To: SUPERSEDED BY EB 06-004 EFFECTIVE 9/7/06		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 01-015

Title: **TWO-LANE, TWO-WAY OPERATIONS IN CONSTRUCTION WORK ZONES**

Distribution:
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Approved: P.T. Wells, Assistant Commissioner and Chief Engineer — 7/2/2001 Date

ADMINISTRATIVE INFORMATION

The policy and guidance provided in this Engineering Instruction (EI) is effective with projects submitted for the letting of November 1, 2001. It may also be used for projects scheduled for earlier lettings, at the Region's discretion. This EI does not supersede any other official issuance. The guidance contained in this EI will be included in the next update of the Highway Design Manual (HDM), Chapter 16.

PURPOSE

This EI formalizes the previously informal policy and guidance for an optional method of maintenance and protection of traffic on projects on 4-lane divided highways, e.g., rural or urban interstates or arterials.

TECHNICAL INFORMATION

Two-lane, two-way operations (TLTWOs) occur on one roadway of a normally divided highway when traffic must be moved through or around temporary traffic control zones on roadways. There are strongly held views and differing practices among Department designers across New York State as to the benefits and safety risks involved with permitting temporary 2-way traffic on normally 1-way roadways, with or without the use of temporary concrete barrier (TCB). In recognition of the need for a consistent and defensible approach, the Department hereby establishes a policy for the appropriate use of TLTWOs on its projects.

Policy Statement:

It shall be the policy of the NYSDOT to consider a two-lane, two-way operation (TLTWO) as an alternative method of work zone traffic control on one roadway of a normally divided highway.

Considerations:

A TLTWO on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, an increase in the risk of head-on crashes) can arise with a TLTWO. Some of the considerations designers should make when assessing the use of TLTWO include:

1. Will a TLTWO provide a safety benefit to workers by removing the conflicts that occur when traffic is maintained immediately adjacent to the work?
2. Will a TLTWO make nighttime construction safer for workers?
3. Will operational and safety problems be caused by low-speed (≤60 km/h) vehicles, creating excessive delays and encouraging illegal passing due to motorist frustration and impatience?
4. Will emergency vehicles experience difficulties resulting from the restricted section when passing through or responding to accidents in, or downstream of, a TLTWO segment?
5. Can the work be accomplished without TLTWO? If another option is considered, will it result in an additional safety risk to temporary traffic control zone personnel?
6. Can temporary lanes be constructed in the median?
7. Will a TLTWO enhance the quality of construction? A TLTWO removes all traffic from the work area and allows the contractor better control of the work operation. Top quality work generally results in extended pavement and bridge deck service lives and a reduction in the frequency and extent of

future maintenance and reconstruction operations.

8. If a TLTWO is selected, will this result in a shorter contract time?
9. Are there any width or height restrictions that would preclude the use of a TLTWO or the use of a shoulder or the median as a temporary lane?
10. What is the condition of the pavement and shoulders in the proposed TLTWO section? If traffic will be forced to drive on the shoulders due to width restrictions, is the shoulder design adequate?
11. Is a suitable detour available that will preclude the need for on-site temporary traffic control or carry traffic in the event of emergency incidents?
12. Will a TLTWO allow a contractor to perform the work more efficiently?
13. Will use of TLTWO cause a significant increase in the project cost?
14. What are the characteristics of the traffic (e.g., traffic volume, demand volume, vehicle type distribution, etc.)?
15. Is the project located on a roadway where bicyclists and pedestrians are permitted to travel? Refer to EI 00-030 for guidance on providing maintenance and protection of traffic for bicyclists and pedestrians.
16. Can traffic be controlled to minimize or eliminate the safety risk to workers when resetting channelizing devices?
17. Is there an impact on existing drainage?

Design Standards: (Required, mandatory, or specifically prohibitive practices.)

1. Temporary concrete barrier or channelizing devices shall be used to separate opposing traffic throughout the length of the TLTWO between crossovers. Pavement markings and complementary signing, alone, shall not be used. When the work zone is located on an urban type street or arterial where operating speeds are low (≤60 km/h) and traffic control devices, including signs and pavement markings, are provided in accordance with the NYSMUTCD, separation devices may be omitted.
2. (See Guideline 3.) Where it is not possible to achieve a design speed equivalent to that of the existing facility, the design speed of the crossover and TLTWO shall not be lower than 15 km/h below either the anticipated operating speed or the preconstruction off-peak 85th percentile speed or the posted speed limit prior to work starting. Use of any design speed below the preconstruction off-peak 85th percentile speed shall be approved by the Regional Traffic Engineer. If circumstances force a further lowering of the design speed, consideration should be given to additional measures for reducing speed to a safe operating level approaching the crossover.
3. TCB shall be used to separate opposing traffic at crossovers for all TLTWOs. TCB and the excessive use of traffic control devices are not allowed as compensation for poor geometric and roadway cross section design of the crossover.
4. The directions of travel (exit, enter, through) at interchanges and rest areas located within the TLTWO shall be properly channelized to prevent wrong-way travel and confusion on the part of the motorist.
5. Protection for the approach ends of TCB shall be provided in accordance with Highway Design Manual Chapter 10, Section 10.4.
6. Two-way traffic signs (W3-3) supplemented with auxiliary mileage signs (W9-2) shall be located every 1.6 km maximum, in both directions of the TLTWO when channelizing devices are used to separate opposing traffic. (See Guideline 10.)
7. DO NOT PASS signs (R4-1) shall be located in both directions of the TLTWO when channelizing devices are used to separate opposing traffic.
8. Appropriate roadside protection, signing, and pavement markings in accordance with the NYSMUTCD, the HDM, and this EI shall be provided for the opposite direction of traffic at obstacles and locations which do not require protection, signing, and pavement markings under normal one-directional conditions.
9. A TLTWO shall not be left in place during the winter snow removal months except as approved by the Regional Traffic Engineer, Regional Construction Engineer, and Regional Maintenance Engineer.

Design Guidelines: (Recommended, not mandatory, practices, with deviations allowed if engineering judgement or analysis indicates the deviation to be appropriate.)

1. A TLTWO should not exceed 8 km in length, except that when an existing interchange is located, in the designer's judgement, a reasonable distance downstream from the terminal of the TLTWO in the crossover direction, the TLTWO may be extended to terminate at that interchange. Special consideration shall be given to the effects of horizontal and vertical alignment and truck volumes on the operation and safety of the TLTWO for lengths in excess of 8 km regarding the potential for aggressive driving.
2. Emergency pull-offs should be provided on the median side of the crossover lane (see Figure 2). The spacing should not exceed 1.6 km on a TLTWO longer than 3 km.
3. The design speed for crossovers and TLTWO should be equivalent to the design speed of the existing facility. (See Standard 2.)
4. TCB (positive barrier) should be used instead of channelizing devices when, in the judgement of the designer, the volume of traffic, the anticipated operating speed, the volume of heavy trucks, or other traffic or roadway conditions result in a potential for unacceptable conflicts between opposing flows. Guidelines for when to consider the use of TCB are when 1 or more of the following conditions occur.
   - The DDHV exceeds 1300.
   - The anticipated operating speed ≥ 80 km/h.
   - The volume of trucks exceeds 10%.

   Special consideration should also be given to such conditions as long, steep grades or a sharp curve at the base of a long, steep grade.
5. For short (approximately 600 m or less) TLTWOs, it may be more economical to use continuous TCB throughout the work zone and crossovers than to use channelizing devices through the TLTWO and TCB with impact attenuators (at the approach ends of the TCB) at the crossovers.
6. Potentially hazardous features with a high accident potential should be shielded, such as with sand barrels for point objects or with temporary guide rail for linear objects. The designer should determine the point-of-need for guide rail for traffic traveling in the opposite direction from which it was originally designed and provide shielding wherever necessary. The trailing end of bridge rail should be given special consideration. Designers should show on the plans where and what length of roadside protection is required throughout the length of the TLTWO.
7. Tapers for lane closures should not be contiguous with crossovers. The distance from the downstream end of the lane closure taper to the beginning of the crossover should be twice the length of the lane closure taper (2L) but no less than the length of the lane closure taper (L).
8. Spacing of channelizing devices used in a longitudinal series to separate opposing traffic flows should not exceed a distance in meters equal to 1/5 the speed limit (km/h) when used for taper channelization, and a distance in meters equal to 2/5 the speed limit (km/h) when used for tangent channelization.
9. The spacing of channelizing devices used at interchanges and rest areas located within the TLTWO should be 1/4 to 1/3 the spacing of the channelizing devices used in tangent locations.
10. Two-way traffic signs (W3-3) supplemented with auxiliary mileage signs (W9-2) should be used but are not required when TCB is used to separate opposing traffic. (See Standard 6.)
11. Intermittent use of alternate channelizing devices, such as opposing traffic lane dividers (separation devices manufactured of lightweight materials with 2-way arrows on both faces), is permitted where space permits, and in accordance with Special Authorization 94-12 of Appendix A of Title 17, NYCRR (NYSMUTCD). These devices may be used to break the monotony of a continuous line of primary channelizing devices, such as tubular markers. One alternate channelizing device may be installed in place of every 5th, or more, primary channelizing device.
12. Maximum speed limit signs should be provided in both directions of the TLTWO in accordance with Interim Directive - A09-245-1 Traffic Control Program: Speed Limits, Supplement No. 1 and located in accordance with the requirements of the NYSMUTCD Table 212-1.

Variance From Standards:
When a designer determines that unique, project-specific circumstances are just cause to vary from the standards for the use of a TLTWO, the decision shall be documented in the project files. The documentation should describe and provide explanations and support for features that do not comply with the TLTWO standards. Documentation is not required for variance from guidelines.

Other Information:
An example of a TLTWO, including crossovers and a tangent section, with separation of opposing traffic by channelizing devices, is provided as Figures 1, 2, and 3.

Cost Impact:
A TLTWO is a maintenance and protection of traffic option that has been used by the Department for several years. Although the use of TLTWO may involve some higher costs on projects where the TCB option is used to separate opposing traffic, the overall cost to the capital program has not been, and is not expected to be, significantly affected.

IMPLEMENTATION

Implementation of a TLTWO shall be by concurrence of the Regional Traffic Engineer and either the Regional Design Engineer for capital construction projects or the Regional Maintenance Engineer for maintenance projects, in accordance with the procedure established by the Regional Director.

BACKGROUND

TLTWOs have been used by the Department on over 25 projects during the past 10 years without formal guidance as to when and why it should be considered and how it should be designed. The unique operational problems inherent in a TLTWO makes it a method that may not be applicable to every situation. A request was made by the Regional Directors to the Office of Engineering to provide such guidance. A task force was formed, consisting of representatives of Regional Design and Regional Traffic units that have had experience with TLTWO, and Main Office representatives of the Design Division, the Traffic Engineering & Highway Safety Division, and the Construction Division. In addition, EICs who have worked on projects with TLTWO met with the task force to discuss their experiences and provide input for consideration.

The Traffic Engineering & Highway Safety Division, in conjunction with the Construction Division and the Regions, conducted an analysis of work zone accidents that occur on TLTWO sections to determine if there is a difference in safety between operations using tubular markers and operations using TCB. The results indicate no significant differences in the frequency or severity of accidents based on the data available.

REFERENCES

- NYS Manual of Uniform Traffic Control Devices.
- Manual of Uniform Traffic Control Devices, 2000, USDOT.
- Design and Operation of Work Zone Traffic Control, June 1996, NHI.

BEST PRACTICES FOLLOWUP AND CONTACT

Designers of projects on which TLTWOs are implemented are asked to advise C.E. Riedel or D.J. Clements in the Safety Program Management Bureau at (518) 457-3537 for the purposes of tracking "best practices" and reporting the findings to other Regions. Questions concerning this EI should be directed to H.G. Rogers in the Design Quality Assurance Bureau at (518) 485-8612, or by e-mail at hgrogers@gw.dot.state.ny.us.

Figure 1 Example of an Entering Crossover in a 2-Lane, 2-Way Operation

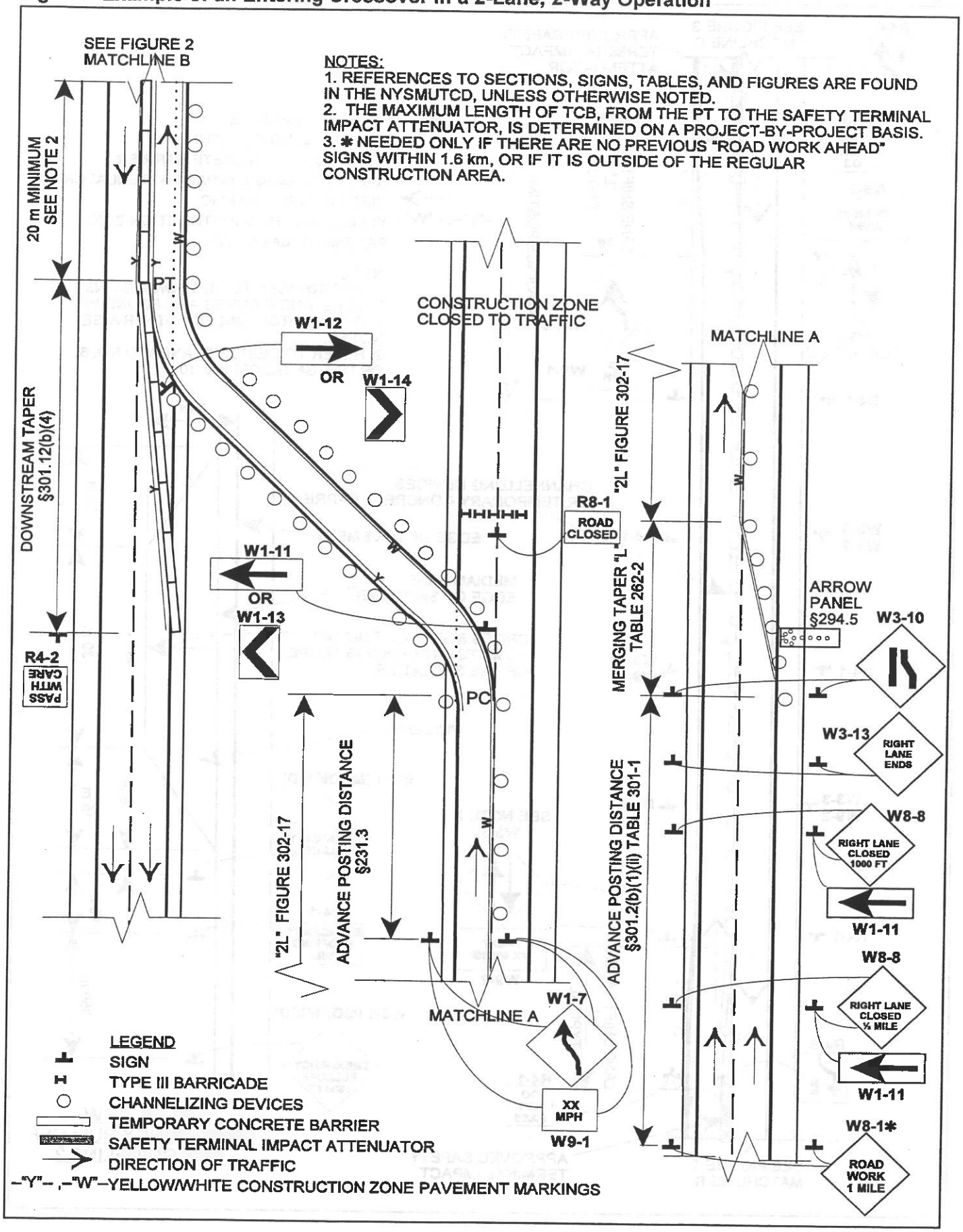


Figure 2 Example of a 2-Lane, 2-Way Operation

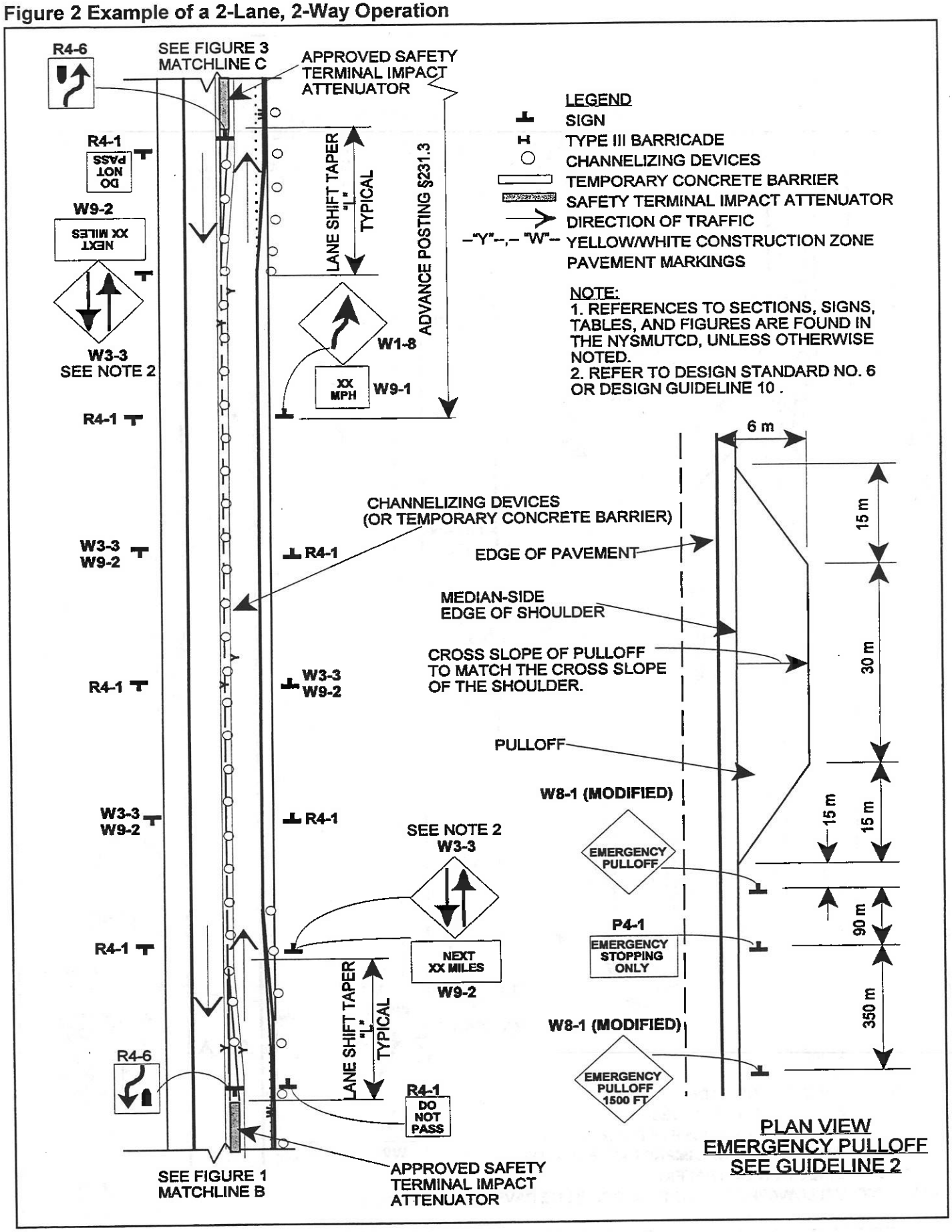
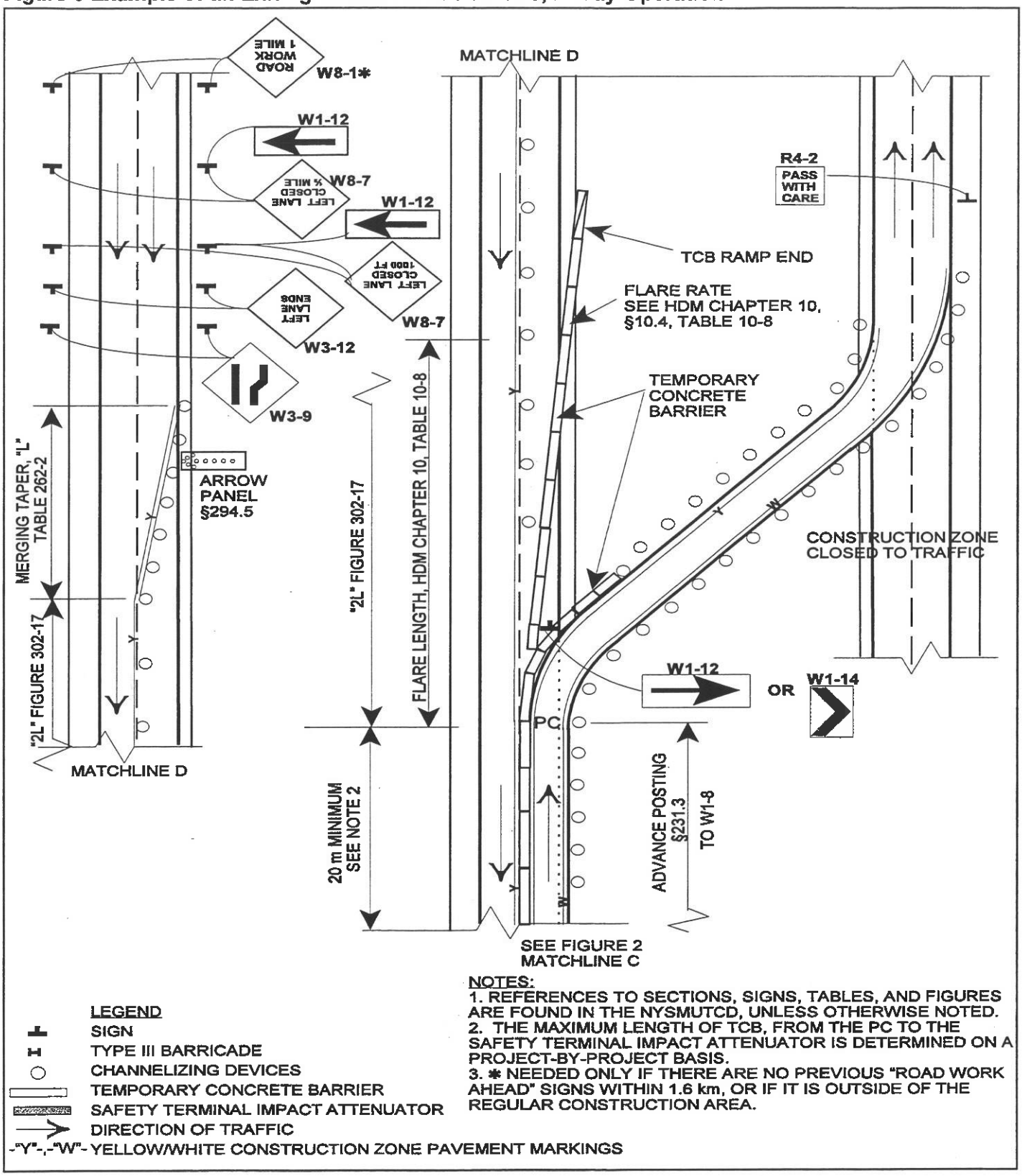


Figure 3 Example of an Exiting Crossover in a 2-Lane, 2-Way Operation



LEGEND
- SIGN
- TYPE III BARRICADE
- CHANNELIZING DEVICES
- TEMPORARY CONCRETE BARRIER
- SAFETY TERMINAL IMPACT ATTENUATOR
- DIRECTION OF TRAFFIC
- "Y"-,-"W"- YELLOW/WHITE CONSTRUCTION ZONE PAVEMENT MARKINGS

NOTES:
1. REFERENCES TO SECTIONS, SIGNS, TABLES, AND FIGURES ARE FOUND IN THE NYSMUTCD, UNLESS OTHERWISE NOTED.
2. THE MAXIMUM LENGTH OF TCB, FROM THE PC TO THE SAFETY TERMINAL IMPACT ATTENUATOR IS DETERMINED ON A PROJECT-BY-PROJECT BASIS.
3. * NEEDED ONLY IF THERE ARE NO PREVIOUS "ROAD WORK AHEAD" SIGNS WITHIN 1.6 km, OR IF IT IS OUTSIDE OF THE REGULAR CONSTRUCTION AREA.