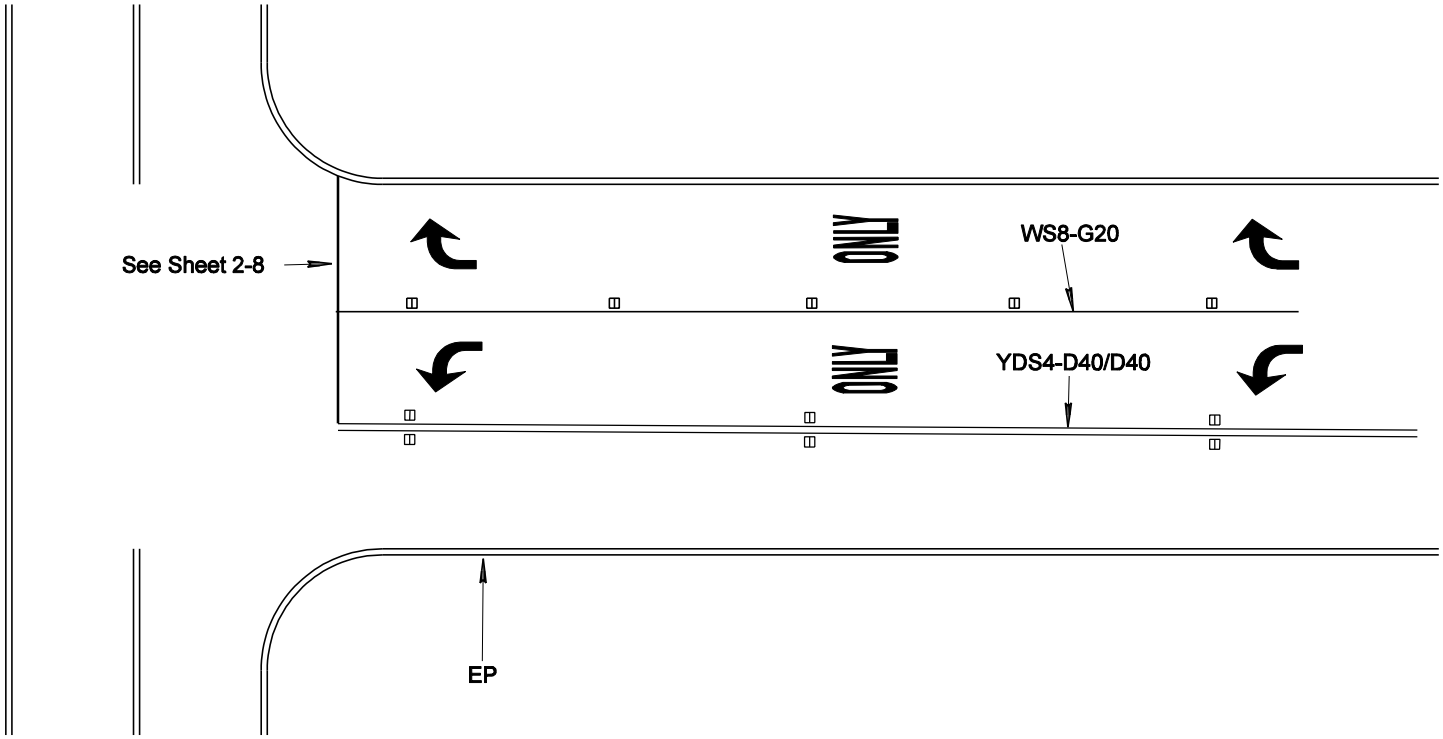
3. For the design of turn lanes and turn lane markings, see Chapter 4.

4. For the design of median end treatments, see Sheets 5-13 and 5-14.

5. For the design of edgelines, see Sheet 3-8.

6. Chevrons are required for gore areas ≥ 6' wide (See Sheet 4-4).

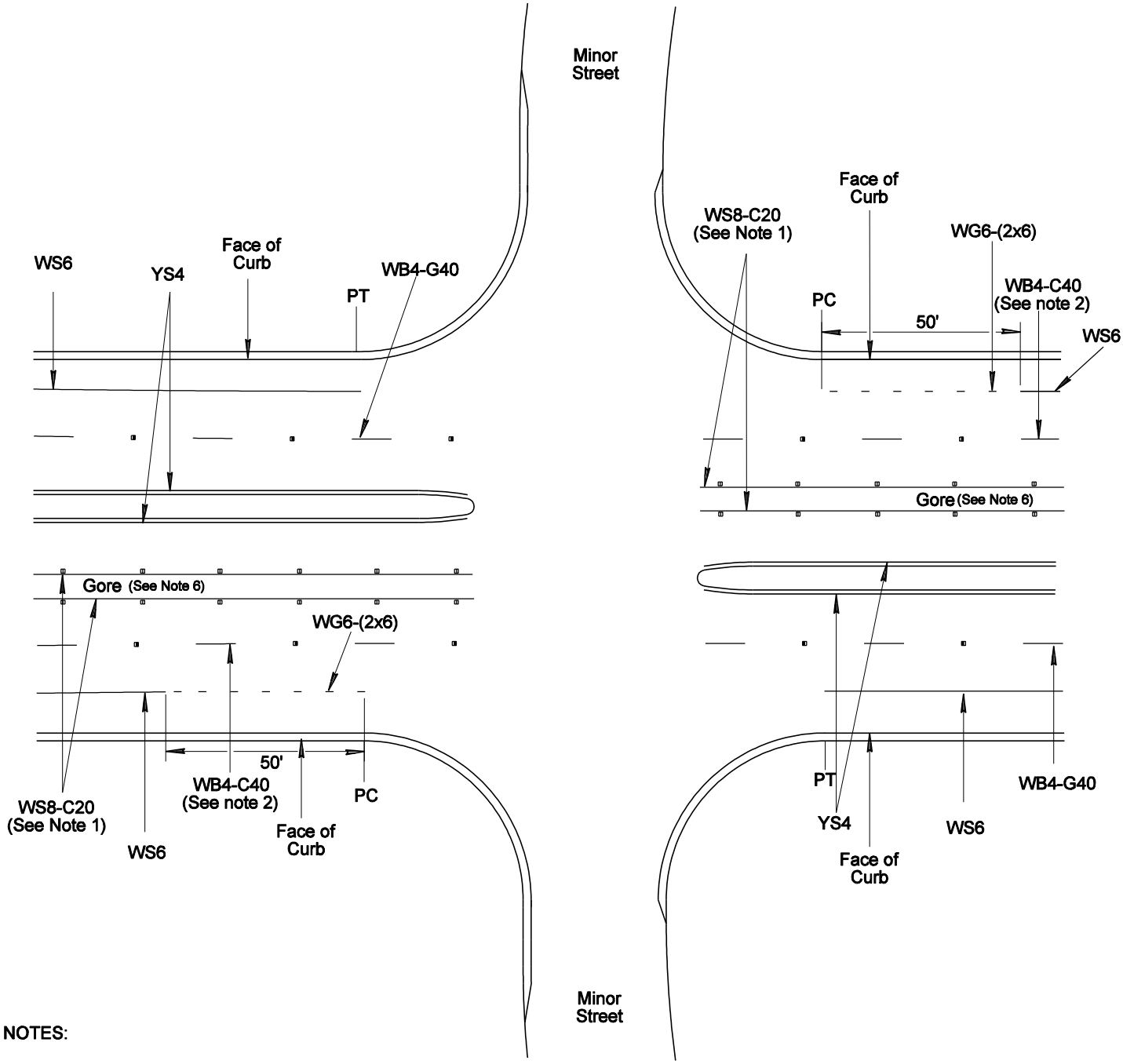
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Median Opening at Commercial Driveway**		SHEET NO. **5-5**



NOTES:

1. For Legends, see Turn Bay design Sheet 4-12.
2. Lane assignment sign R3-8b may be needed if directed by the Traffic Engineer.
3. For Stop Line placement, see Sheet 5-15.

ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Unsignalized Intersection** **T Intersection Collector and Collector/Arterial**	CITY OF TUCSON FOUNDED 1776	SHEET NO. **5-6**



NOTES:

1. RPM placement begins at the start of the turn lane (direction of travel) and the number of RPMs depends on the length of the storage lanes.

2. All white reflective RPMs on the approach shall be Type C (White/Red) RPMs for a distance equal to the longest turn bay length (right or left). The spacing of the Type C RPMs shall be every 20 feet on solid white lines (WS8-C20) and every 40 feet on broken white lines (WB4-C40).

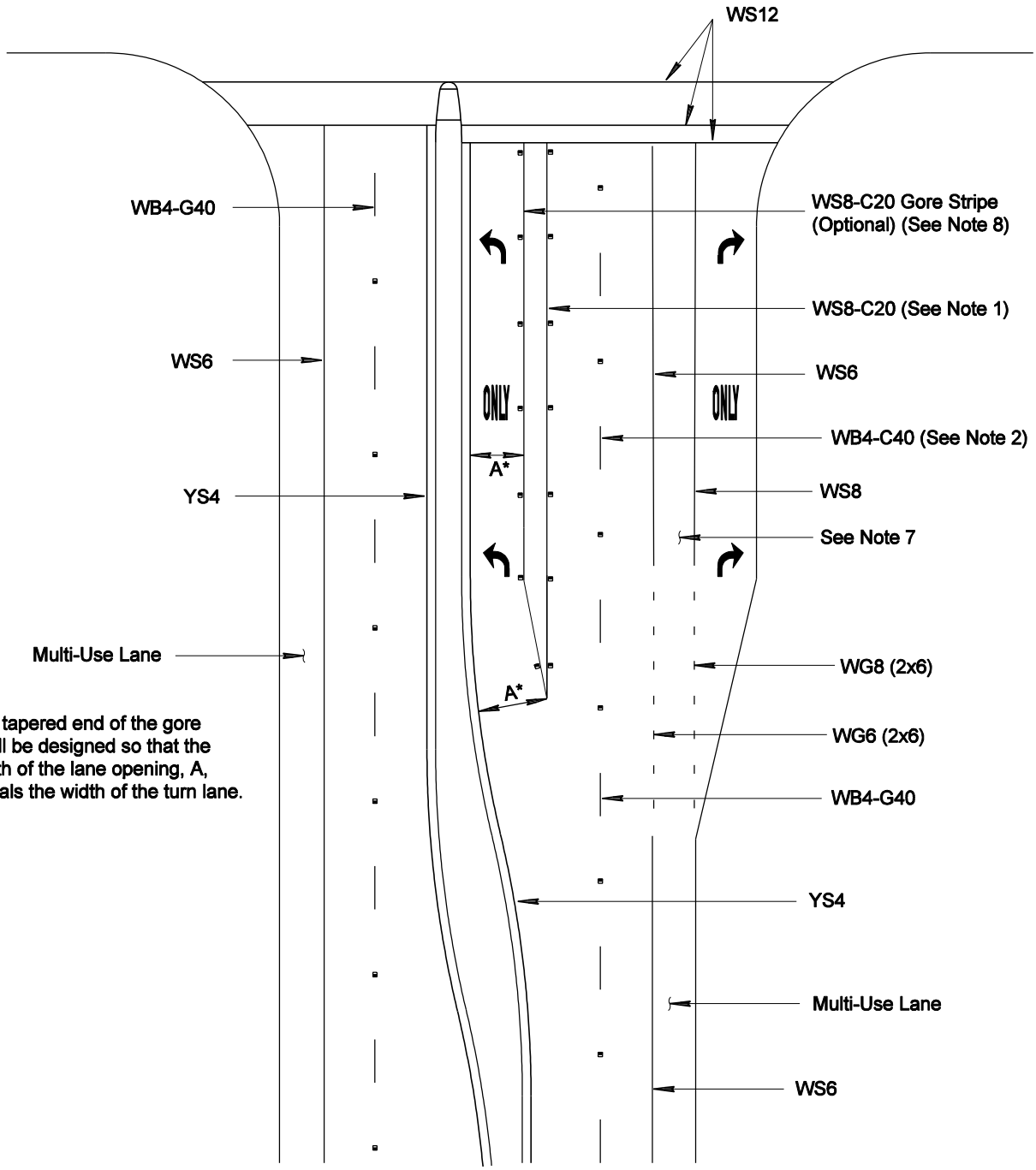
3. For the design of turn lanes and turn lane markings, see Chapter 4.

4. For the design of median end treatments, see Sheets 5-13 and 5-14.

5. For the design of edgelines, see Sheet 3-8.

6. Chevrons are required for gore areas ≥ 6' wide (See Sheet 4-4).

ISSUED October 2000 **REVISED** August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Median Opening at Minor Cross-Street, 4-Legged Intersection**		**SHEET NO.** 5-7

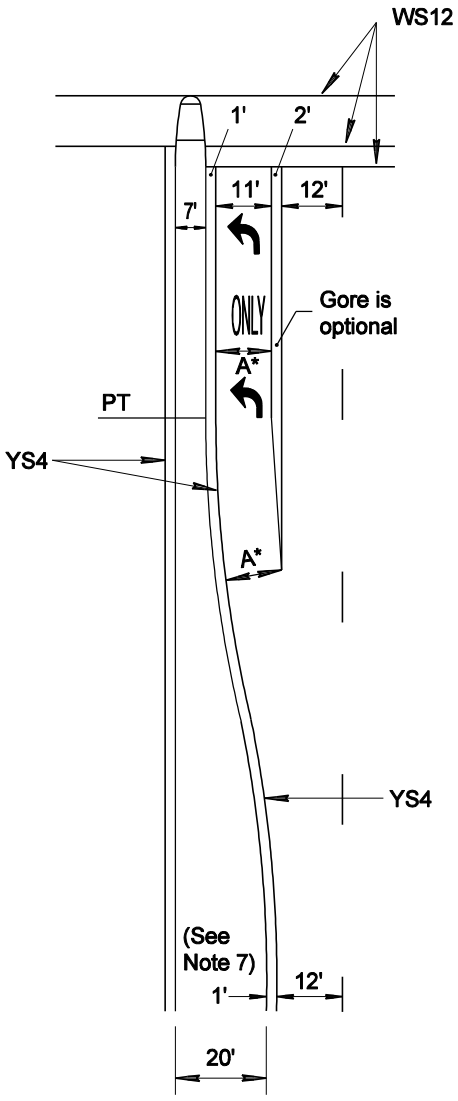


* The tapered end of the gore shall be designed so that the width of the lane opening, A, equals the width of the turn lane.

NOTES:

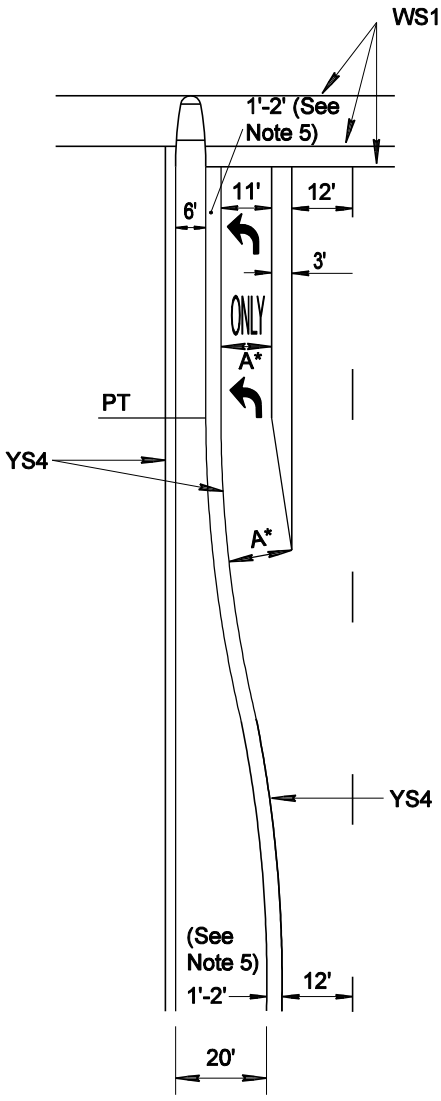
1. RPM placement begins at the start of the turn lane (direction of travel) and the number of RPMs depends on the length of the storage lanes.
2. All white reflective RPMs on the approach shall be Type C (White/Red) RPMs for a distance equal to the longest turn bay length (right or left). The spacing of the Type C RPMs shall be every 20 feet on solid white lines (WS8-C20) and every 40 feet on broken white lines (WB4-C40).
3. For the design of turn lanes and turn lane markings, see Chapter 4.
4. For the design of Crosswalks, see Sheet 5-12.
5. For the design of median end treatments, see Sheets 5-13 and 5-14.
6. For the design of edgelines, see Sheet 3-8.
7. For the design of bicycle lanes, see Chapter 6.
8. Chevrons are required for gore areas ≥6' wide. (See Sheet 4-4.)
9. Pavement Legends optional for single left turn bays in City of Tucson. See Sheet 4-12, note 4.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Intersection Approach with Median at Signalized Intersection**		SHEET NO. 5-8



TDOT - Pavement Markings

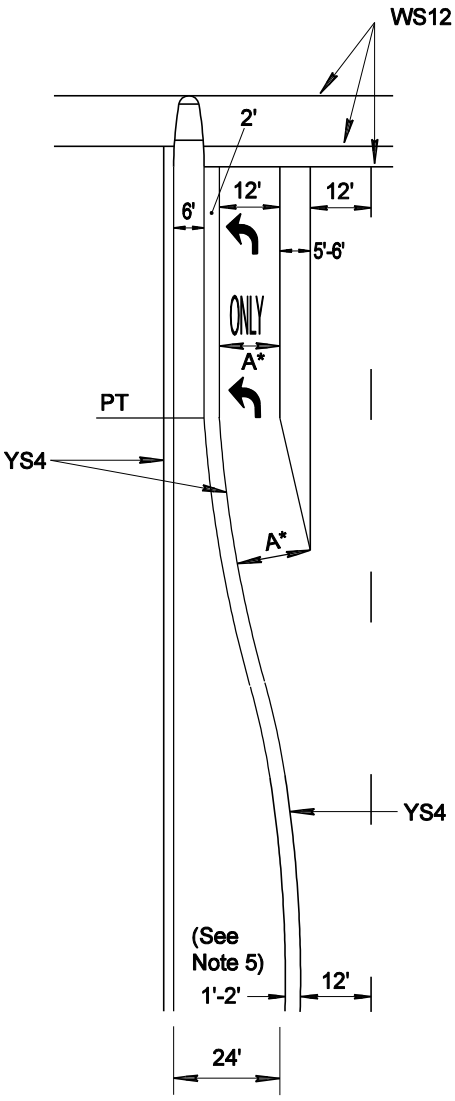
(See Note 4)



PCDOT - Pavement Markings

For 20' median

(See Note 1)



PCDOT - Pavement Markings

For 24' median

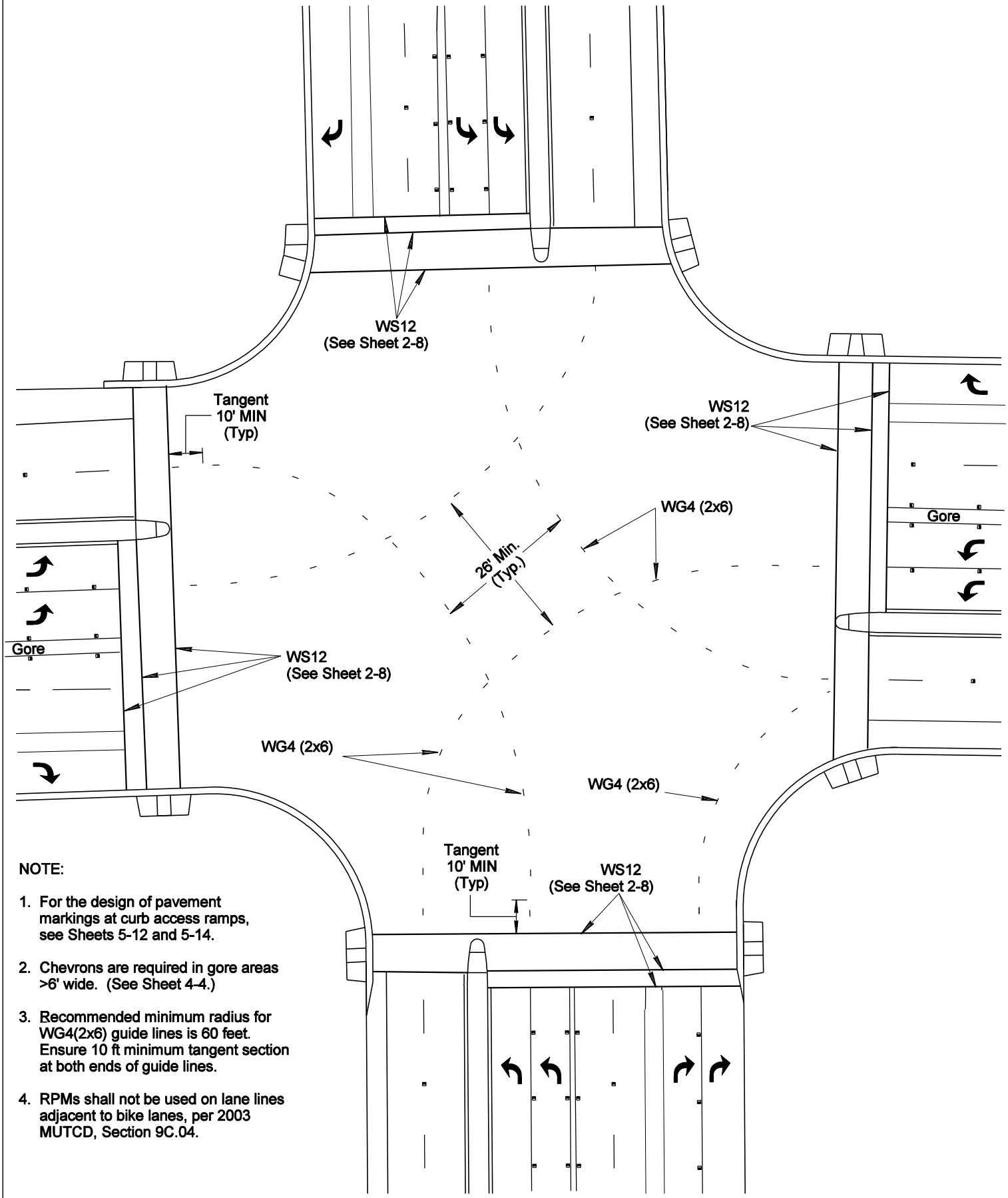
(See Note 1)

* For all three details, the tapered end of the gore shall be designed so that the width of the lane opening, A, equals the width of the turn lane.

NOTES:

1. This treatment can be implemented at unsignalized intersections at the discretion of the Engineer.
2. For the design of Turn Bay Lanes, see Sheet 4-12.
3. Pavement arrows and "ONLY" legend markings are optional for single left-turn lanes in the City of Tucson. See Sheet 4-12, note 4.
4. For the design of Ped-Xing, see Sheet 2-8.
5. Typical lane widths are shown for both Pima County and City of Tucson. Lane widths may vary. For City of Tucson, the offset of the median yellow edgeline from the face of curb is typically 1'-0". For Pima County, the offset of the median yellow edgeline is 1 ft for a median without a gutter pan or 2 ft if there is a gutter pan. Gore width varies accordingly.

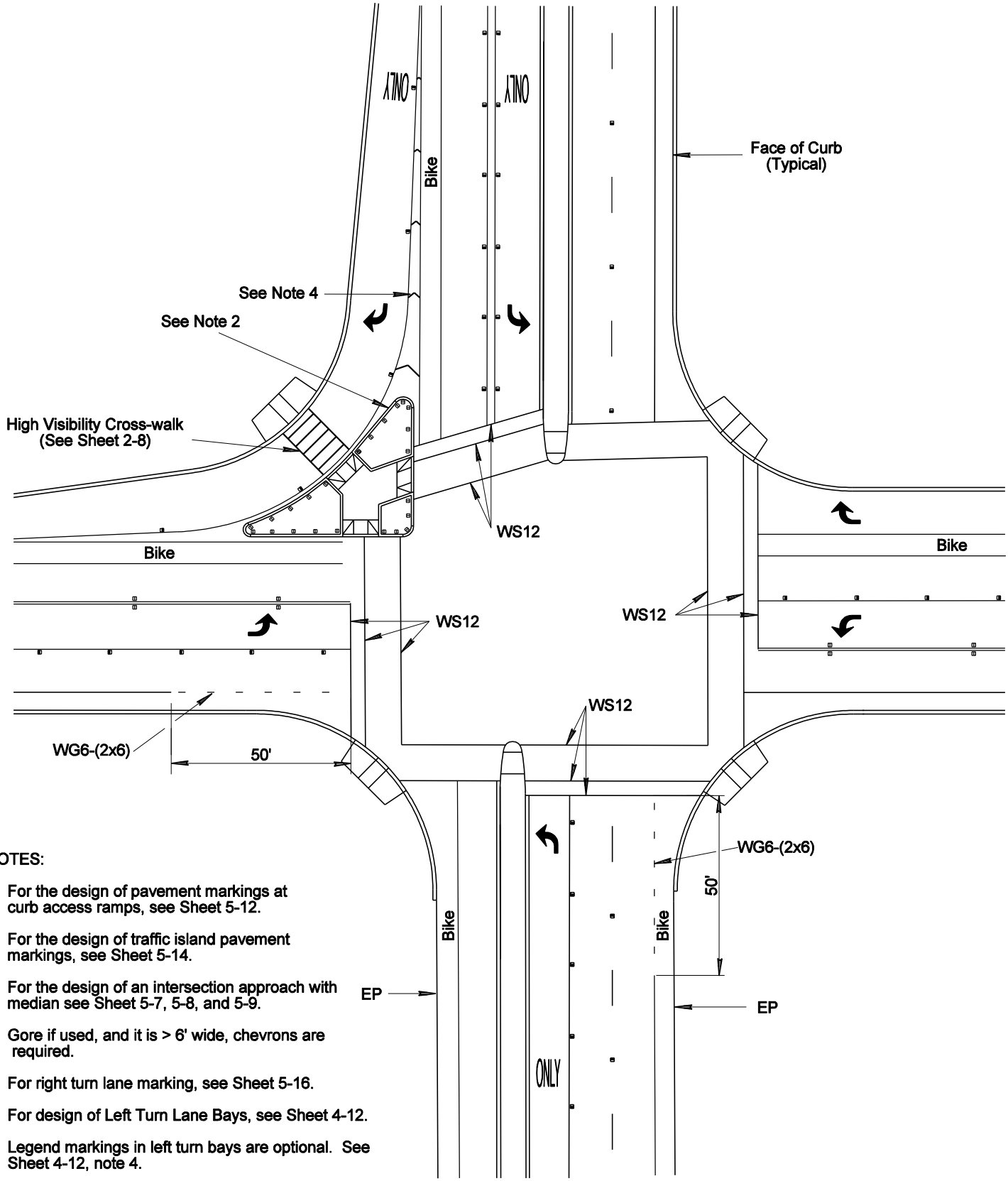
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Markings for Left Turn Lane Approaching Signalized Intersection with median**		SHEET NO. **5-9**



NOTE:

1. For the design of pavement markings at curb access ramps, see Sheets 5-12 and 5-14.
2. Chevrons are required in gore areas >6' wide. (See Sheet 4-4.)
3. Recommended minimum radius for WG4(2x6) guide lines is 60 feet. Ensure 10 ft minimum tangent section at both ends of guide lines.
4. RPMs shall not be used on lane lines adjacent to bike lanes, per 2003 MUTCD, Section 9C.04.

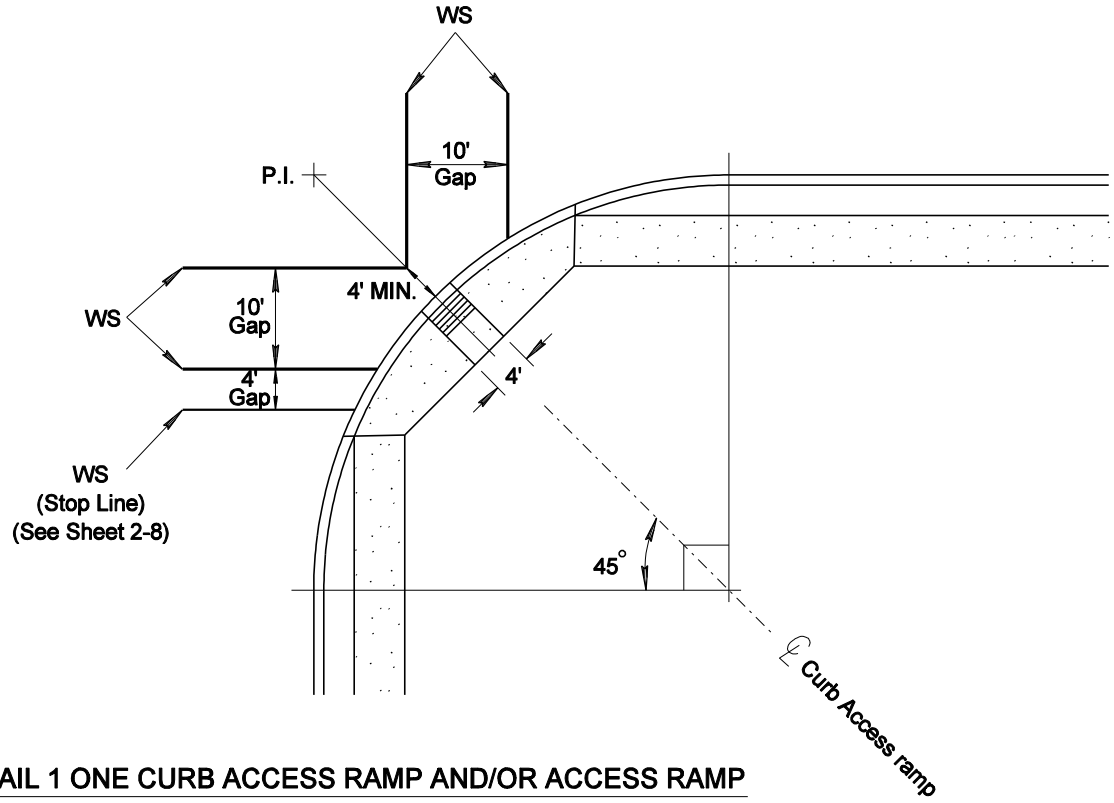
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Markings at a Signalized Intersection, Case 1**		SHEET NO. **5-10**



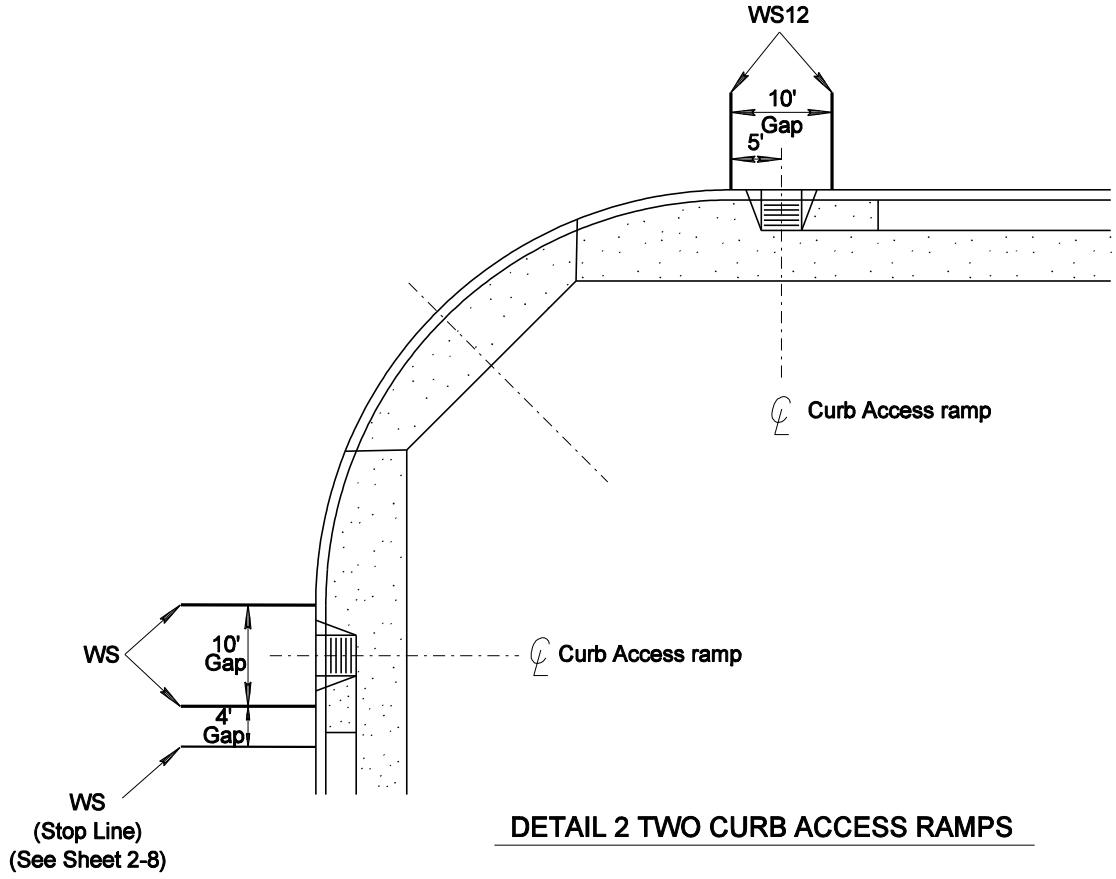
NOTES:

1. For the design of pavement markings at curb access ramps, see Sheet 5-12.
2. For the design of traffic island pavement markings, see Sheet 5-14.
3. For the design of an intersection approach with median see Sheet 5-7, 5-8, and 5-9.
4. Gore if used, and it is > 6' wide, chevrons are required.
5. For right turn lane marking, see Sheet 5-16.
6. For design of Left Turn Lane Bays, see Sheet 4-12.
7. Legend markings in left turn bays are optional. See Sheet 4-12, note 4.

ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Markings at a Signalized Intersection, Case 2**	CITY OF TUCSON FOUNDED 1776	SHEET NO. **5-11**

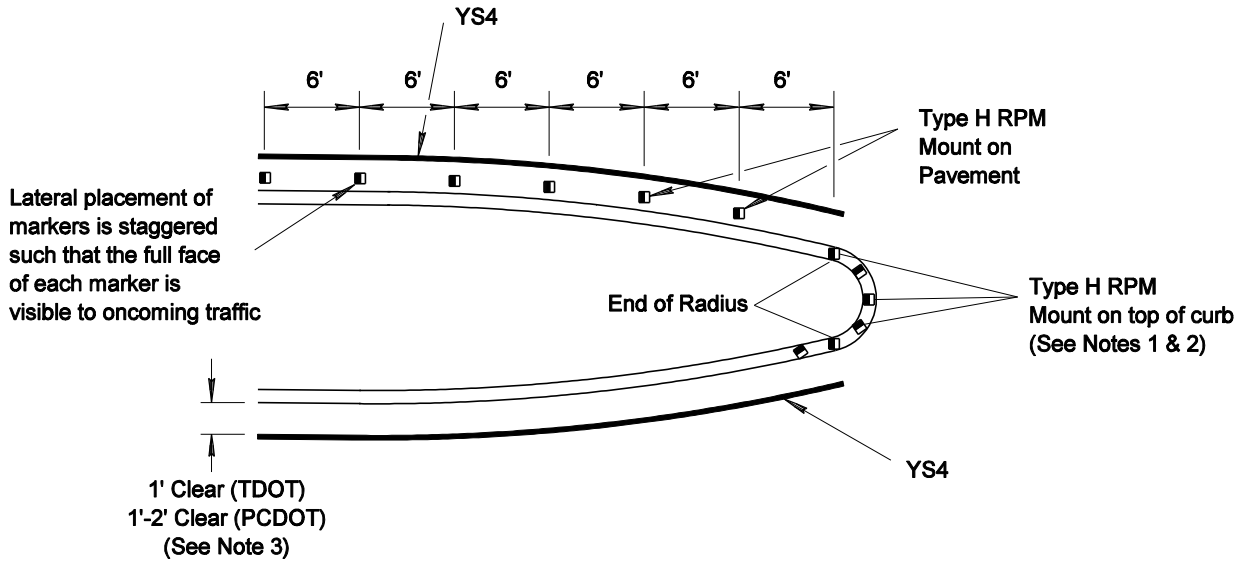


DETAIL 1 ONE CURB ACCESS RAMP AND/OR ACCESS RAMP



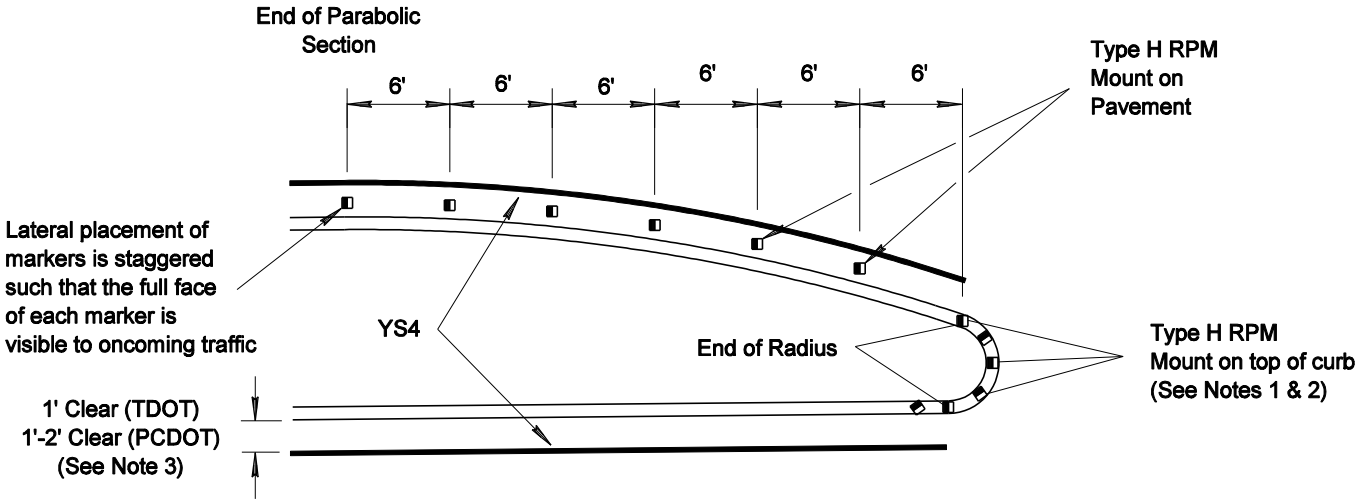
DETAIL 2 TWO CURB ACCESS RAMPS

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Crosswalk Dimensions at Corners with Curb Access Ramps**		SHEET NO. **5-12**



DETAIL 1 - TYPICAL MEDIAN END TREATMENT

NTS



DETAIL 2 - TYPICAL MEDIAN END TREATMENT

NTS

NOTES:

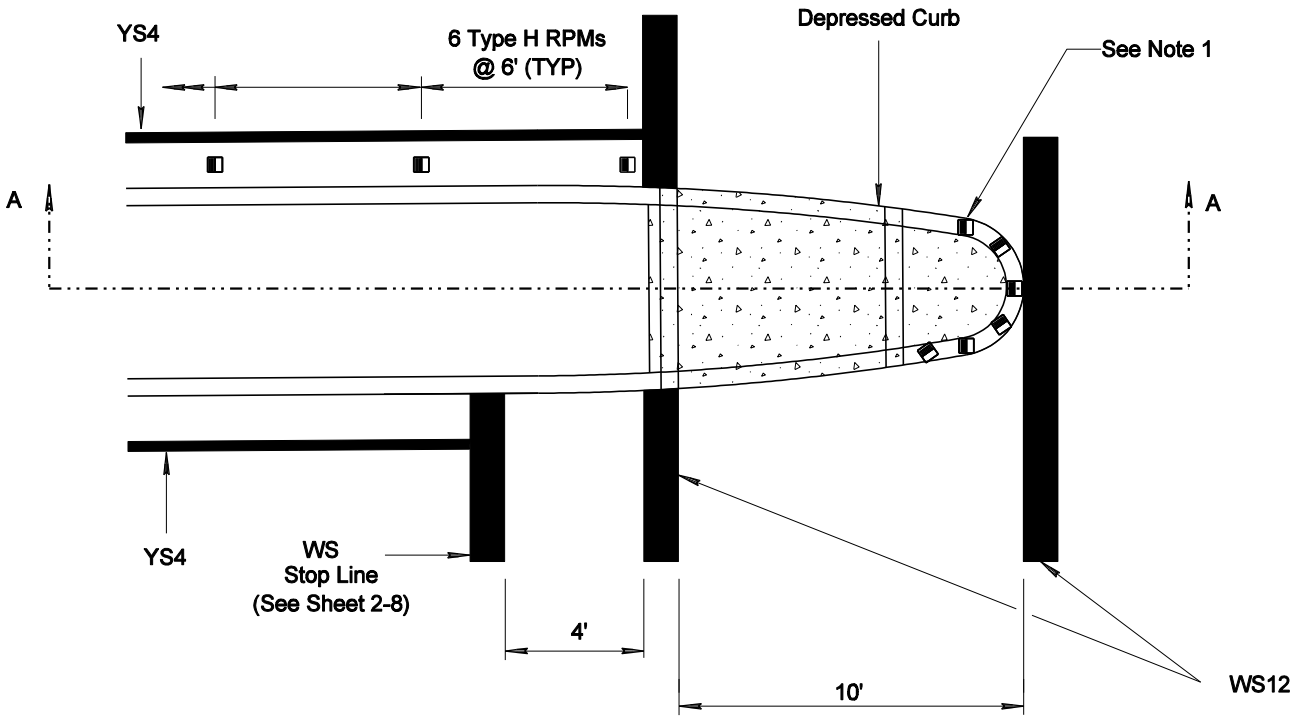
1. Half of the RPMs mounted on the median nose end shall be aimed at on-coming traffic, and half shall be aimed at the cross-street approach left-turn movement in an alternating pattern, as shown.

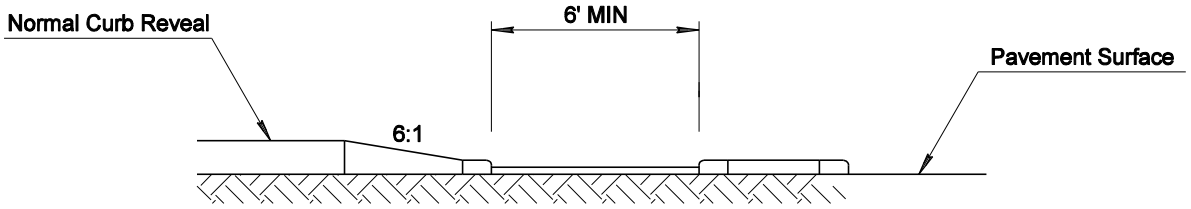
2. A minimum of 6 RPMs shall be installed at equal spacing. Maximum spacing is 2'-0".

3. For City of Tucson, the offset of the median yellow edgeline from the face of curb is typically 1'-0".

   For Pima County, the offset of the median yellow edgeline from the face of curb is typically 1'-0" for a median without a gutter pan, or 2'-0" for a median with a gutter pan.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Median End Treatments**		SHEET NO. **5-13**



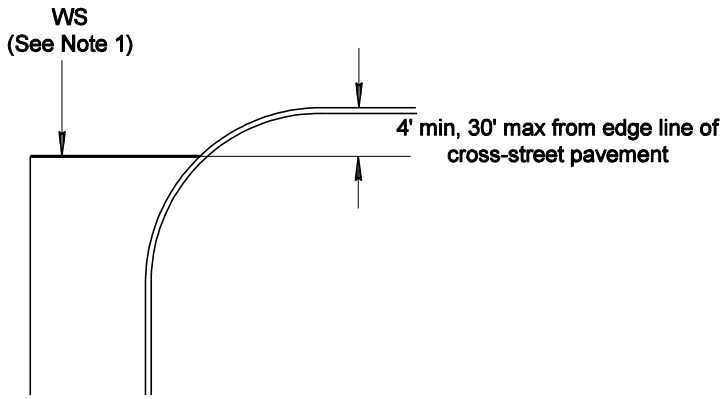


SECTION A-A

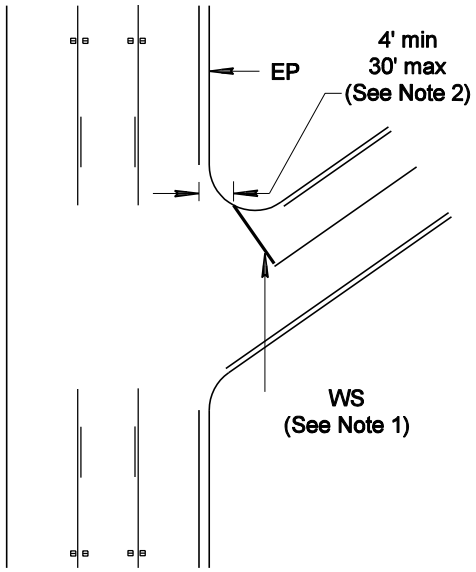
NOTE:

1. For the placement of RPMs on the median nose, refer to Sheet 5-13.
2. Stop Line installed typically at signalized intersection and at stop sign controlled intersection.
3. Depressed crosswalk should be within the confines of the painted crosswalk.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Median End Treatment with Crosswalk**		SHEET NO. **5-14**



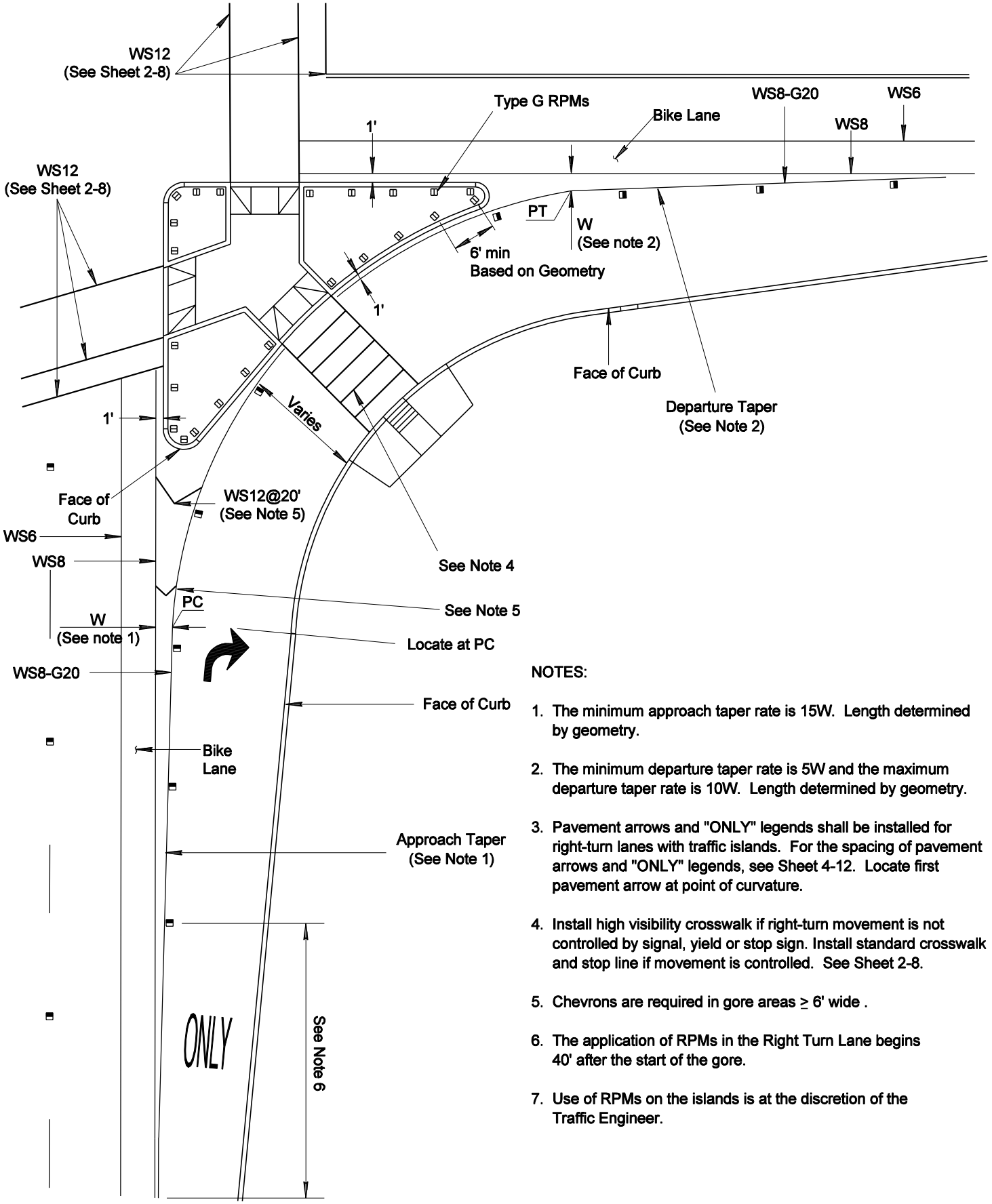
DETAIL 1 - STOP LINE AT 90° INTERSECTION



DETAIL 2 - STOP LINE AT SKEWED INTERSECTION

NOTES:

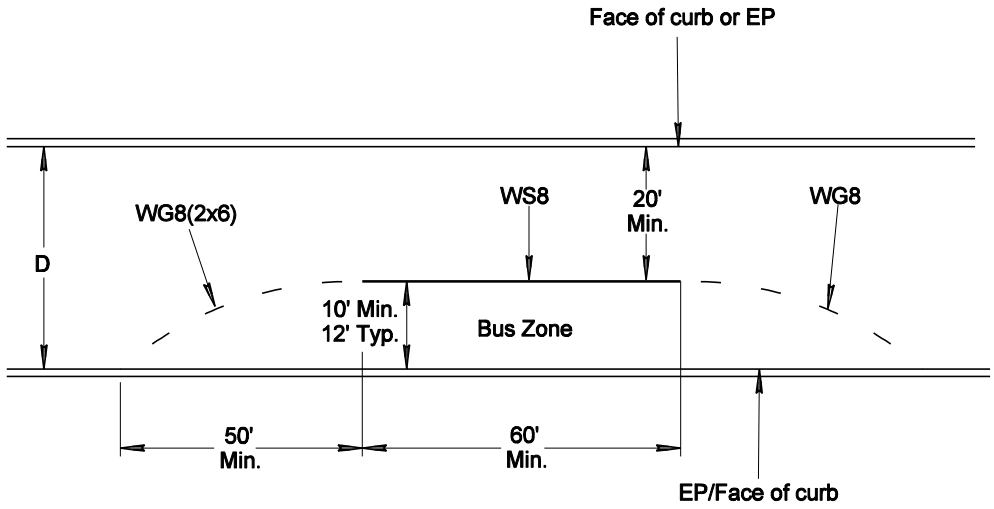
1. Use WS12 at intersections with stop sign or traffic signal control and with speed limits ≤ 40mph. Use WS24 at intersections with stop sign control and with approach speed limits ≥45 mph. If intersecting street have different speed limits, the higher speed limit controls.
2. Minimum distance between stop line and edgeline shall be 4 feet.
3. Stop lines may be placed parallel to the intersecting street at skewed intersections, if approved.
4. Stop lines should be placed to optimize sight distance whenever possible.
5. Stop lines shall be placed a minimum of 4 feet in advance of crosswalks and curb access ramps.
6. At multi-way stops, on striped roads only, the stop line shall be placed at sight visibility distance determined in field by the Traffic Engineer.
7. Stop Lines are not installed at residential streets (25 MPH) unless deemed necessary by Traffic Engineer.



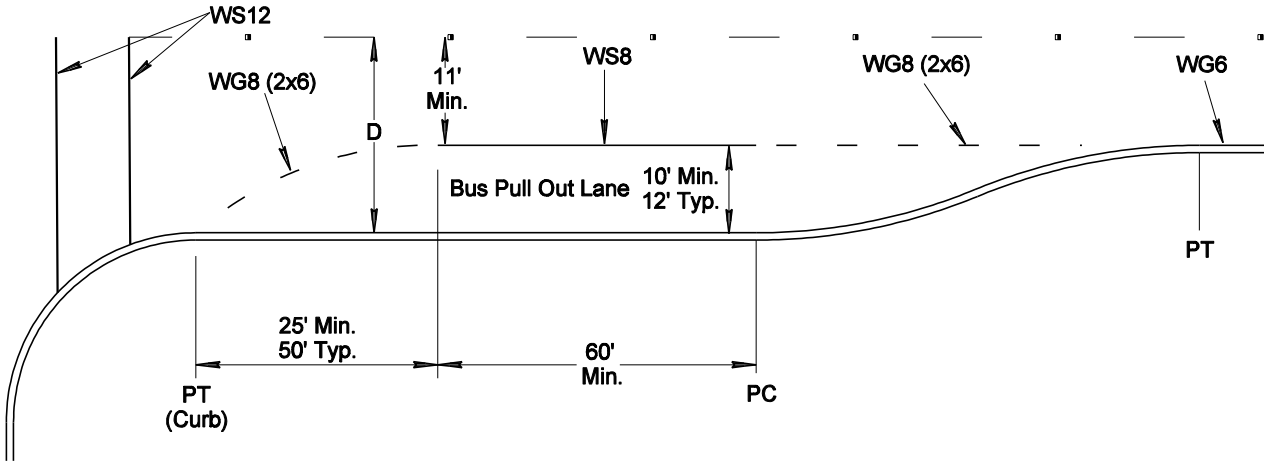
NOTES:

1. The minimum approach taper rate is 15W. Length determined by geometry.
2. The minimum departure taper rate is 5W and the maximum departure taper rate is 10W. Length determined by geometry.
3. Pavement arrows and "ONLY" legends shall be installed for right-turn lanes with traffic islands. For the spacing of pavement arrows and "ONLY" legends, see Sheet 4-12. Locate first pavement arrow at point of curvature.
4. Install high visibility crosswalk if right-turn movement is not controlled by signal, yield or stop sign. Install standard crosswalk and stop line if movement is controlled. See Sheet 2-8.
5. Chevrons are required in gore areas ≥ 6' wide .
6. The application of RPMs in the Right Turn Lane begins 40' after the start of the gore.
7. Use of RPMs on the islands is at the discretion of the Traffic Engineer.

ISSUED October 2000 **REVISED** August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Right-Turn Traffic Island Pavement Marking Detail**		**SHEET NO.** 5-16

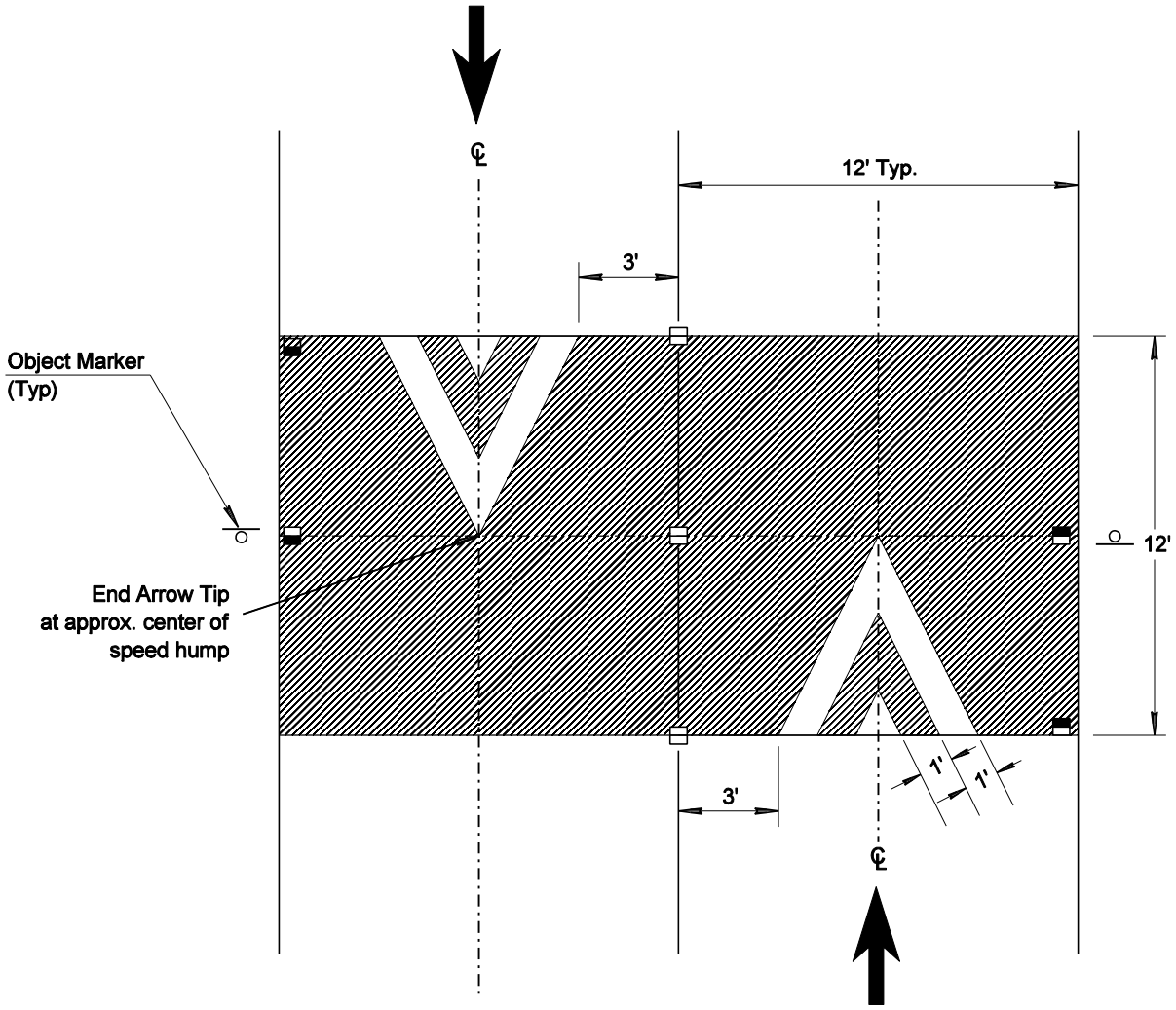


NOTE:
For use of School Bus Zone pavement markings in location with road width D ≥ 32' (school district only).



NOTES:
The use of Bus Zone (Sun Tran) Pavement Markings are for location with lane width D ≥ 21' (collector/arterial).

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Bus Zone Stripe for on Street Bay**		SHEET NO. **5-17**



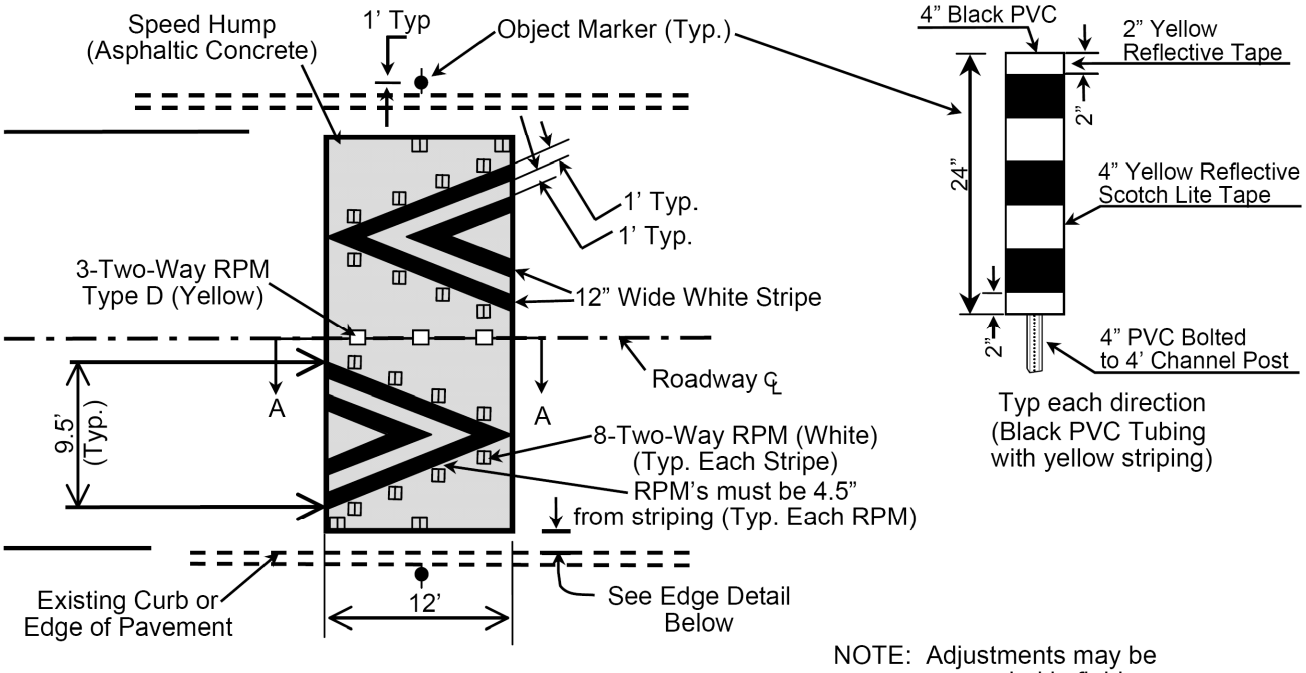
NOTES:

1. The pointed end of the center white tape/paint shall end at approximately the center of the speed hump.
2. The application of speed hump RPMs is an option for PCDOT. If used, 3 Type "D" are installed in the center and 2 Type "G" at the edges of the speed hump as shown.
3. All stripes are WS12.
4. Advance speed hump warning pavement markings are not typically used.

LEGEND

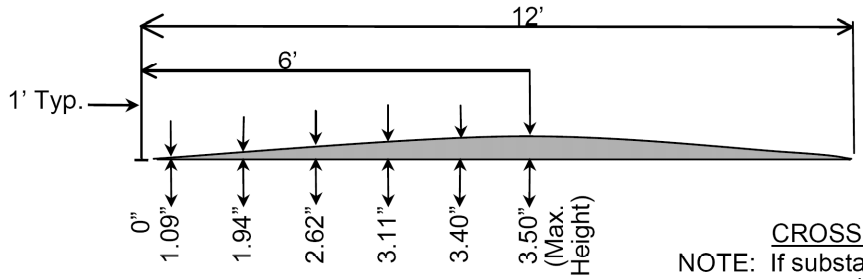
→ Direction of Travel.

ISSUED October 2000 REVISED August 2008	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Marking for Speed Humps - Pima County**	CITY OF FOUNDED 1776 TUCSON	SHEET NO. **5-18**



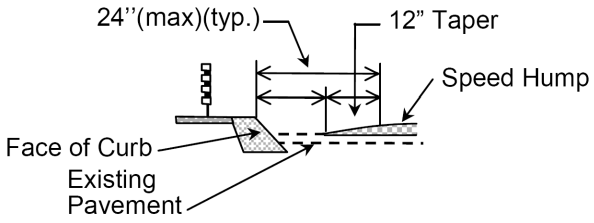
NOTE: Adjustments may be needed in field.

PLAN VIEW



CROSS SECTION A-A

NOTE: If substantial invert exists on roadway pavement, the above details may require modification.



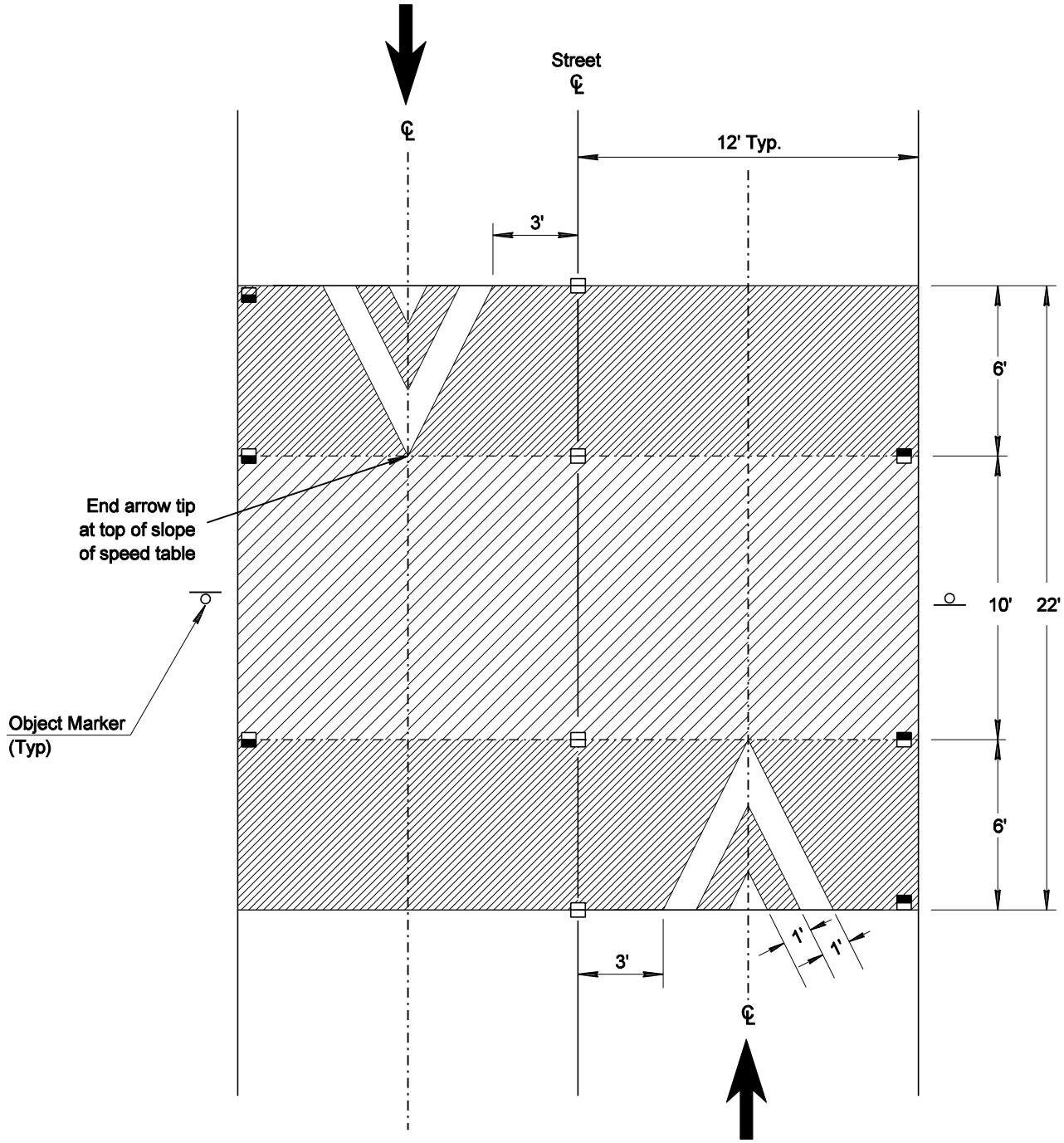
CURB NO GUTTER

EDGE DETAIL

NOTES:

1. **Advance speed hump warning pavement markings are not typically used.**

ISSUED **August 2008** **REVISED**	THE SEAL OF PIMA COUNTY · ARIZONA ·	**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Marking for Speed Humps - City of Tucson**	CITY OF FOUNDED 1776 TUCSON	**SHEET NO.** **5-18.1**



NOTES:

1. The pointed end of the center white tape/paint shall end at approximately the top of the slope of the speed hump.

2. The application of speed table RPMs is an option for PCDOT. If used, 4 Type "D" are installed in the center and 3 Type "G" at the edges of the speed table as shown.

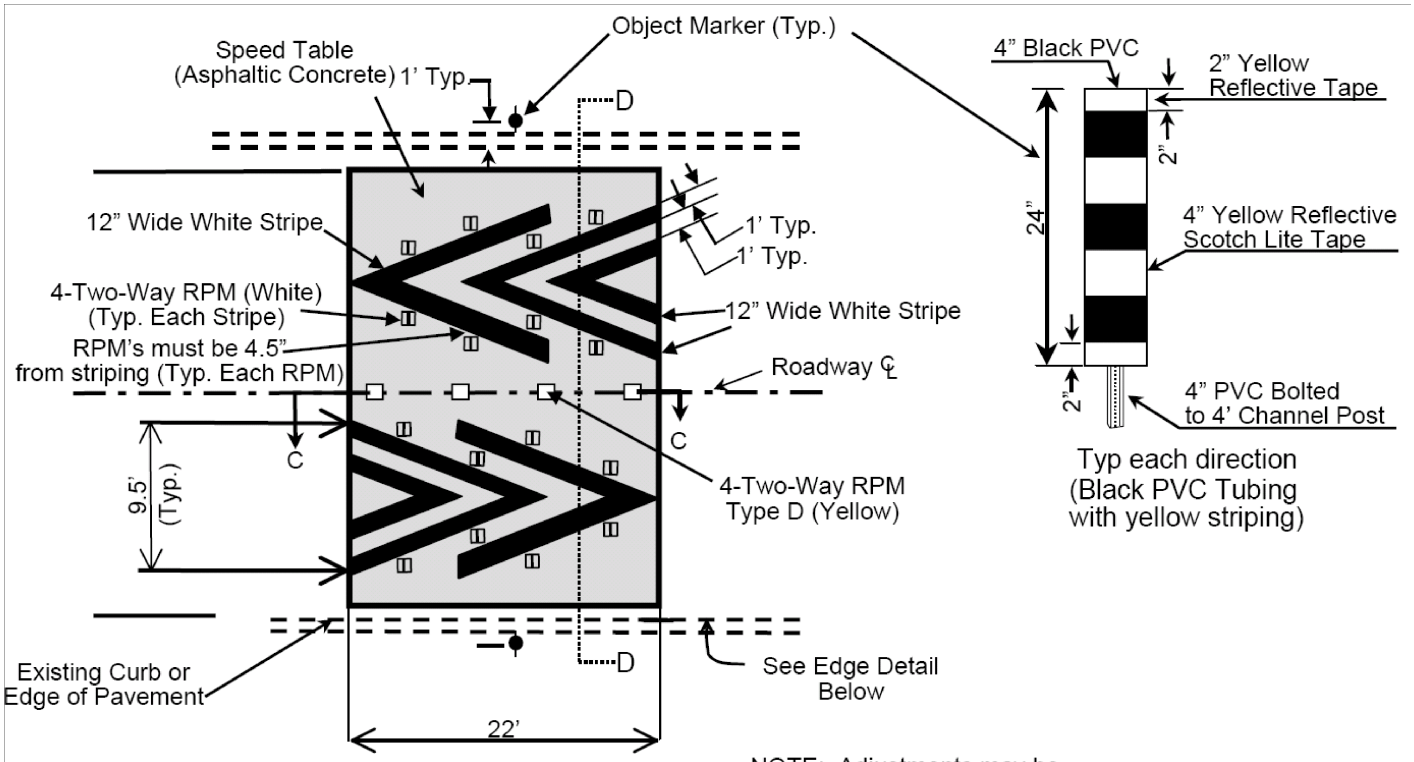
3. All stripes are WS12.

4. Advance speed table warning pavement markings are not typically used.

LEGEND

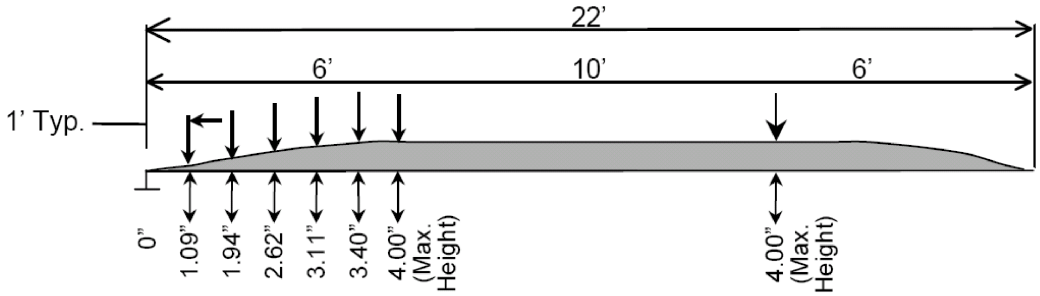
→ Direction of Travel.

ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Typical Pavement Marking for Speed Tables - Pima County**		SHEET NO. **5-19**



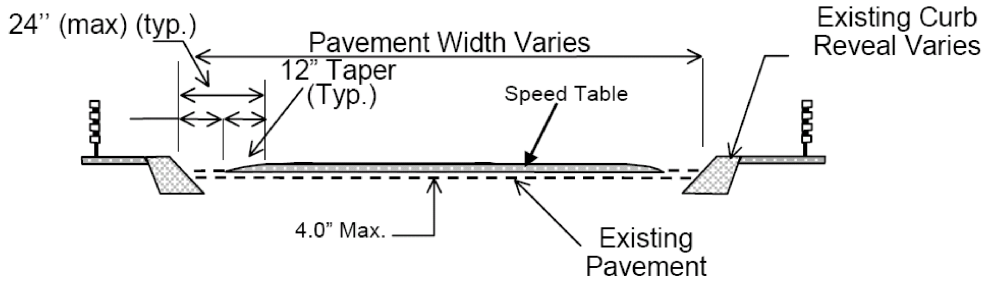
NOTE: Adjustments may be needed in field.

PLAN VIEW



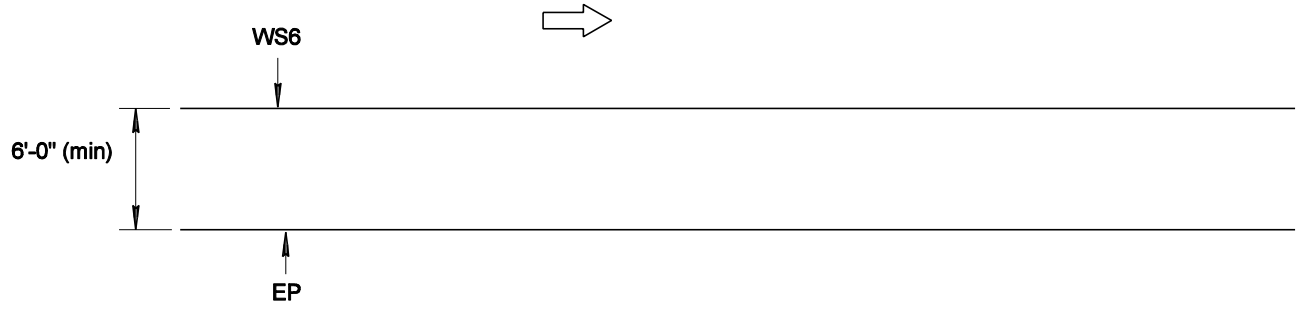
NOTE: If substantial invert exists on roadway pavement, the above details may require modification.

CROSS SECTION C-C

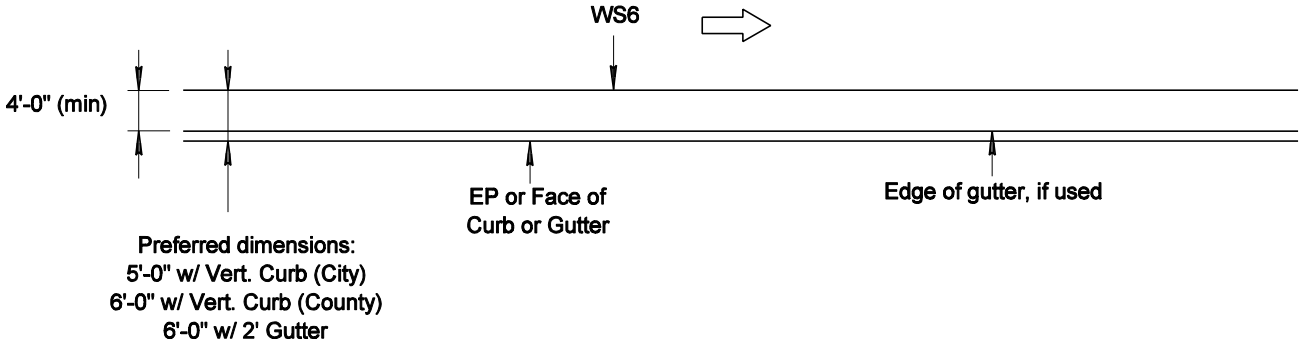


CROSS SECTION D-D

ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
August 2008		PAVEMENT MARKING STANDARDS		5-19.1
REVISED		Typical Pavement Marking for Speed Tables - City of Tucson		



DETAIL 1 - PAVED SHOULDER



DETAIL 2 - PAVED SHOULDER WITH CURB OR CURB AND GUTTER

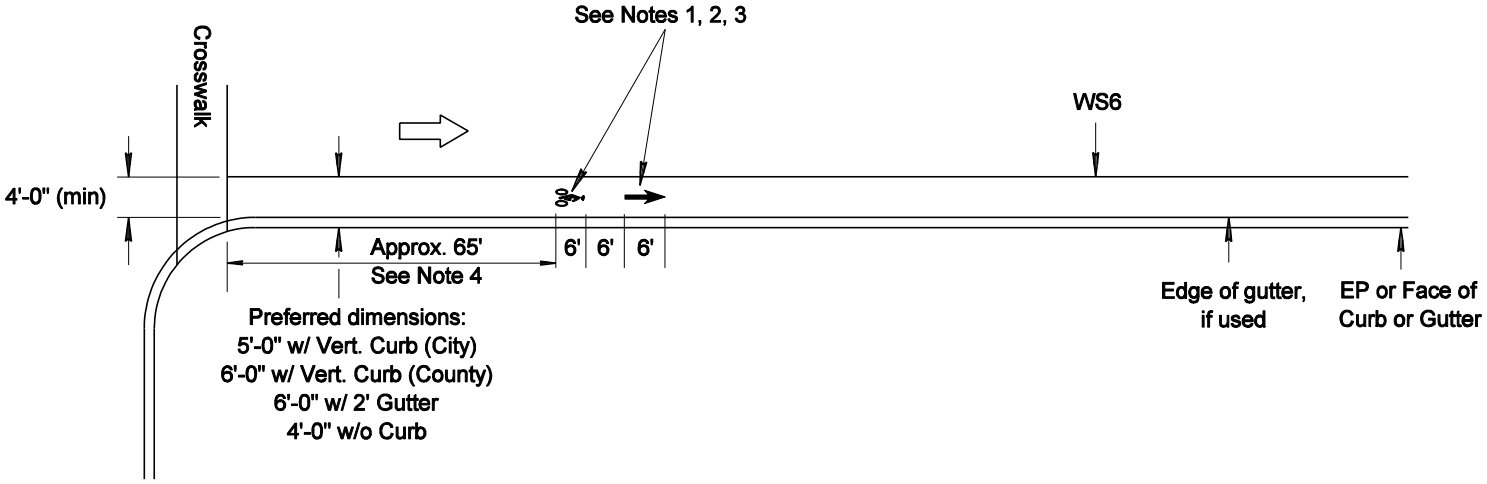
NOTES:

1. Use of bike lane legends is optional.
2. Paved shoulders may provide an area for bicycle use, bus stops, and disabled vehicles.

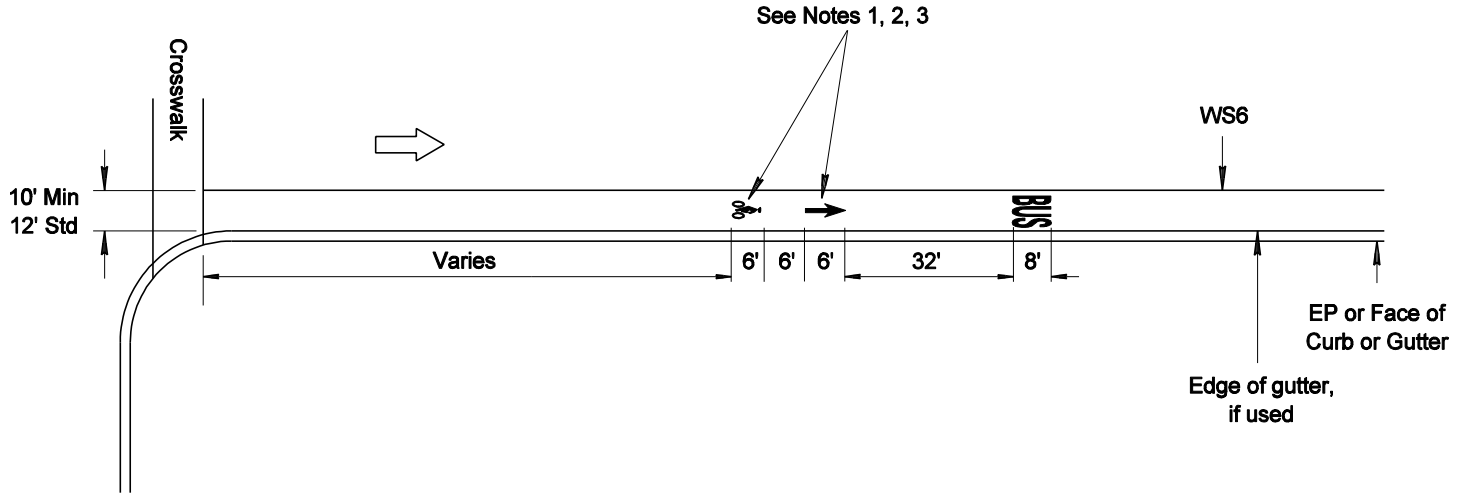
LEGEND

Direction of Travel.

ISSUED October 2000 REVISED August 2008		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Paved Shoulder Markings and Dimensions		SHEET NO. 6-1



DETAIL 1 - BIKE LANE



DETAIL 2 - BUS / BIKE LANE

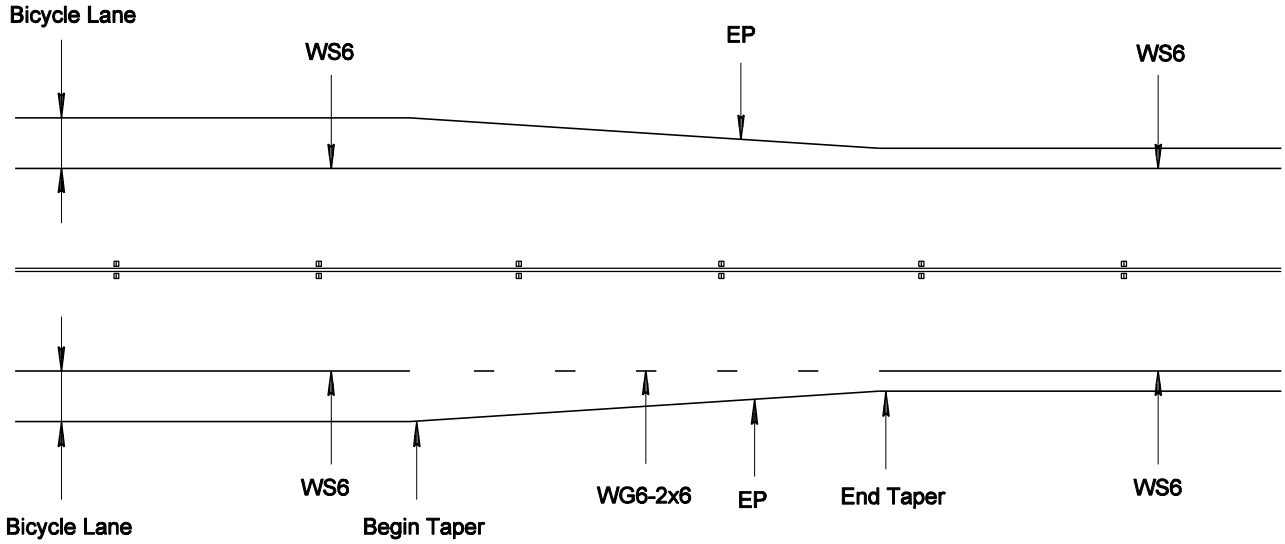
NOTES:

1. Use of bike lane symbols is optional.
2. The bike lane symbol may be installed on designated bike routes at the discretion of the Engineer.
3. If used, the bike lane symbol shall be placed approximately 65 ft. (from crosswalk) from the crossroad, or other locations as needed. The frequency of the symbol is every half mile (City of Tucson) or quarter mile (Pima County) and after every major signalized intersection.
4. 65 ft ensures that turning vehicles do not damage the legends. Distance from intersection should take into consideration the presence of driveways and bus stops. Avoid placing legends where buses stop and dwell.

LEGEND

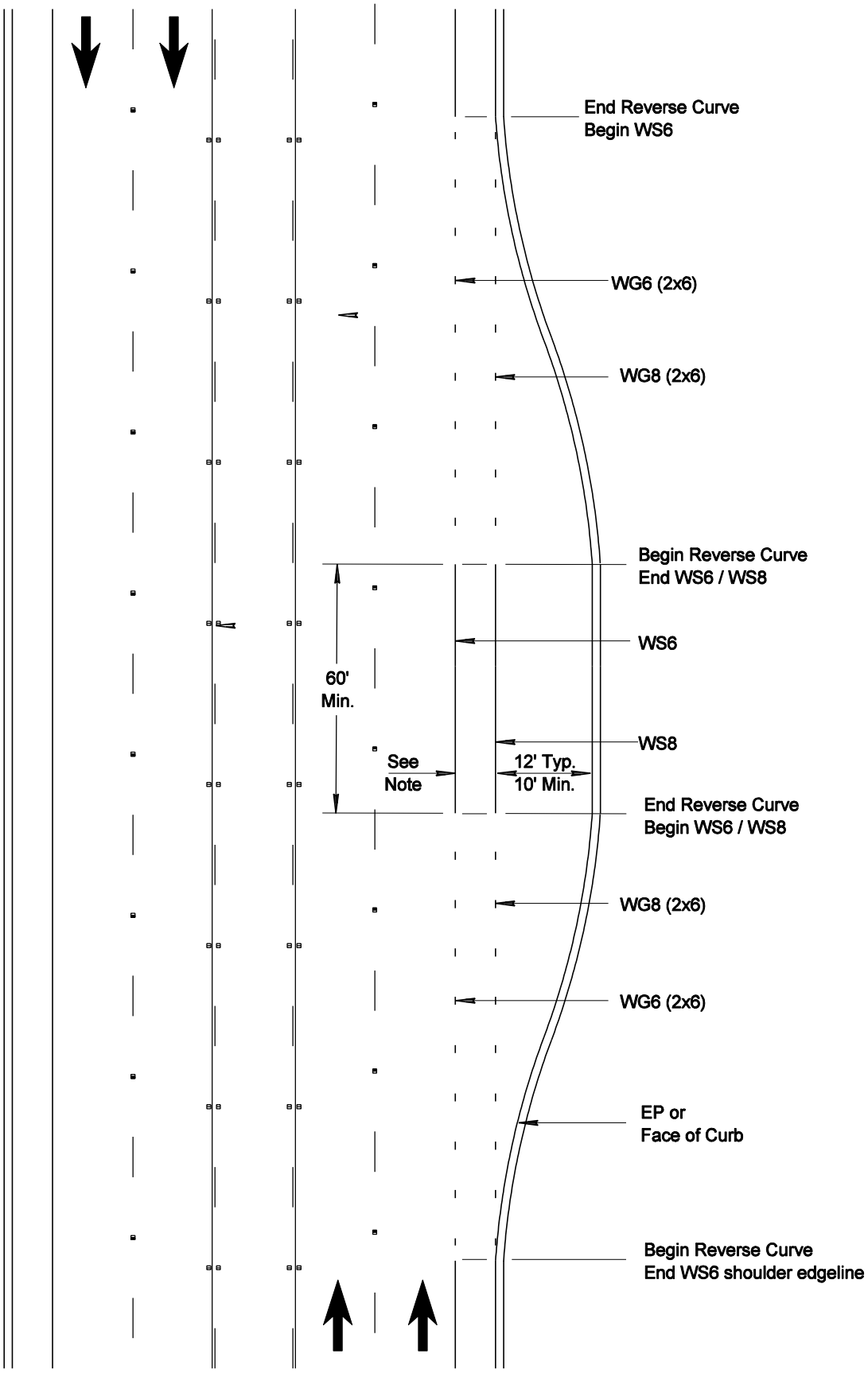
⇨ Direction of Travel

ISSUED August 2008 REVISED		PCDOT and TDOT Traffic Engineering Division PAVEMENT MARKING STANDARDS Bike Lane and Bus / Bike Lane Markings and Dimensions	SHEET NO. 6-1.1



BICYCLE LANE TRANSITION

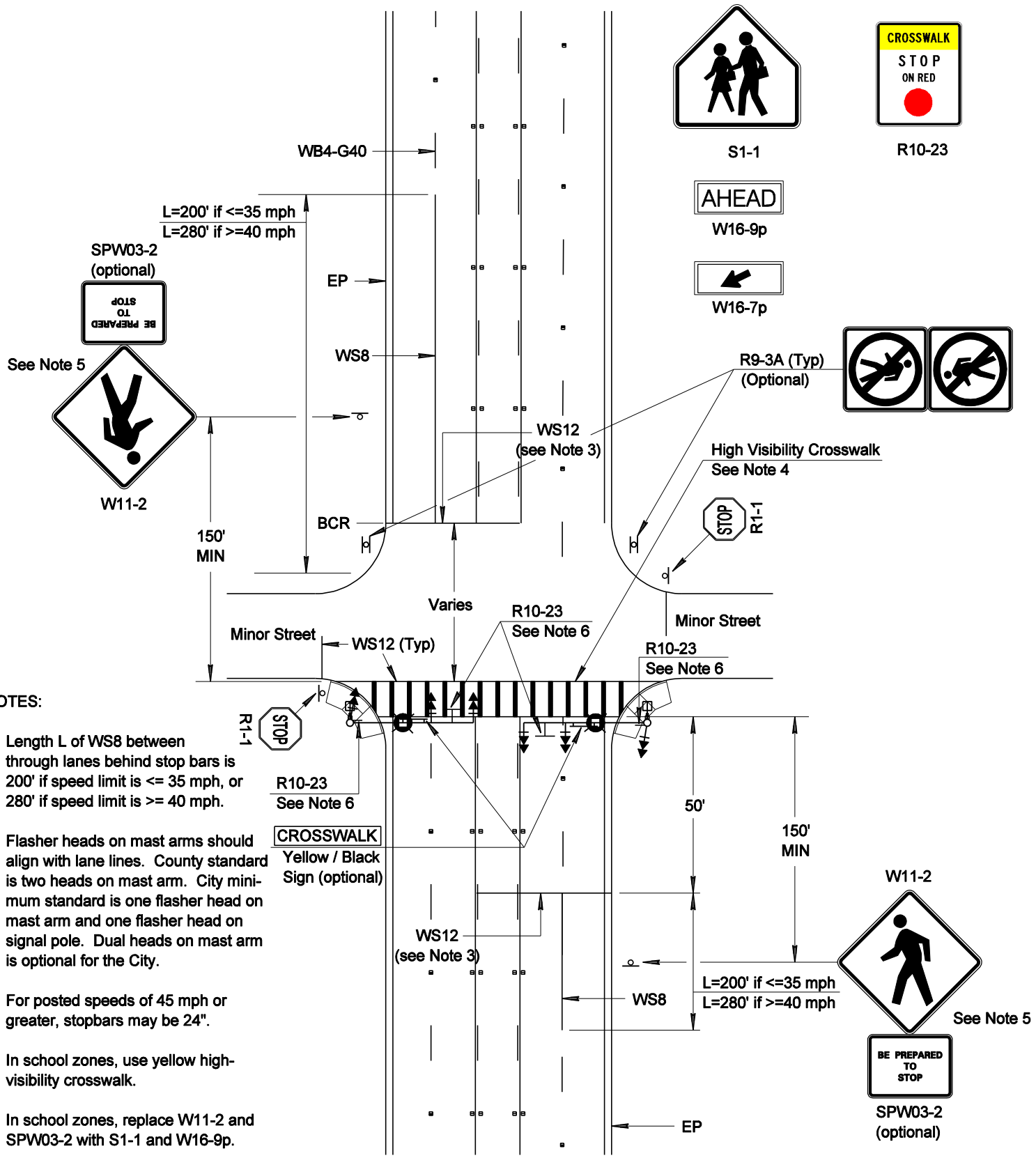
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Beginning and Ending Transitions for Bicycle Lanes**		SHEET NO. **6-2**



NOTE:

The width of the paved shoulder adjacent to the pullout lane should match the width of the paved shoulder used on the facility.

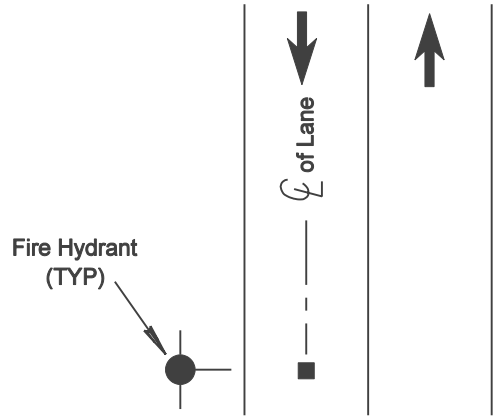
ISSUED October 2000 REVISED August 2008		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Bus Pull-Out with Bicycle Lane Detail**		SHEET NO. **6-3**



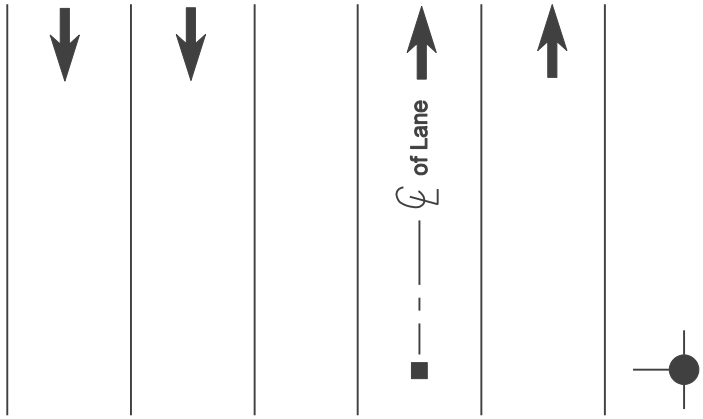
NOTES:

1. Length L of WS8 between through lanes behind stop bars is 200' if speed limit is <= 35 mph, or 280' if speed limit is >= 40 mph.
2. Flasher heads on mast arms should align with lane lines. County standard is two heads on mast arm. City minimum standard is one flasher head on mast arm and one flasher head on signal pole. Dual heads on mast arm is optional for the City.
3. For posted speeds of 45 mph or greater, stopbars may be 24".
4. In school zones, use yellow high-visibility crosswalk.
5. In school zones, replace W11-2 and SPW03-2 with S1-1 and W16-9p.
6. In school zones, replace pole-mounted R10-23 with S1-1 and W16-7p assembly, and replace arm-mounted R10-23 with S1-1.

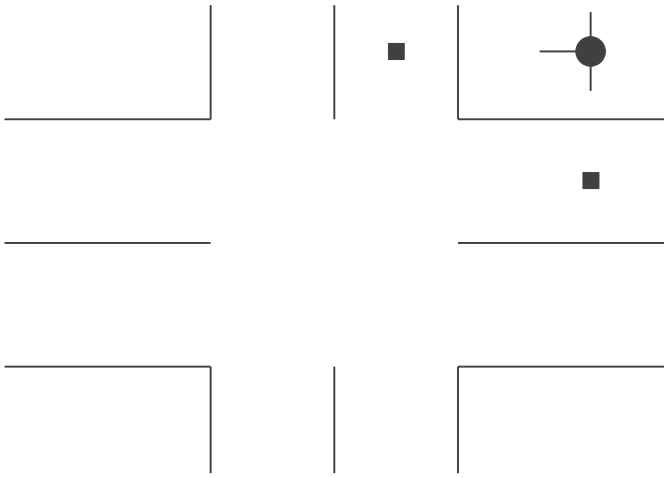
ISSUED		PCDOT and TDOT Traffic Engineering Division		SHEET NO.
August 2008		PAVEMENT MARKING STANDARDS		6-4
REVISED		HAWK Signal Striping and Signing Detail		



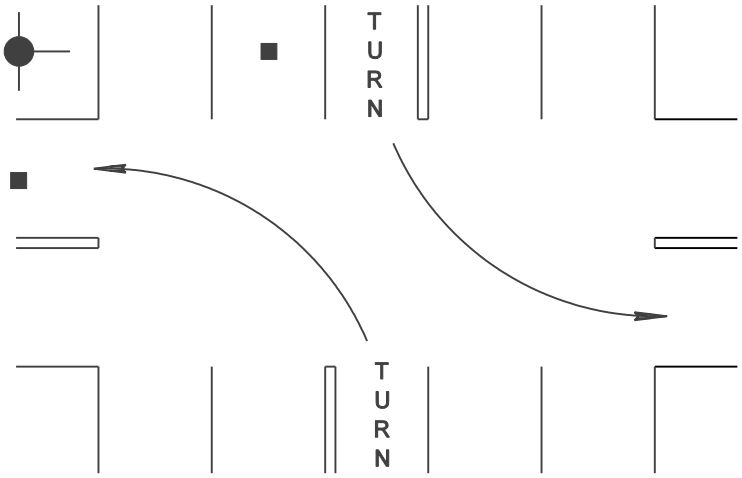
TWO LANE STREET



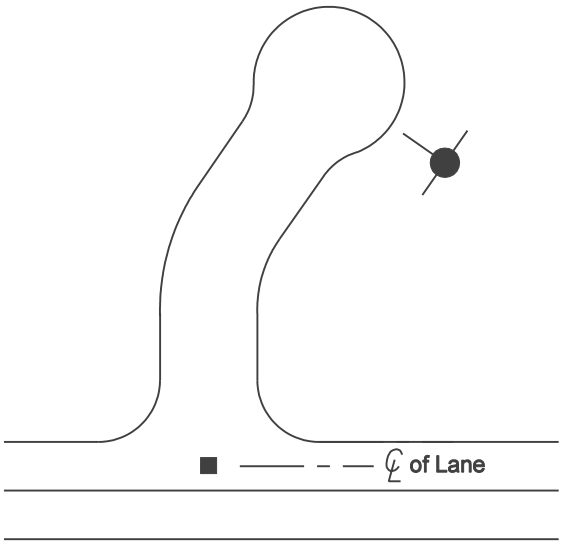
MULTI-LANE STREET
(Install RPM in Left-Most Lane)



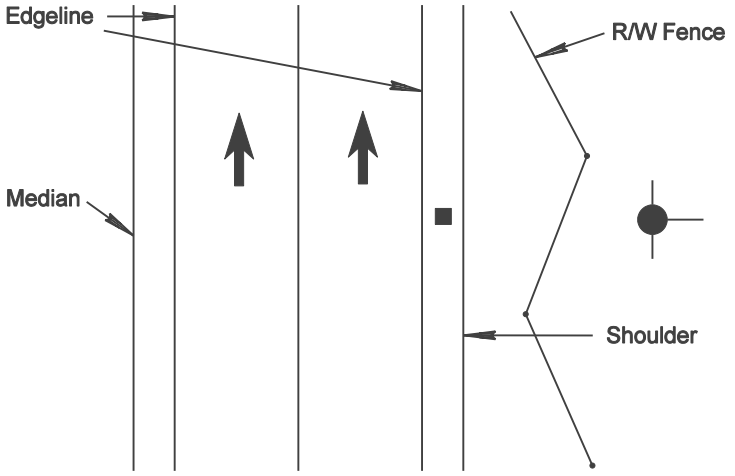
TWO LANE STREET
AT INTERSECTION



FOUR LANE STREET WITH
TURN LANE AT INTERSECTION



CUL-DE-SAC INSTALLATION



FREEWAYS AND EXPRESSWAYS

ISSUED October 2000 REVISED October 2002		**PCDOT and TDOT Traffic Engineering Division** **PAVEMENT MARKING STANDARDS** **Placement of Blue RPMs for Fire Hydrants**		SHEET NO. **7-1**

Table 2C-4
Source: Manual on Uniform Traffic Control Devices - 2009 Edition
(Based on December 2007 Notice of Proposed Amendments for the MUTCD)

Posted or 85th-Percentile Speed	Advance Placement Distance[1, 2]						
	Condition A: Speed reduction and lane changing in heavy traffic[3]	Condition B: Deceleration to the listed advisory speed (mph) for the condition[5]					
		0[4]	10	20	30	40	50
20 mph	225 ft	100 ft[7]	N/A[6]	—	—	—	—
25 mph	325 ft	100 ft[7]	N/A[6]	N/A[6]	—	—	—
30 mph	460 ft	100 ft[7]	N/A[6]	N/A[6]	—	—	—
35 mph	565 ft	100 ft[7]	N/A[6]	N/A[6]	N/A[6]	—	—
40 mph	670 ft	125 ft	100 ft[7]	100 ft[7]	N/A[6]	—	—
45 mph	775 ft	175 ft	125 ft	100 ft[7]	100 ft[7]	N/A[6]	—
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft[7]	—
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A[6]
60 mph	1100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft[7]
65 mph	1200 ft	475 ft	425 ft	400 ft	350 ft	275 ft	175 ft

Notes:

1 For word message warning signs with more than four words or with letter heights of less than 6 inches, the advance placement distance is 100 feet more than the distance shown in this table in order to provide adequate legibility.

2 The distances are adjusted for a sign legibility distance of 180 feet for Condition A, which is based on a word legend height of 5 inches. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign.

3 Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

4 Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second2, minus the sign legibility distance of 180 feet.

5 Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second2, minus the sign legibility distance of 250 feet.

6 No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

7 The advance placement distance is listed as 100 feet to provide adequate spacing between signs.

Table A2-1 -- Safe Stopping Sight Distance (SSSD)
Source: American Association of State Highway and Transportation Officials,
A Policy on Geometric Design of Highways and Streets, 2004 edition, Exhibit 3-1.

US Customary				
Design Speed (mph)	Brake Reaction Distance (ft)	Braking Distance on level (ft)	Stopping sight distance	
			Calculated (ft)	Design (ft)
15	55.1	21.6	76.7	80
20	73.5	38.4	111.9	115
25	91.9	60.0	151.9	155
30	110.3	86.4	196.7	200
35	128.6	117.6	246.2	250
40	147.0	153.6	300.6	305
45	165.4	194.4	359.8	360
50	183.8	240.0	423.8	425
55	202.1	290.3	492.4	495

NOTE: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 3.4 m/s^2 [11.2 ft/s^2] used to determine calculated sight distance.

	DISTANCE FOR THRU STREET VEHICLE	DISTANCE FOR ENTERING VEHICLE V (SPEED=15 MPH)	TOTAL STRIPING (NO-PASSING) DISTANCE REQUIRED
DESIGN SPEED	SSSD	SSSD (V=15) = 75 FEET	REQUIRED LENGTH
30	200		275 feet + radius
35	250		325 feet + radius
40	305		380 feet + radius
45	360		435 feet + radius
50	425		500 feet + radius
55	495		570 feet + radius

Table 3B-1
Minimum Passing Sight Distance

85th Percentile or Posted or Statutory Speed Limit (MPH)	Minimum Passing Sight Distance (FEET)
25	450
30	500
35	550
40	600
45	700
50	800
55	900
60	1,000
65	1,100
70	1,200

Listing of "frequently" used
Pavement Words

1. STOP
2. XXMPH
3. STOP AHEAD
4. YIELD AHEAD
5. SCHOOL X-ING
6. SIGNAL AHEAD
7. PED X-ING
8. R X R
9. HUMP
10. BUS

NOTES:

1. Placement of pavement words is at the discretion of the Traffic Engineer.
2. Pavement words and markings shall be white except when otherwise stated.
3. For size, spacing and other information for pavement words, refer to Section 3B.19 of the MUTCD.
4. Do not use pavement words or legends where reversible lanes are in use