230 Signing and Pavement Marking

230.1 General

Traffic control devices are necessary to help ensure highway safety. Traffic control devices provide an orderly and predictable movement of motorized and non-motorized traffic throughout the highway transportation system. They also provide guidance and warnings to ensure the safe and informed operation of individual elements of the traffic stream. The design and layout of signs and pavement markings should complement the basic highway design.

FHWA's ***Manual on Uniform Traffic Control Devices (MUTCD)*** contains detailed drawings of all standard highway signs and pavement marking messages. Each sign is identified by a unique designation. Signs and pavement markings not included in this manual or in the ***Standard Plans*** are to be detailed in the plans.

Examples of typical signing and pavement marking configurations are included in ***FDM 230.6***.

230.1.1 Structural Supports

AASHTO's ***LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*** and ***FDOT Modifications to LRFDLTS-1*** provide structural design criteria.

Refer to ***FDM 261*** for information regarding structural support requirements. Refer to ***FDM 325*** for information regarding plan requirements.

230.1.2 School Zones

The Department's ***Manual on Speed Zoning for Highways, Roads and Streets in Florida*** (a.k.a., ***Speed Zoning Manual***)***, Chapter 15*****,** provides school zone signing and pavement marking requirements.

Public or private elementary, middle schools (Jr. High), and federally funded facilities providing a full-time educational program are to comply with the pavement markings, signs, and other traffic control devices referenced in the ***Speed Zoning Manual***. The use of these devices at high schools must be justified by an engineering study.

Standard Plans, ***Index 700-120*** provides details relating to enhanced highway signing assemblies.

230.1.3 Vertical Clearance

See ***FDM 210.10.3*** for vertical clearance requirements for sign structures.

230.2 Signing

230.2.1 Sign Placement

Refer to the ***MUTCD***, ***Standard Plans***, and ***FDM 215*** for acceptable sign locations. Provide a four-foot clear width, not including the width of curb, when a sign is located within a sidewalk.

230.2.2 Overhead Signs on Limited Access Facilities

Section 2A.17 of the ***MUTCD*** lists thirteen optional conditions where overhead signs have value on limited access facilities. Signs are to be ground mounted except at locations required by the ***MUTCD*** or noted below:

Use overhead exit direction signs when any of the following conditions exists:

(1) Interchange Spacing ≤ 3 Miles

(2) Left Exit

(3) Three or More Through Lanes

Use overhead advance guide signs when any of the following conditions exists:

(1) Interchange Spacing ≤ 3 Miles

(2) Left Exit

(3) Limited access facility to limited access facility Interchange (1/2 mile and 2 mile, 1 mile required by ***MUTCD***)

This criteria is not intended to restrict the use of overhead signs where there is insufficient space for post mounted signs or where there is restricted sight distance.

Place overhead advance guide signs over the shoulder with the edge of the sign aligned with the edge of the traveled way unless otherwise shown in the ***MUTCD***. Place overhead

exit signs over the ramp traffic lane(s). If a barrier is present to shield another hazard, place the upright behind the barrier with proper setback for barrier performance.

230.2.3 Local Street Names on Guide Signs

Standard practice is to use route numbers on guide signs to designate roadways. When the local name for a roadway is more familiar than the route number, the local street name may be used. The decision to use a local name should be coordinated with the District Traffic Operations Engineer.

230.2.4 External Lighting of Overhead Signs

Provide external lighting of overhead signs only for the following conditions:

(1) Horizontal curves with radii of 880 feet or less in rural context classifications.

(2) Horizontal curves with radii of 2,500 feet or less in urban context classifications.

(3) In sag vertical curves with a K value of 60 or less for all context classifications.

Show sign lighting requirements on the Guide Sign Worksheet when sign lighting is required. Include sign lighting calculations in the Lighting Design Analysis Report.

See ***FDM 231.2*** for sign lighting criteria.

230.2.5 Signs on Barriers and Traffic Railings

For information regarding attachments to bridge traffic railings, concrete median barrier walls, or concrete shoulder barrier walls, refer to ***FDM 215.5***.

Utilize ***Standard Plans, Index 700-013*** when attaching the following permanent sign supports to a median traffic railing:

- No U-Turns (R3-4) w/ Official Use Only (FTP 65-06)
- Left Lane Ends (W9-1)
- Lane Ends Merge Right (W9-2)
- Merge Symbol (W4-2)
- Warning, Regulatory, or Advisory Speed signs used as a countermeasure or mitigation for safety conditions

No other permanent signs are to be attached to median traffic railings. ***Standard Plans*****, *Index 700-013*** may be used for temporary or work zone signs when ***Standard Plans*****, *Index 102-600*** cannot accommodate post mounted signs within existing conditions.

230.2.6 Signing for Temporary Bridges with Steel Decks

Place "Slippery When Wet" signs (W8-5) in advance of temporary bridges with steel decks. Refer to ***TEM*****, *Section 2.1***

230.2.7 Delineators, Object Markers and Express Lane Markers

An object marker is used to mark obstructions within or adjacent to the roadway. The ***MUTCD*** describes four object markers and how they are to be used. A Type 1 or Type 3 object marker is used to mark obstructions within the roadway. A Type 2 or Type 3 object marker is used to mark obstructions adjacent to the roadway. A Type 4 object marker (end-of-roadway marker) is used to alert users of the end of the road.

A delineator is a guidance device rather than a warning device. The ***MUTCD*** and ***Standard Plans*****, *Index 711-003*** illustrate the use of delineators along the edge of limited access traffic lanes and interchange ramps. A delineator may be a flexible or a non-flexible type. District maintenance offices generally have a preference on which should be specified.

Modification for Non-Conventional Projects:
Delete the last sentence of the above paragraph and see RFP for requirements.

A delineator is also used to mark median openings. In general, flexible delineators are used in urban context classifications and non-flexible in rural context classifications. A high visibility median delineator should be used on traffic separators at the following locations:

(1) Multilane intersections where additional visibility is required for the marking of the traffic separator,

(2) Where the separator is obstructed due to crest vertical curves,

(3) Intersections where the alignment thru the intersection is not straight, and

(4) Where traditional flexible delineators are constantly being replaced.

Use high performance delineators only in urban context classifications where the posted speed is 45 mph or less, and where;

(1) The delineator is being used to maintain lane position,

(2) The delineator is being used to restrict vehicle movements,

(3) The delineator is subject to being frequently hit.

An Express Lane Marker is similar to a high performance delineator except for the height and speed application. Express Lane Markers may be used on projects where it is not feasible to provide a physical barrier between managed and general use lanes. The ***FDOT Express Lanes Manual*** provides additional guidance on the use of Express Lane Markers.

Identify the particular type of object marker or delineator in the plans by the use of the pay item.

Modification for Non-Conventional Projects:
Delete the last sentence and replace with the following: The particular type of object marker or delineator must be identified in the plans.

230.2.8 Enhanced Highway Signing Assemblies

Flashing beacons, highlighted signs, and electronic speed feedback signs may be used to increase the conspicuity of warning and regulatory signs.

For school signing requirements, see the ***Speed Zoning Manual***.

Typical applications with these enhancements are shown in ***Standard Plans, Index 700-120***.

230.2.9 Internally Illuminated Street Name Signs

Do not exceed nine feet in width for an internally illuminated street name sign. For span wire systems, the sign is to be mounted to the strain poles. On mast arm supports, the sign may be mounted to the support or to the arm. When mounted to the arm, the distance between the upright and the near side edge of the sign is not to exceed ten feet.

Design the street name sign in accordance with the ***TEM, Section 2.2***. Utilize the following text attributes in order of preference:

(1) 10-inch upper case with 8-inch lower case, Type EM font

(2) 10-inch upper case with 8-inch lower case, Type E font

(3) 8-inch upper case with 6-inch lower case, Type EM font

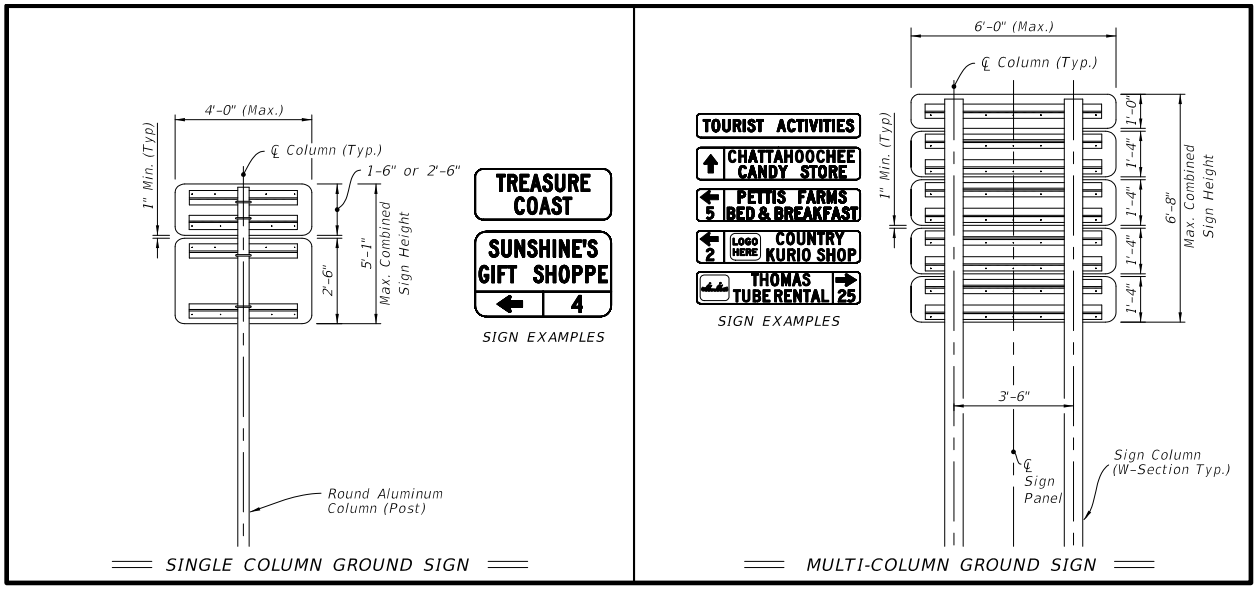
(4) 8-inch upper case with 6-inch lower case, Type E font

230.2.10 Tourist-Oriented Directional Signs

Tourist-Oriented Directional Signs are guide sign assemblies with individual panels displaying the identity and directional information for a business, service, or activity facilities. These panels are unique in size, content, and have specific criteria for that must comply with ***Rule 14-51, Florida Administrative Code*** and ***MUTCD***, ***Chapter 2K***.

Maximum sign panel dimensions for single and multi-column ground-mounted signs are shown in ***Figure 230.2.1***. Place Tourist-Oriented Directional Signs in accordance with ***Standard Plans, Index 700-101***.

Figure 230.2.1 Tourist-Oriented Directional Sign Panel Dimensions



230.3 Pavement Markings

Pavement marking design are to comply with ***Standard Specifications***, ***Standard Plans***, ***TEM***, ***MUTS***, and the ***MUTCD.***

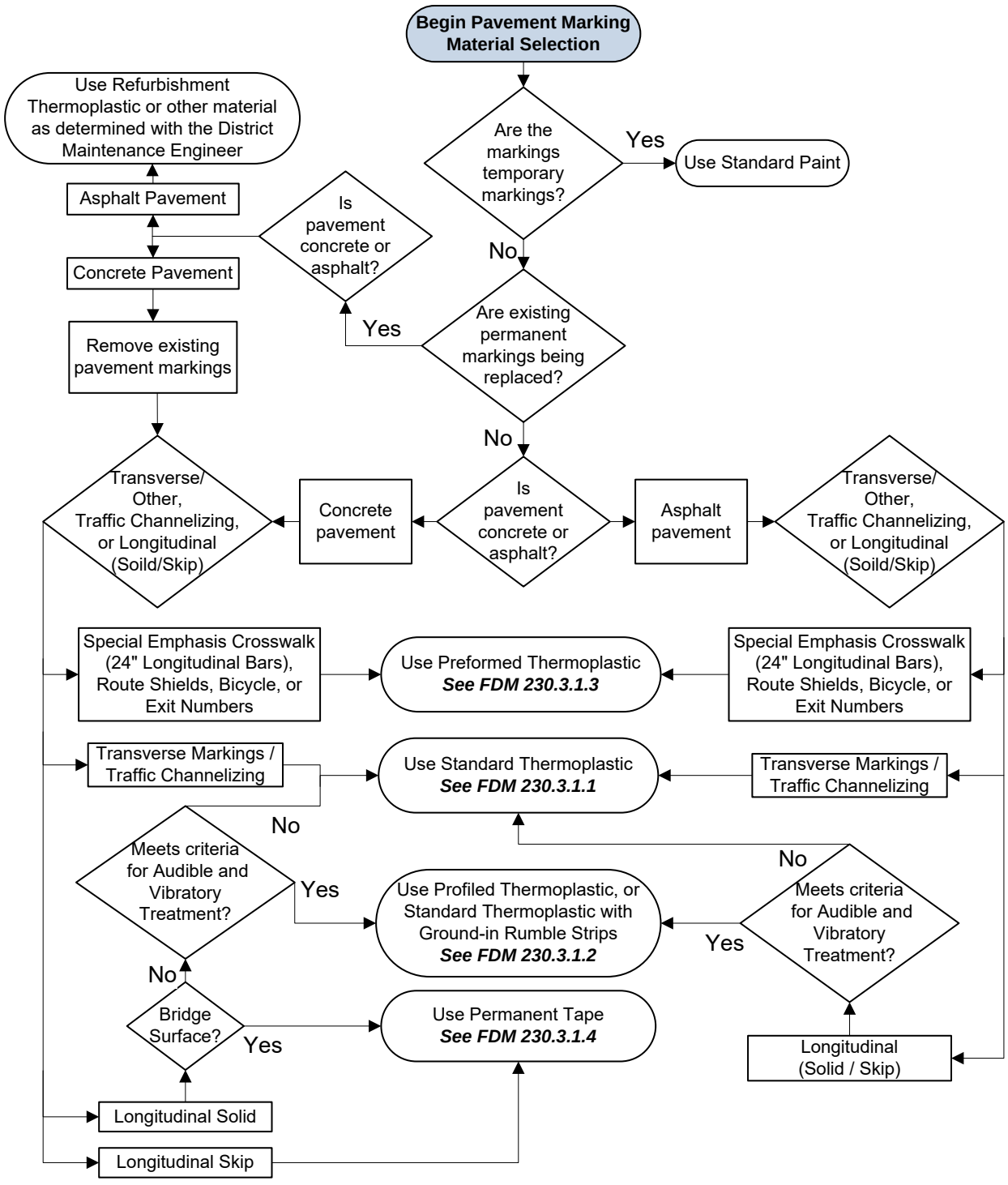
The ***MUTCD*** was adopted by the Department as the uniform system of traffic control for use on the streets and highways of the State. This action was in compliance with ***Chapter 316.0745*** of the ***Florida Statutes***. The ***MUTCD*** is therefore the basic guide for pavement marking. The requirements of the ***MUTCD*** must be met, as a minimum, on all roads in the State. Where Department manuals indicate criteria which is more stringent than the ***MUTCD***, Department criteria is to be followed.

230.3.1 Selection of Pavement Marking Material

Use the flowchart, shown in ***Figure 230.3.1***, as a tool to assist in determining the appropriate pavement marking material.

Once the pavement marking material is selected from ***Figure 230.3.1***, verify the project meets the criteria discussed in ***FDM 230.3.1.1*** through ***230.3.1.5***.

Figure 230.3.1 Pavement Marking Material Selection



230.3.1.1 Standard and Refurbishment Thermoplastic

Use Standard Thermoplastic traffic stripes and markings unless Profiled Thermoplastic, Preformed Thermoplastic, or Permanent Tape is required. Standard Thermoplastic is not used on bridge structures with concrete riding surfaces due to vibration and durability issues.

Standard Thermoplastic is placed at a thickness of 0.10 to 0.15 inches. Refurbishment Thermoplastic is the placement of new thermoplastic material on existing pavement markings and is placed at a thickness of 0.06 inches. Refurbishment Thermoplastic is not to be used on concrete riding surfaces; e.g., concrete pavement and bridge structures. Remove existing stripes and markings from concrete surfaces before placing new stripes and markings.

Coordinate with the District Maintenance Engineer to determine if Refurbishment Thermoplastic is appropriate. If Refurbishment Thermoplastic cannot be applied without exceeding the maximum thickness of 0.150 inch, remove the existing stripes and markings before placing new stripes and markings. Refer to ***Standard Specification 711*** for additional information on Standard and Refurbishment Thermoplastic.

Coordinate with the District Maintenance Engineer to determine if black paint contrast is required for skip lines, messages and arrows.

Consider the use of Durable Paint for refurbishment markings on asphalt pavement where the longer service life of Refurbishment Thermoplastic is not required. The performance of Refurbishment Thermoplastic has been evaluated by the Department for a period of 36 months. Contact the District Maintenance Engineer to determine if Durable Paint is acceptable.

Modification for Non-Conventional Projects:
Delete the last three paragraphs above and see the RFP.

230.3.1.2 Profiled Thermoplastic or Standard Thermoplastic with Ground-In Rumble Strips

Audible and vibratory treatments provide a lane departure warning. Striping material selection, and audible and vibratory treatment used are often related. Audible and vibratory treatment can be either Profiled Thermoplastic, or Standard Thermoplastic with ground-in rumble strips.

See ***FDM 210.4.6*** for audible and vibratory treatment on arterials and collectors.

See ***FDM 211.4.4*** for audible and vibratory treatment on LA Facilities.

Contrast marking is not used with Profiled Thermoplastic markings.

For more information refer to:

- ***Standard Specification 546*** for Ground-In Rumble Strips.
- ***Standard Specification 701*** for Profiled Thermoplastic.

230.3.1.3 Preformed Thermoplastic

Use Preformed Thermoplastic on all pavement types for the following markings:

(1) Bicycle Markings and Shared Use Path Markings (see ***Standard Plans, Index 711-002***, Sheet 1)

(2) 24” longitudinal bars of Special Emphasis Crosswalks (see ***Standard Plans, Index 711-001***)

(3) Route Shields

(4) Ramp Exit Numbers

(5) Roundabout informational markings

Use Preformed Thermoplastic on concrete riding surfaces (i.e., concrete pavement and bridge structures) for the following markings:

(1) White dotted Lines (2’-4’) with trailing black contrast; i.e., two feet white preformed thermoplastic plus two feet black Preformed Thermoplastic. Use only the alternating skip pattern.

(2) Arrows, Messages, and Symbols. Black contrast border is required for design speeds 45 mph and less. Black contrast block is required for design speeds greater than 45 mph. Border or block is to provide a minimum 1.5 inches from message to the outside edge. Provide details of black contrast borders and blocks in the plans.

Refer to ***Standard Specification 711*** for more information on Preformed Thermoplastic.

230.3.1.4 Permanent Tape

Use Permanent Tape on all concrete riding surfaces (i.e., concrete pavement and bridge structures) for the following markings:

(1) White skip lines (10'-30') with trailing black contrast; i.e., ten feet white tape plus ten feet black tape. Only use the alternating skip pattern.

(2) White dotted lines (6'-10') with trailing black contrast; i.e., six feet white tape plus six feet black tape. Only use the alternating skip pattern.

(3) White dotted lines (3'-9') with trailing black contrast; i.e., three feet white tape plus three feet black tape). Only use the alternating skip pattern.

(4) Yellow skip lines (10'-30'). Do not use contrast.

Use Permanent Tape for solid center lines and edge lines on bridges with concrete riding surfaces. Do not use contrast on edge lines.

Remove existing stripes and markings from concrete surfaces before placing new permanent tape.

Refer to ***Standard Specification 713*** for more information on Permanent Tape.

230.3.1.5 Two Reactive Components

Two Reactive Components may be used as an alternative to Standard Thermoplastic markings for edge lines and skip lines on asphalt pavement and only edge lines on concrete pavement.

Two Reactive Components pavement markings may be feasible for large projects. The use of Two Reactive Components pavement markings must be approved by both the District Maintenance Engineer and the District Construction Engineer.

For existing asphalt pavement, contact the District Maintenance Engineer to determine if black paint contrast is required for skip lines, messages and arrows.

Modification for Non-Conventional Projects:
Delete the last two paragraphs above and see the RFP.

230.3.2 Refurbishment Applications

For refurbishment markings, consider the following factors:

(1) Remaining service life of the pavement

(2) Thickness and conditions of existing markings

(3) Traffic volumes

(4) Cost of markings

(5) Other special requirements such as contrast needs or audible and vibratory treatment

230.3.3 No-Passing Zones

Follow the procedures contained in the ***MUTS*** for determining the limits of no-passing zones.

Limits of pavement markings for no-passing zones will be established by one of the following methods:

(1) On projects where existing roadway conditions (vertical and horizontal alignments) are to remain unaltered by construction, the no-passing zones study will be accomplished as part of the design phase. The limits of the no-passing zones will be shown on the plans.

(2) On projects with new or altered vertical and horizontal alignments, limits for no-passing zones will be established during construction. The required traffic study and field determination of limits will be performed by the designer during post design. Sufficient time must be included to accomplish the required field operations without delaying or interfering with the construction process.

230.3.4 Work Zone Pavement Markings

Use Standard Paint for work zone markings on asphalt and concrete pavement. The performance of Standard Paint has been evaluated by the Department for a period of 6 months.

Use Removable Tape for transitions on the final asphalt surface.

Consider using Durable Paint or Refurbishment Thermoplastic when a work zone phase is expected to last for more than a year under heavy traffic volumes. The performance of Durable Paint has been evaluated by the Department for a period of 18 months.

230.3.5 Raised Pavement Markers (RPMs)

Retroreflective RPMs, Class B, are the standard type of RPM.

Internally illuminated RPMs are similar to retroreflective RPMs, but are internally illuminated with LEDs. Internally illuminated RPMs may be used in lieu of retroreflective RPMs to enhance delineation and driver awareness as a mitigation strategy for substandard conditions as defined in the ***TEM***, ***Section 4.6***.

Place all RPMs in accordance with the ***Standard Plans, Index 706-001*** and the ***MUTCD***.

230.4 Exit Ramp Intersections

The standard for signing and pavement marking at exit ramp intersections is illustrated in ***Exhibit 230-1*** and described as follows:

(1) Include ***MUTCD*** "optional" signs; second DO NOT ENTER, second WRONG WAY sign, and ONE WAY signs.

(2) Include NO RIGHT TURN and NO LEFT TURN signs.

(3) Use 3.5 feet by 2.5 feet WRONG WAY signs mounted at four-foot height and include a retroreflective strip on sign supports.

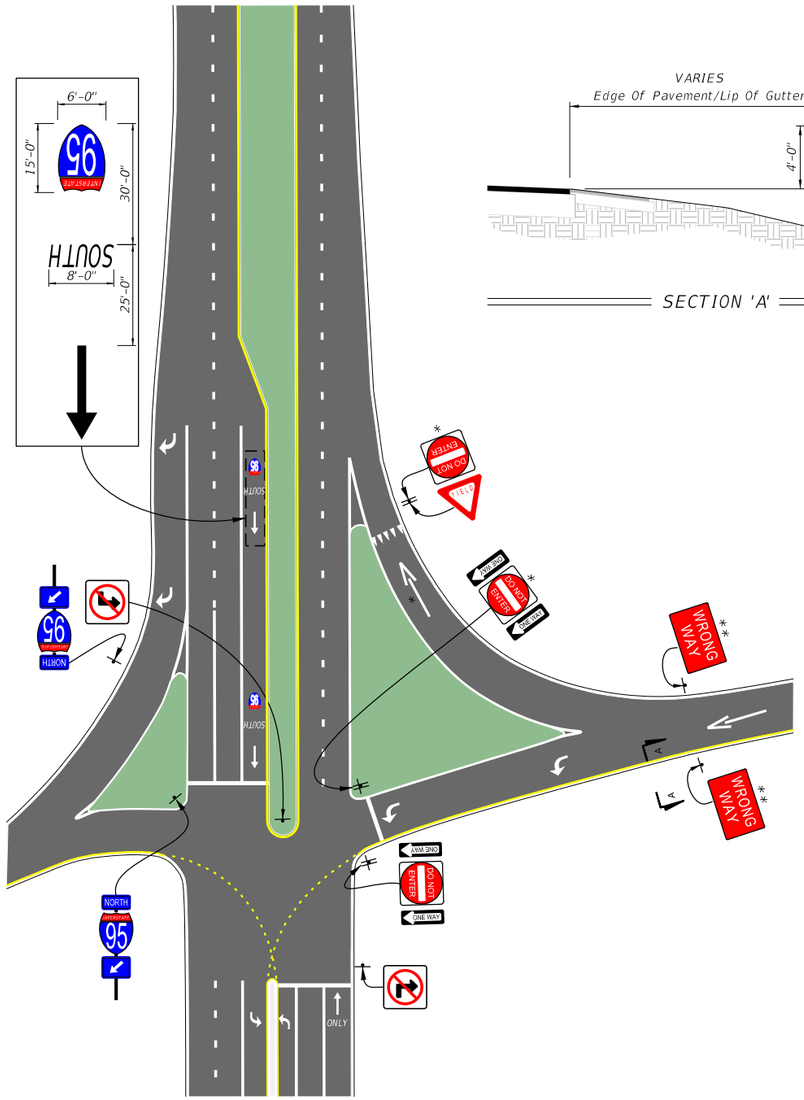
(4) Include 2-4 dotted guide line striping for left turns between ramps entrances/exits and cross-streets.

(5) Include retroreflective yellow paint on ramp median nose where applicable.

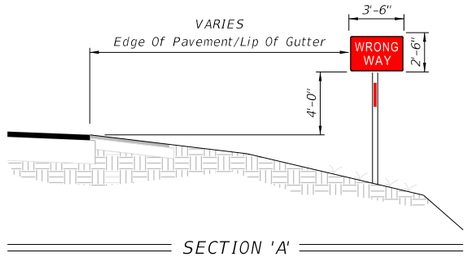
(6) Include a straight arrow and route interstate shield pavement marking in left-turn lanes extending from the far-side ramp intersection through the near-side ramp intersection to prevent premature left turns. Refer to ***TEM***, ***Section 4.2.4*** "Route Shields for Wrong Way Treatment" for additional information.

(7) Include a straight arrow and ONLY pavement message in outside lane approaching the ramp exit.

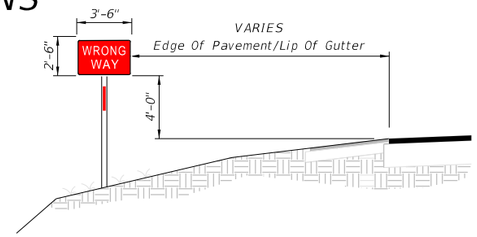
STANDARD SIGNING AND PAVEMENT MARKING AT EXIT RAMP INTERSECTIONS



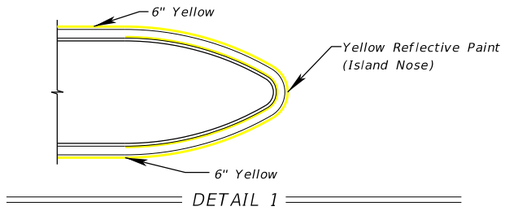
TYPICAL LAYOUT FOR DIAMOND INTERCHANGE EXIT RAMP



SECTION 'A'

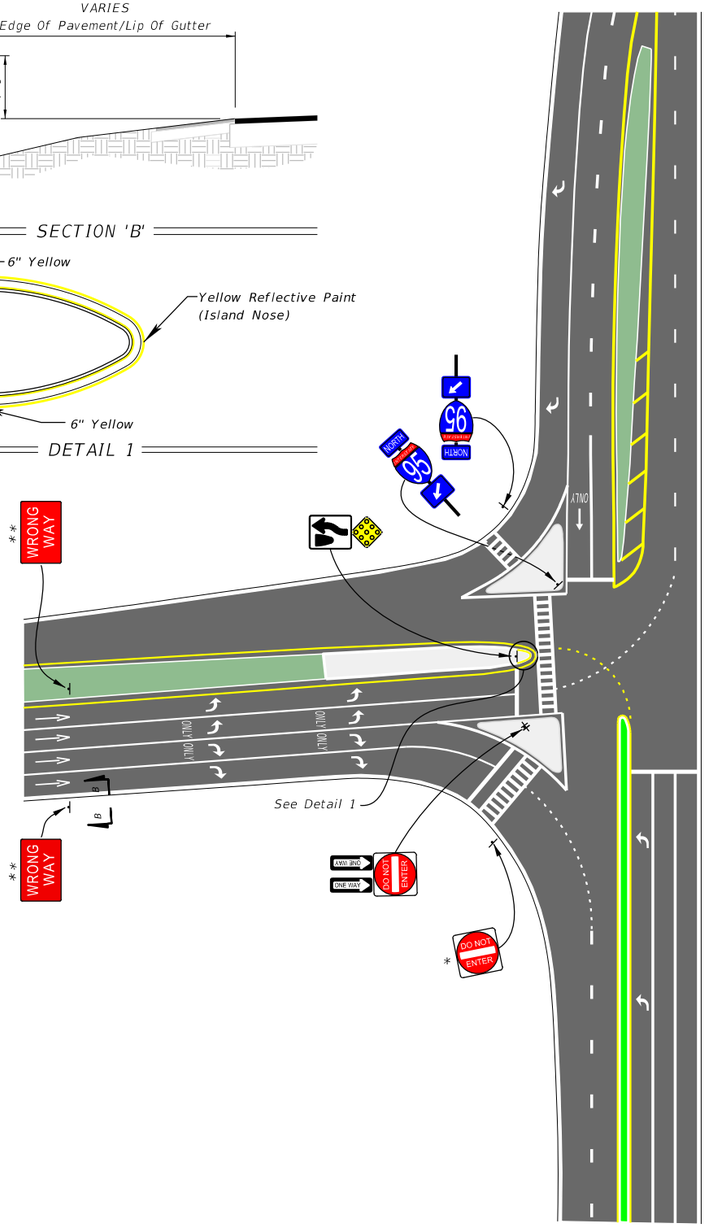


SECTION 'B'



DETAIL 1

Installation Details
* Include if connecting road is undivided or has traversable median
** Mount WRONG WAY and include vertical retroreflective strips on sign posts (See FDM 230.4)



TYPICAL LAYOUT FOR PARTIAL CLOVERLEAF/TRUMPET EXIT RAMP

NOT TO SCALE

EXHIBIT 230-1
01/01/2019

230.5 Signing and Pavement Marking Coordination

Coordination with other offices and agencies is a very important aspect of signing and pavement marking design. The offices discussed in this section are those that are typically involved in developing signing and marking plans; however, there may be other offices or agencies involved.

The District Utilities Engineer provides the coordination between the designer and the various utilities. The Utilities Section may assist in identifying or verifying conflicts with overhead and underground utilities. The District Utilities Engineer should be contacted as early in the design phase as possible.

The Structures EOR provides the design of the sign structure and foundation for overhead cantilever and overhead truss sign assemblies. The Structures EOR should be contacted early in the design phase to allow adequate time for coordination with the Geotechnical Engineer in obtaining the necessary soils information.

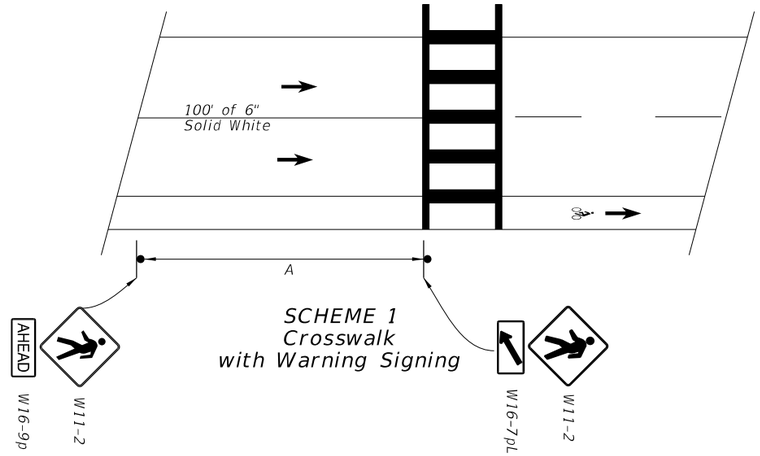
Contact the State Outdoor Advertising and Logo Manager on any project affecting business logo structures. Refer to ***FDM 110.5.5*** for requirements and additional information.

Modification for Non-Conventional Projects:
Delete ***FDM 230.5*** and replace with the following: **230.5 Signing and Pavement Marking Coordination** The Design-Build firm must submit a master signing plan with the Technical Proposal. The master signing plan can be on a roll plot.

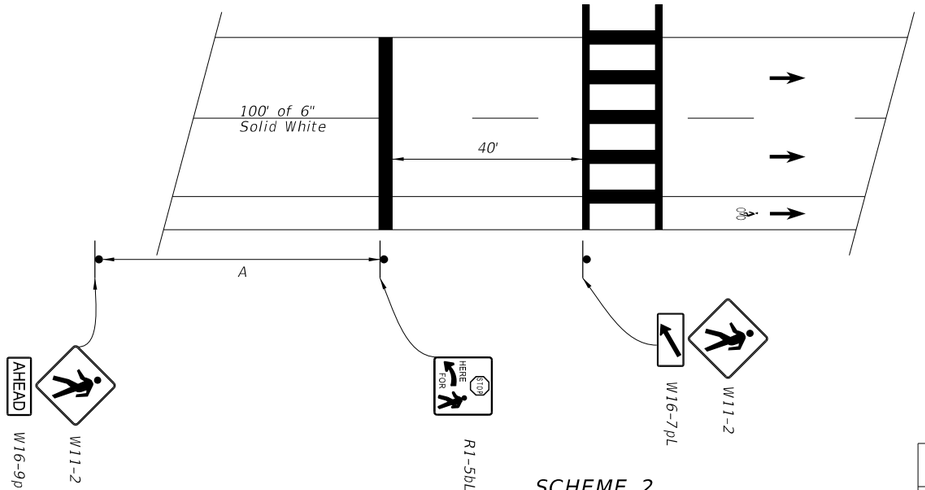
230.6 Typical Signing and Pavement Marking Configurations

The following Exhibits include standard signing and pavement marking schemes for typical situations.

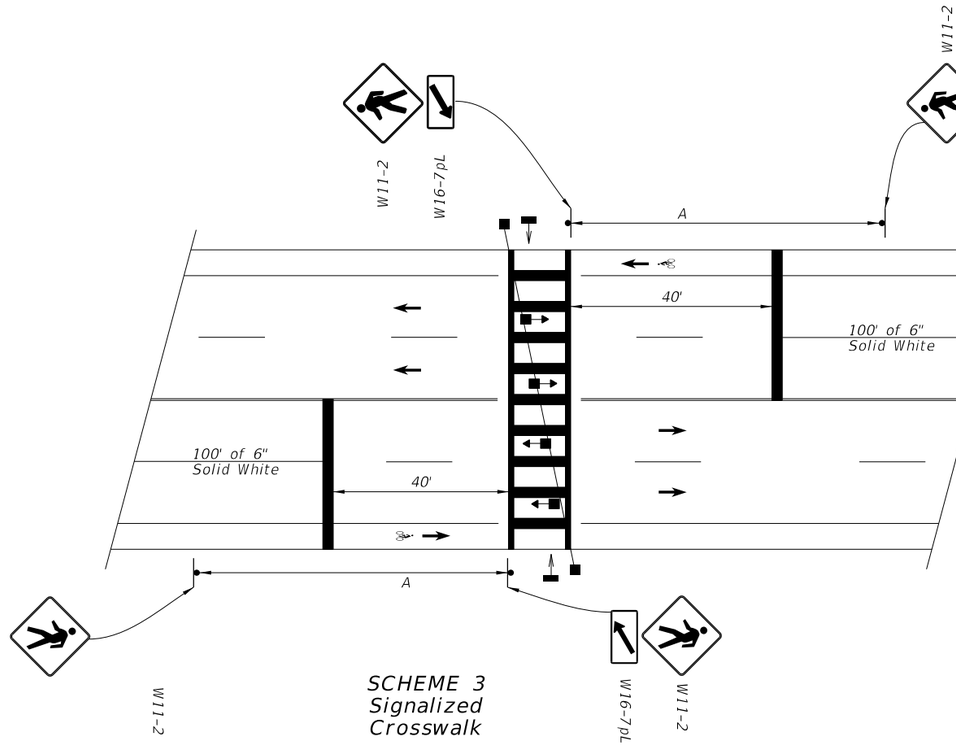
TYPICAL SIGNING AND PAVEMENT MARKING FOR MIDBLOCK CROSSWALKS



SCHEME 1
Crosswalk
with Warning Signing



SCHEME 2
Crosswalk
with Stop Signing



SCHEME 3
Signalized
Crosswalk

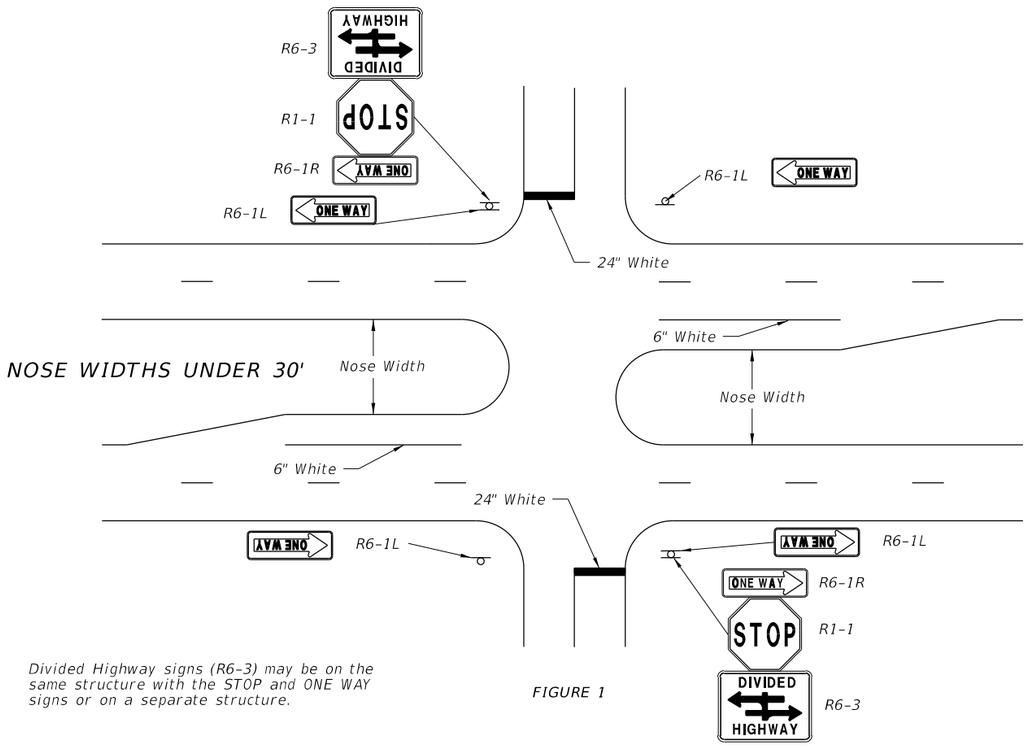
APPROACH SPEED MPH	A-SUGGESTED DISTANCE (Ft.)
25 Or Less	200
26 To 35	250
36 To 45	300

1. Plans shall indicate which crosswalk scheme is to be used.
2. The details shown do not depict the signing and markings for multi-lane roadways with divided medians. For these applications, additional signs shall be installed on the median side. Minimum width of Mid-Block Crosswalks is 10'.
3. All mid-block crosswalks shall use special emphasis crosswalk markings.
4. Crosswalk marking shall be preformed marking materials.

NOT TO SCALE

EXHIBIT 230-2
01/01/2018

TYPICAL SIGNING AND PAVEMENT MARKING
FOR MEDIAN OPENINGS ALONG DIVIDED HIGHWAYS



Divided Highway signs (R6-3) may be on the same structure with the STOP and ONE WAY signs or on a separate structure.

FIGURE 1

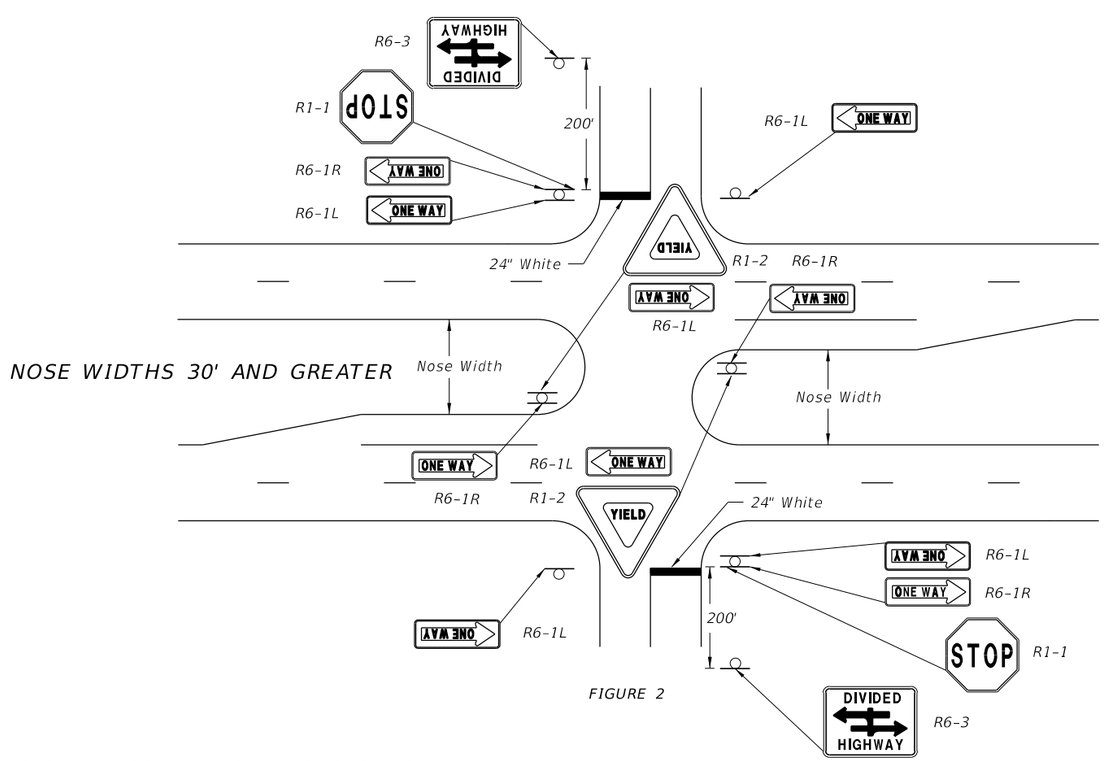


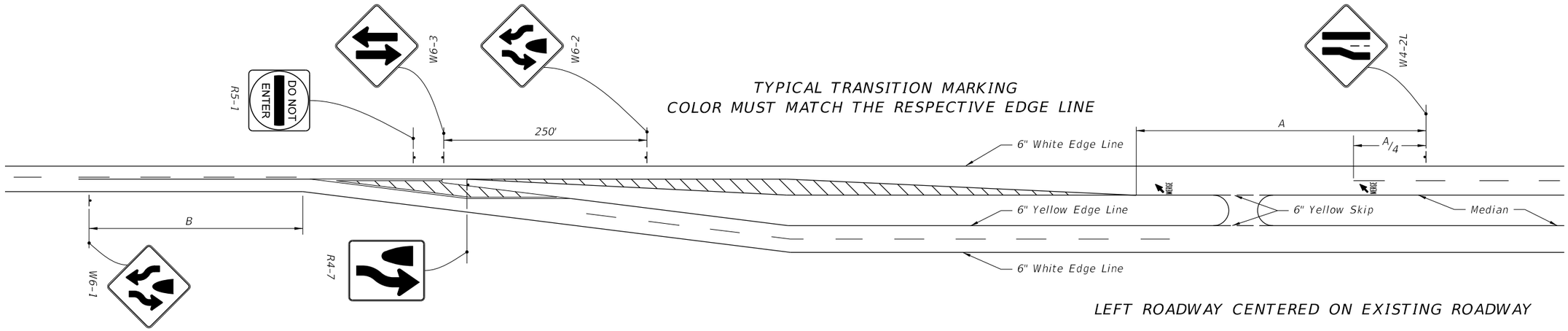
FIGURE 2

ONE-WAY SIGNS 0N DIVIDED HIGHWAY INTERSECTIONS

NOT TO SCALE

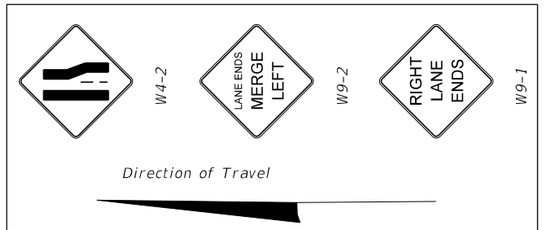
EXHIBIT 230-3
01/01/2018

TYPICAL SIGNING AND PAVEMENT MARKINGS FOR ROADWAY TRANSITIONS

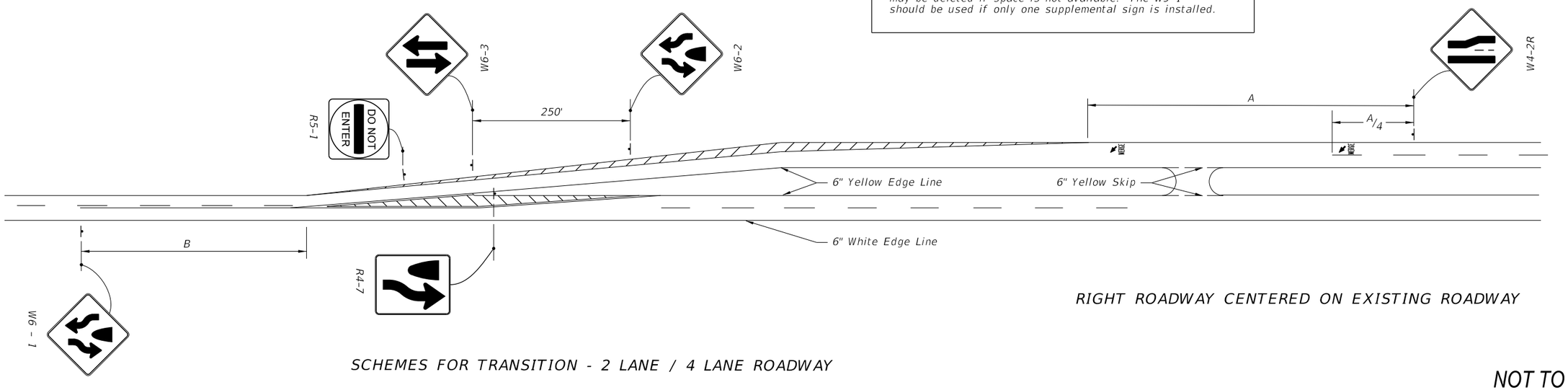


LEFT ROADWAY CENTERED ON EXISTING ROADWAY

SPEED* MPH	"A" (FT.)	"B" (FT.)
60	---	640
55	950	595
50	850	550
45	750	500
40	650	455
30	450	365



NOTE:
W9-1 & W9-2 are supplemental to the W4-2 sign and may be deleted if space is not available. The W9-1 should be used if only one supplemental sign is installed.



RIGHT ROADWAY CENTERED ON EXISTING ROADWAY

SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY

NOT TO SCALE

EXHIBIT 230-4
01/01/2018