



National Committee on Uniform Traffic Control Devices

13236 North 7th Street, Suite 4-259, Phoenix, Arizona 85022
Phone/Text: 231-4-NCUTCD (231-462-8823)
E-mail: secretary@ncutcd.org

National Committee on Uniform Traffic Control Devices (NCUTCD) Recommended Changes to Proposed Text for 11th Edition of the MUTCD Docket Number: FHWA-2020-0001

Federal Register Item Number: 228 through 241

NPA MUTCD Section Number: 2F.01 through 2F.20

Legend: Base text shown in proposal is the NPA “clean” proposed text.

- [NCUTCD recommendation for text to be added in final rule.](#)
- ~~NCUTCD recommendation for text to be deleted in final rule.~~
- [NCUTCD recommendation for text to be moved/relocated in final rule.](#)
- NPA text that was not previously approved by NCUTCD but is not approved.
- Explanatory note: [\[Note that explains purpose of recommended change.\]](#)

The following pages present NCUTCD recommendations for changes to the MUTCD NPA proposed text, tables, and figures for Chapter 2F. Below is a short summary of the NCUTCD position for each section of this chapter. A more detailed summary is provided at the beginning of each section.

- Section 2F.01. NCUTCD agrees with NPA content (no changes recommended).
- NPA #228, Chapter 2F Subchapter and Organization: Changes recommended based on Council action in Spring 2021
- NPA #229, Section 2F.02: Changes recommended based on Council action in Spring 2021
- NPA #230, Section 2F.03: Changes recommended based on Council action in Spring 2021
- NPA # 231, Section 2F.04: Changes recommended based on Council action in Spring 2021
- NPA #232, Section 2F.05: Changes recommended based on Council action in Spring 2021
- NPA #233, Section 2F.06 through 2F.09: Changes recommended based on Council action in Spring 2021
- NPA #234, Section 2F.10: Changes recommended based on Council action in Spring 2021
- NPA #235, Section 2F.11: Changes recommended based on Council action in Spring 2021
- NPA #236, Section 2F.12: Changes recommended based on Council action in Spring 2021
- NPA #237, Section 2F.13: Changes recommended based on Council action in Spring 2021
- Section 2F.14: NCUTCD agrees with NPA content (no changes recommended)
- Section 2F.15: NCUTCD agrees with NPA content (no changes recommended)
- Section 2F.16: NCUTCD agrees with NPA content (no changes recommended)
- NPA #238, Section 2F.017: Changes recommended based on Council action in Spring 2021
- NPA #239: NCUTCD agrees with NPA content (no changes recommended)
- NPA #240, Section 2F.18: Changes recommended based on Council action in Spring 2021
- NPA #241, Section 2F.19: NCUTCD agrees with NPA content (no changes recommended)
- Section 2F.20: NCUTCD agrees with NPA content (no changes recommended)

Chapter 2F Comments: NCUTCD generally agrees with the organization of Chapter 2F as presented in the NPA, but recommends revising the title of Section 2F.03 from “Color” to “Use of Purple with ETC Account Pictographs”, as other Sections in the MUTCD (1D.07, 2A.06) are also titled with the term “Color”, which could cause confusion.

Chapter 2F Subchapter and Section Organization

General

2F.01 Scope

2F.02 Sizes of Toll Road Signs and Electronic Toll Collection (ETC) System Pictographs

2F.03 ~~Color~~ Use of Purple with ETC Account Pictographs

(revise Section name)

Regulatory Signs

2F.04 Regulatory Signs for Toll Plazas

2F.05 Electronic Toll Collection (ETC) Account-Only Regulatory Sign and Plaque (R3-31, R3-32P)

Warning Signs

2F.06 Pay Toll and Take Ticket Advance Warning Signs (W9-6, W9-6e)

2F.07 Pay Toll and Take Ticket Advance Warning Plaques (W9-6bP, W9-6gP)

2F.08 Stop Ahead Pay Toll and Take Ticket Warning Signs (W9-6a, W9-6f)

2F.09 Stop Ahead Pay Toll and Take Ticket Warning Plaques (W9-6cP, W9-6hP)

2F.10 LAST EXIT BEFORE TOLL Warning Plaques (W16-16P, W16-16aP)

2F.11 TOLL Warning Plaque (W16-17P)

Guide Signs

2F.12 Toll Facility and Toll Plaza Guide Signs – General

2F.13 Electronic Toll Collection (ETC) Signs – General

2F.14 Advance Signs for Conventional Toll Plazas

2F.15 Advance Signs for Toll Plazas on Diverging Alignments from Open-Road ETC Account-Only Lanes

2F.16 Toll Plaza Canopy Signs

2F.17 Guide Signs for Entrances to ETC Account-Only Facilities

2F.18 Guide Signs for Entrances to ETC-Only Facilities

2F.19 Guide Signs for ETC-Only Entrance Ramps to Non-Toll Highways

2F.20 ETC Account Program Information Signs

Section 2F.01 Comments: NCUTCD agrees with 2F.01 as presented in the NPA.

Section 2F.01 Scope

Support:

Toll highways are typically limited-access freeway or expressway facilities. A portion of or an entire route might be a toll highway, or a bridge, tunnel, or other crossing point might be the only toll portion of a highway at which a toll is collected. A toll highway might be a conventional road. The general signing requirements for toll roads will depend on the type of facility and access (freeway, expressway, or conventional road). The provisions of Chapters 2D and 2E will generally apply for guide signs along the toll facility that direct road users within and off the facility where exit points and geometric configurations are not dependent specifically on the collection of tolls. The aspect of tolling and the presence of toll plazas or collection points necessitate additional considerations in the typical signing needs. The notification of the collection of tolls in advance of and at entry points to the toll highway also necessitates additional modifications to the typical signing.

The scope of this Section applies to a route or facility on which all lanes are tolled. Chapter 2G contains provisions for the signing of managed lanes within an otherwise non-toll facility that employ tolling or pricing as an operational strategy to manage congestion levels.

Standard:

Except where specifically provided in this Chapter, the provisions of other Chapters in Part 2 shall apply to toll roads.

Section 2F.02 Comments: NCUTCD agrees with 2F.02 as presented in the NPA with minor editorial revisions.

Section 2F.02 Sizes of Toll Road Signs and Electronic Toll Collection (ETC) System Pictographs

Standard:

Except as provided in Section 2A.~~4107~~, the sizes of toll road signs that have standardized designs shall be as shown in Table 2F-1.

Support:

Section 2A.~~4107~~ contains information regarding the applicability of the various columns in Table 2F-1.

Option:

Signs larger than those shown in Table 2F-1 may be used (see Section 2A.~~4107~~).

NCUTCD generally agrees with Table 2F-1 as presented in the NPA, but recommends revising as follows:

Table 2F-1. Toll Road Sign and Plaque Minimum Sizes

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Toll Rate	R3-28	2F.06	—	—	114 x 48	114 x 48	—	—
Pay Toll (plaque)	R3-29P	2F.06	—	—	24 x 18	24 x 18	—	—
Take Ticket (plaque)	R3-30P	2F.06	—	—	24 x 18	24 x 18	—	—
Pay Toll XX Miles Cars (price)	W9-6	2F.07	96 x 66	96 x 66	96 x 66	96 x 66	—	—
Pay Toll XX Miles Cars (price) (plaque)	W9-6aP	2F.07	312" x 30	312" x 30	312" x 30	312" x 30	—	—
Stop Ahead Pay Toll Cars (price)	W9-6a	2F.08	114 x 66	114 x 66	114 x 66	114 x 66	—	—
Stop Ahead Pay Toll (plaque)	W9-6cP	2F.09	254" x 30	254" x 30	254" x 30	254" x 30	—	—
Stop Ahead Pay Toll	W9-6d	2F.06	144 x 48	144 x 48	144 x 48	144 x 48	—	—
Take Ticket XX Miles	W9-6e	2F.06	144 x 48	144 x 48	144 x 48	144 x 48	—	—
Stop Ahead Take Ticket	W9-6f	2F.08	144 x 48	144 x 48	144 x 48	144 x 48	—	—
Take Ticket XX Miles (plaque)	W9-6gP	2F.07	216 x 30	216 x 30	216 x 30	216 x 30	—	—
Stop Ahead Take Ticket	W9-6hP	2F.09	282 x 30	216 x 30	216 x 30	216 x 30	—	—
Last Exit Before Toll (plaque)	W16-16P	2F.10	—	—	252" x 36	252" x 36	—	—
Last Exit Before Toll (plaque)	W16-16aP	2F.10	—	—	126" x 48	126" x 48	—	—
Toll (plaque)	W16-17P	2F.11	24 x 12	24 x 12	36 x 18	36 x 18	24 x 12	36 x 18
No Cash	R3-32P	2F.05	24 x 12	24 x 12	36 x 18	36 x 18	24 x 12	36 x 18
Toll Collector Symbol	M4-17	2F.12	—	—	48 x 48	48 x 48	—	—
Exact Change Symbol	M4-18	2F.12	—	—	48 x 48	48 x 48	—	—
ETC Only	R3-31	2F.05	24 x 24	24 x 24	36 x 36	36 x 36	24 x 24	36 x 36

* The width shown represents the minimum dimension. The width shall be increased as appropriate to match the width of the guide sign.

Notes:

1. Larger signs may be used when appropriate
2. Dimensions in inches are shown as width x height

Standard:

The ETC system pictograph (see Chapter 2A) shall be of a size that makes it a prominent feature of the sign legend as necessary for conspicuity for those road users with registered ETC accounts seeking such direction, as well as for those road users who do not have ETC accounts so that it is clear to them to avoid such direction when applicable.

Guidance:

Except as provided in Paragraph 6 of this Section, an ETC pictograph that is in the shape of a horizontally oriented rectangle should have a minimum height of 1.5 times the upper-case letter height of the principal legend on the sign. The width of an ETC pictograph in the shape of a horizontal rectangle should be between approximately two and three times the height of the pictograph.

When the pictograph is the principal legend on the sign, such as for advance guide signs for open-road tolling lanes (see Section 2F.15), the minimum height of a horizontally oriented rectangular ETC pictograph should be consistent with that of a route shield prescribed for the particular application and type of sign.

For ETC pictographs whose shape is square, circular, or otherwise similar in height and width, or is a vertically oriented rectangle, the same basic principles for conspicuity and placement should be followed. ETC pictographs whose shape is not in that of a horizontally oriented rectangle should be suitably sized to facilitate conspicuity as described in Paragraph 14 and should be of a similar approximate area as the horizontally oriented rectangular pictographs designed in accordance with the height and width as provided in Paragraph 5.

Section 2F.03 Comments: NCUTCD generally agrees with 2F.03 as presented in the NPA, but recommends revising the title from “Color” to “Use of Purple with ETC Account Pictographs” (see Chapter 2F comment), plus minor editorial revisions.

Section 2F.03 ~~Color~~ Use of Purple with ETC Account Pictographs

Standard:

Use of the color purple on any sign shall comply with the provisions of Sections ~~1A.12~~ 1D.07 and 2A.~~1006~~. Except as provided in Sections 2F.05 and 2F.12, purple as a background color shall be used only when the information associated with the appropriate ETC account is displayed on that portion of the sign. The background color of the remaining portion of such signs shall comply with the provisions of Sections ~~1A.12~~ 1D.07 and 2A.~~1006~~ as appropriate for a regulatory, warning, or guide sign. Purple shall not be used as a background color to display a destination, action message, or other legend that is not a display of the requirement for all vehicles to have a registered ETC account.

If only vehicles with registered ETC accounts are allowed to use a highway lane, a toll plaza lane, an open-road tolling lane, or all lanes of a toll highway or connection, the guide signs for such lanes or highways shall incorporate the pictograph (see Chapter 2A) adopted by the toll facility’s ETC payment system and the regulatory message ONLY. Except for ETC pictographs whose predominant background color is purple, if incorporated within the green background of a guide sign, the ETC pictograph shall be on a white rectangular or square panel set on a purple underlay panel with a white border. For rectangular ETC pictographs whose predominant background color is purple, a white border shall be used at the outer edges of the purple rectangle to provide contrast between the pictograph and the sign background color.

If an ETC pictograph is used on a separate plaque in a route sign assembly (see Section 2F.05) or on a header panel within a guide sign, the plaque or the header panel shall have a purple background with a white border and the ETC pictograph shall have a white border to provide contrast between the pictograph and the background of the plaque or header panel.

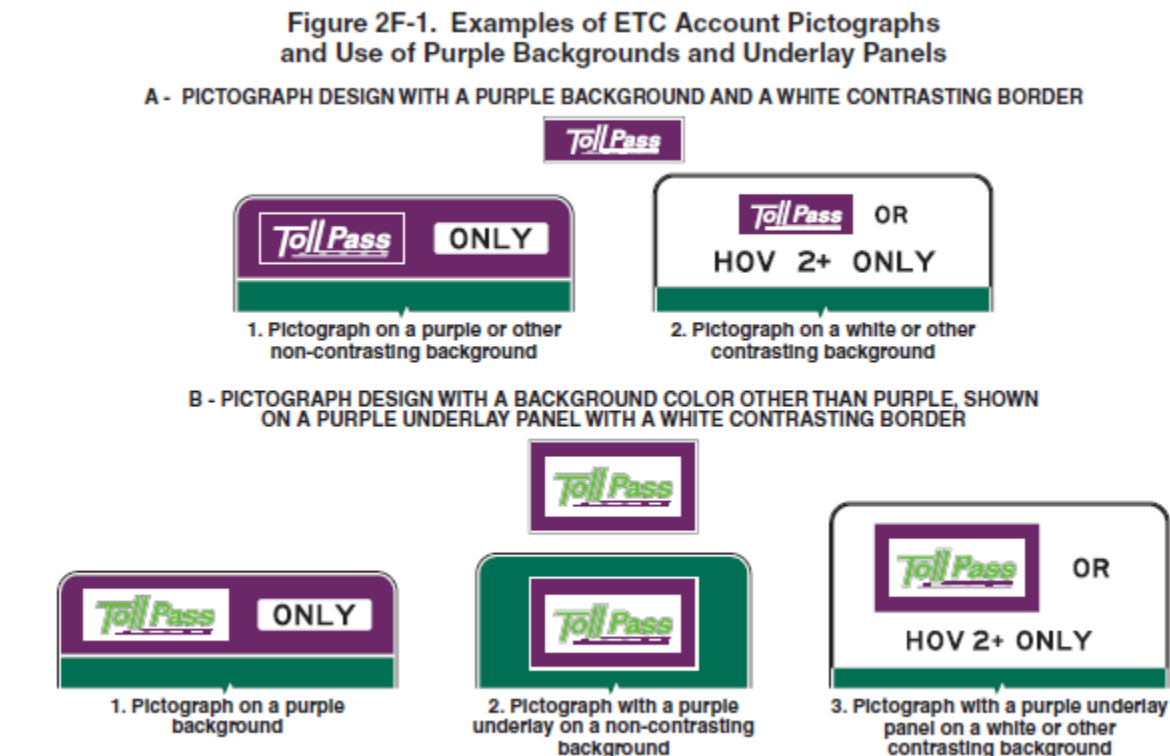
Purple underlay panels for ETC pictographs or purple backgrounds for plaques and header panels shall only be used in the manner described in Paragraphs 1 through 3 to convey the requirement of a registered ETC account on signs for lanes reserved exclusively for vehicles with such an account and on directional signs to an ETC account-only facility from a non-toll facility or from a toll facility that accepts multiple payment forms.

Support:

Figure 2F-1 shows examples of ETC account pictographs, their use with various background colors, and modifications involving underlay panels.

Section 2F.02 contains provisions regarding the size of pictographs for ETC accounts.

193 NCUTCD agrees with Figure 2F-1 as presented in the NPA.



194
195
196
197 **Section 2F.04 Comments:** NCUTCD generally agrees with 2F.04 as presented in the NPA with
198 minor editorial revisions.

199
200 **Section 2F.04 Regulatory Signs for Toll Plazas**

201
202 Support:

203 Toll plaza operations often include lane-specific restrictions on vehicle type, forms of
204 payment accepted, and speed limits or required stops. Vehicles are typically required to come to
205 a stop to pay the toll or receive a toll ticket in the attended and exact change or automatic lanes.
206 Electronic toll collection (ETC) lanes with favorable geometrics typically allow vehicles to move
207 through the toll plaza without stopping, but usually within a set regulatory speed limit or
208 advisory speed. In some ETC lanes and in most lanes that accommodate non-ETC vehicles, a
209 stop might be required while the ETC payment is processed because of geometric or other
210 conditions.

211 *Guidance:*

212 *Regulatory signs applicable only to a particular lane or lanes should be located in a position*
213 *that makes their lane applicability clear to road users approaching the toll plaza.*

214 *Regulatory signs, or regulatory panels within guide signs, indicating restrictions on vehicle*
215 *type and forms of toll payment accepted at a specific toll plaza lane should be installed over the*
216 *applicable lane either on the toll plaza canopy or on a separate structure immediately in*

advance of the canopy located in a manner such that each sign is clearly related to an individual toll lane.

Support:

Section 2F.12 contains information regarding the incorporation of regulatory messages into guide signs for toll plazas.

Section 2F.16 contains information regarding the design and use of toll plaza canopy signs.

Guidance:

One or more Speed Limit (R2-1) signs (see Section ~~2B.13~~ 2B.21) should be installed in the locations provided in Paragraph 8 for an ETC-Only lane at a toll plaza in which an enforceable regulatory speed limit is established for a lane in which it is intended that vehicles move through the toll plaza without stopping while toll payments requiring stops occur in other lanes at the toll plaza. The speed limit displayed on the signs should be based on an engineering study taking into account the geometry of the plaza and the lanes and other appropriate safety and operational factors.

A Speed Limit (R2-1) sign should not be installed for a toll plaza lane that is controlled by a STOP (R1-1) sign or where a stop is required.

~~Guidance:~~

Where speed limit signs are installed over a toll plaza lane on the toll plaza canopy, on the approach end of the toll booth island, on the toll booth itself, or on a vertical element of the canopy structure, then down arrows or diagonally downward-pointing directional arrows should be used to supplement the speed limit signs if there is a need clarify the applicability of a sign to a specific lane or to improve compliance.

Standard:

A STOP (R1-1) sign shall not be installed for a toll plaza lane that is operated as an ETC-Only lane and that is designed for tolls to be collected while vehicles continue moving.

Option:

A STOP (R1-1) sign may be installed to require all vehicles to come to a complete stop to pay a toll in an attended or exact change lane, even if that lane is also available for optional use by vehicles with registered ETC accounts. A PAY TOLL (R3-29P) or TAKE TICKET (R3-30P) plaque (see Figure 2F-2), as appropriate to the operation, may be installed directly under the STOP (R1-1) sign for a toll plaza lane, if needed.

The mounting height of the STOP sign and any supplemental plaque may be less than the normal mounting height requirements if constrained by the physical features of the toll island or toll plaza.

The lateral offset of a STOP or other regulatory sign located within a toll plaza island may be reduced to a minimum of 1 foot from the face of the toll island or raised barrier to the nearest edge of the sign.

Guidance:

If used, a STOP (R1-1) sign for a toll plaza cash payment lane should be located in a longitudinal position as near as practical to the point where a vehicle is expected to stop to pay the toll or take a ticket.

Option:

A Toll Rate (R3-28) sign (see Figure 2F-2) may be installed in advance of the toll plaza to indicate the toll applicable to the various vehicle types.

Guidance:

If used, the Toll Rate (R3-28) sign should be located between the toll plaza and the first advance sign informing road users of the toll plaza.

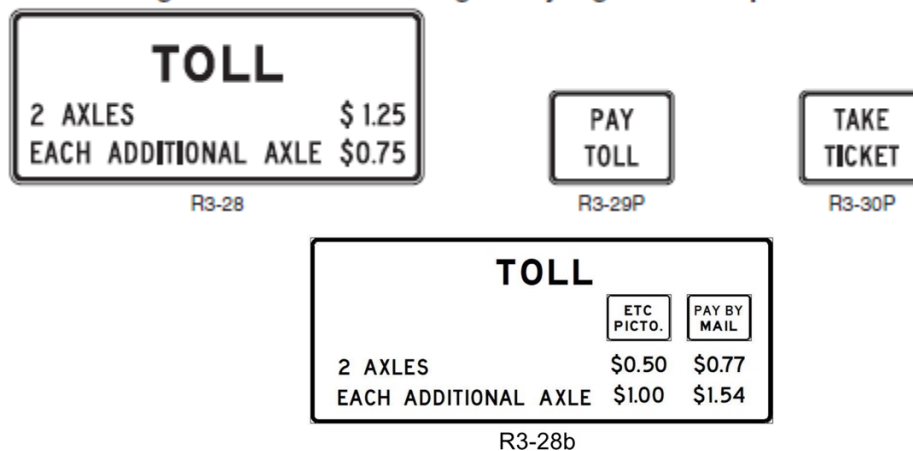
The R3-28 sign should not contain more than three lines of legend. Each line that shows a toll amount should display only a single toll amount.

Option:

Additional toll rate information exceeding three lines of legend may be displayed on the toll booth adjacent to the payment window of an attended lane or the payment receptacle of an exact change or automatic lane where it is visible to a road user who has stopped to pay the toll, but is not visible to approaching road users who have not yet entered the toll lane.

NCUTCD generally agrees with Figure 2F-2 as presented in the NPA, but recommends adding a new R3-28b toll rate sign that agrees more closely with the design of signs currently used by toll authorities and operators.

Figure 2F-2. Toll Plaza Regulatory Signs and Plaques



Section 2F.05 Comments: NCUTCD agrees with 2F.05 as presented in the NPA.

Section 2F.05 Electronic Toll Collection (ETC) Account-Only Regulatory Sign and Plaque (R3-31, R3-32P)

Standard:

In any route sign assembly providing directions to a toll facility, or to a tolled segment of a highway, where electronic toll collection (ETC) is the only payment method accepted and all vehicles are required to have a registered ETC account, the ETC Account-Only (R3-31) sign (see Figure 2F-3) shall be mounted directly below the route sign of the numbered or named toll facility. The R3-31 sign shall have a white border and purple background and incorporate the pictograph adopted by the toll facility's ETC payment system and the word ONLY in black letters on a white panel set on the purple background of the sign.

Option:

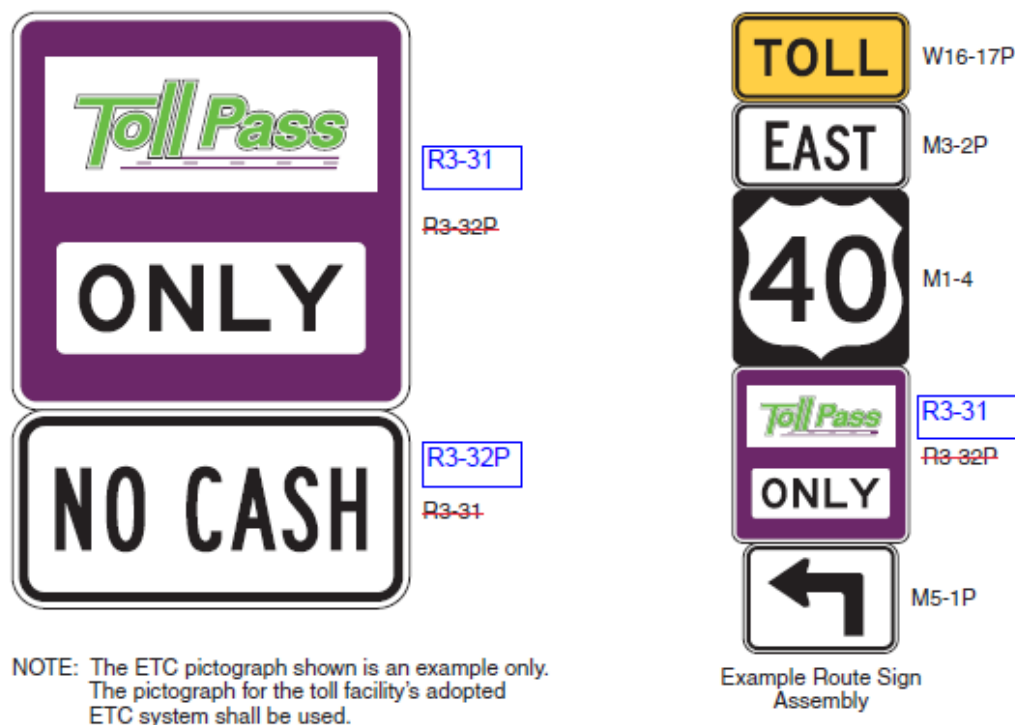
The NO CASH (R3-32P) plaque (see Figure 2F-3) with a black legend and border on a white background may be mounted directly below the R3-31 sign in a Directional or other sign assembly.

NCUTCD recommends revising Figure 2F-3 as follows:

- Revise the figure title to read “ETC Account-Only Regulatory Sign and Plaque”
- Revise sign designations to agree with Table 2F-1:
 - Revise R3-31 to R3-32P
 - Revise R3-32P to R3-31

Regulatory Sign and Plaque

Figure 2F-3. ETC Account-Only ~~Auxiliary Signs for Use in Route Sign Assemblies~~



Section 2F.06 Comments: NCUTCD generally agrees with 2F.06 as presented in the NPA, but recommends deleting “overhead” in the second Guidance paragraph because the optimum or practical location for these signs may not always be overhead.

Section 2F.06 Pay Toll and Take Ticket Advance Warning Signs (W9-6, W9-6e)
Standard:

The Pay Toll and Take Ticket Advance Warning (W9-6 and W9-6e) signs shall display the distance to the toll plaza and, except for toll-ticket facilities, the toll for passenger or 2-axle vehicles (see Figure 2F-4). Where the toll for passenger or 2-axle vehicles is variable by

time of day, a changeable message element shall be incorporated into the W9-6 sign to display the toll in effect.

Guidance:

The Pay Toll Advance Warning sign should be installed at approximately 1 mile and 1/2 mile in advance of mainline toll plazas at which some or all lanes are required to come to a stop to pay a toll (see Sections 2F.14 and 2F.15).

The Take Ticket Advance Warning sign should be installed ~~overhead~~ at approximately 1 mile and 1/2 mile in advance of mainline toll plazas at which some or all lanes are required to come to a stop to take a toll ticket (see Sections 2F.14 and 2F.15).

The Pay Toll and Take Ticket Advance Warning signs should be overhead-mounted.

Option:

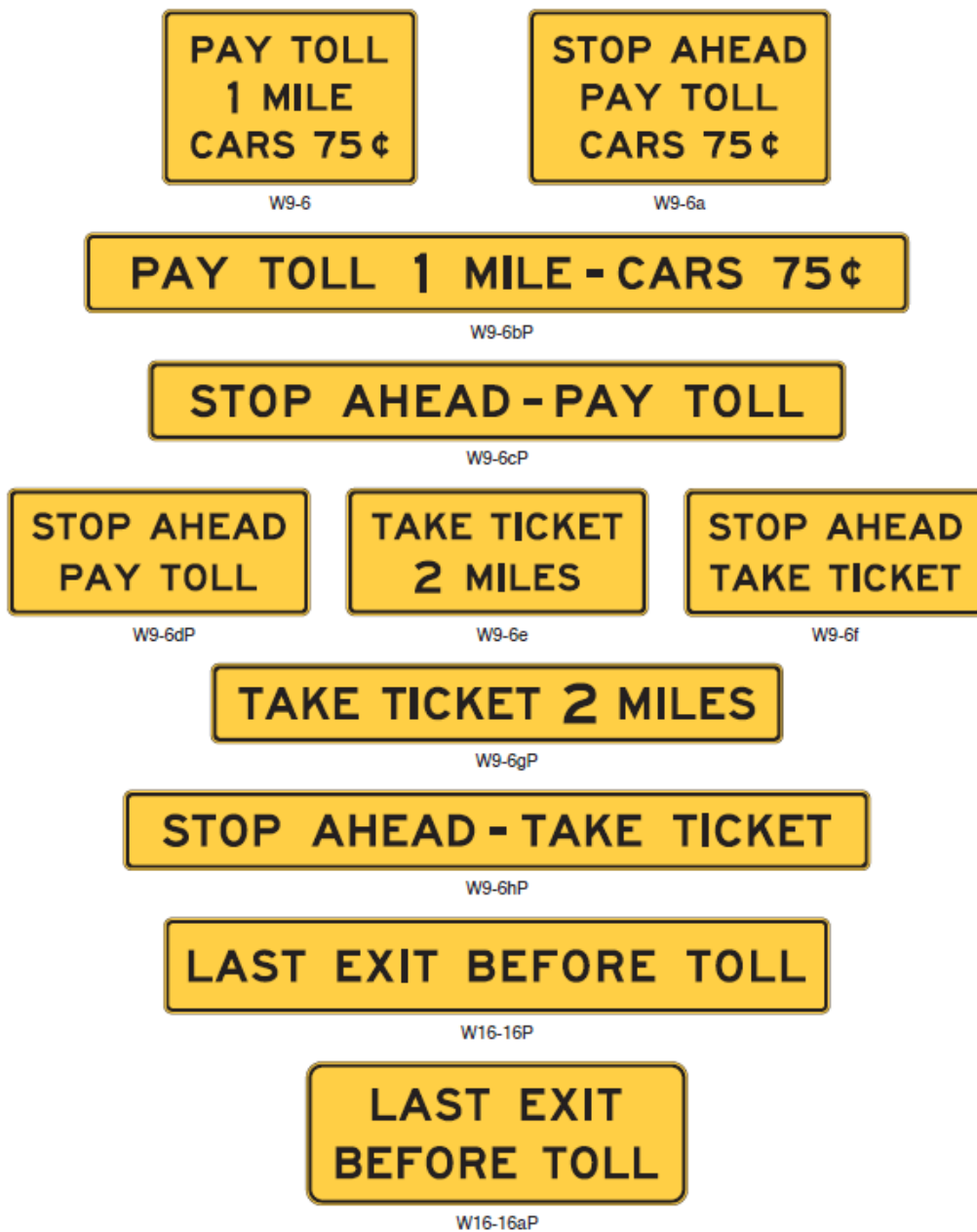
If there is insufficient space for the W9-6 or W9-6e sign at the 1-mile or 1/2-mile advance location, the Pay Toll or Take Ticket Advance Warning (W9-6bP, W9-6gP) plaque (see Section 2F.07) may be installed at those advance locations above the appropriate guide sign(s) that relate to toll payment types.

An additional W9-6 or W9-6e sign may be installed approximately 2 miles in advance of a mainline toll plaza. This sign may be either overhead- or post-mounted.

If the visibility of a ramp toll plaza at which some or all lanes are required to come to a stop to pay a toll or take a ticket is limited, the W9-6 or W9-6e sign may also be installed in advance of the ramp toll plaza.

337 NCUTCD agrees with Figure 2F-4 as presented in the NPA.
338

Figure 2F-4. Toll Plaza Warning Signs and Plaques



339
340

Section 2F.07 Comments: NCUTCD agrees with 2F.07 as presented in the NPA.

Section 2F.07 Pay Toll and Take Ticket Advance Warning Plaques (W9-6bP, W9-6gP)

Option:

The Pay Toll or Take Ticket Advance Warning (W9-6bP, W9-6gP) plaque (see Figure 2F-4) may be installed above the appropriate guide sign(s) relating to toll payment types at the 1-mile and/or 1/2-mile advance locations on the approach to a toll plaza if there is insufficient space for the W9-6 or W9-6e sign (see Section 2F.06) at those advance locations.

Standard:

The W9-6bP and W9-6gP plaques shall display the distance to the toll plaza and, except for toll ticket facilities, the toll for passenger or 2-axle vehicles. Where the toll for passenger or 2-axle vehicles is variable by time of day, a changeable message element shall be incorporated into the W9-6bP plaque to display the toll in effect.

Option:

The distance to the toll plaza may be omitted from the W9-6bP and W9-6gP plaques if the distance is displayed on the guide sign that the plaque accompanies.

The toll for passenger or 2-axle vehicles may be omitted from the W9-6bP plaque if the toll information is displayed on the guide sign that the plaque accompanies.

Section 2F.08 Comments: NCUTCD agrees with 2F.08 as presented in the NPA.

Section 2F.08 Stop Ahead Pay Toll and Take Ticket Warning Signs (W9-6a, W9-6f)

Standard:

The Stop Ahead Pay Toll (W9-6a) sign shall display the toll for passenger or 2-axle vehicles (see Figure 2F-4). Where the toll for passenger or 2-axle vehicles is variable by time of 4 day, a changeable message element shall be incorporated into the W9-6a sign to display the toll in effect.

Guidance:

The Stop Ahead Pay Toll sign should be installed downstream from the W9-6 sign that is 1/2 mile in advance of a mainline toll plaza where some or all of the lanes are required to come to a stop to pay a toll (see Sections 2F.14 and 2F.15).

The Stop Ahead Pay Toll Advance Warning sign should be overhead-mounted. The location of the overhead sign should coincide with the approximate location where the mainline lanes begin to widen on the approach to the toll plaza lanes.

Where open-road tolling is used in addition to a toll plaza at a particular location, the W9-6a or W9-6f sign should be located such that the message is clearly related to the lanes that access the toll plaza and not to the open-road tolling lanes.

Option:

If there is insufficient space for the W9-6a or W9-6f sign at the recommended location, the Stop Ahead Pay Toll (W9-6cP) or the Stop Ahead Take Ticket (W9-6hP) plaque (see Section 2F.09) may be installed at that location above the appropriate guide sign that relates to toll payment types.

If the visibility of a ramp toll plaza at which some or all lanes are required to come to a stop to pay a toll or take a ticket is limited, the W9-6a or W9-6f sign may also be installed in advance of the ramp toll plaza.

Section 2F.09 Comments: NCUTCD agrees with 2F.09 as presented in the NPA.

Section 2F.09 Stop Ahead Pay Toll and Take Ticket Warning Plaques (W9-6cP, W9-6hP)

Option:

The Stop Ahead Pay Toll (W9-6cP) plaque (see Figure 2F-4) may be installed above the appropriate guide sign at the location specified for the Stop Ahead Pay Toll (W9-6a) sign (see Section 2F.08) if there is insufficient space for the W9-6a sign at that location.

Standard:

The W9-6cP plaque shall display the toll for passenger or 2-axle vehicles. Where the toll for passenger or 2-axle vehicles is variable by time of day, a changeable message element shall be incorporated into the W9-6cP plaque to display the toll in effect.

Option:

The toll for passenger or 2-axle vehicles may be omitted from the W9-6cP plaque if the toll information is displayed on the guide sign that the plaque accompanies.

Section 2F.10 Comments: NCUTCD recommends revising 2F.10 to retain the option of placement for the plaque to above or below the guide sign. This is consistent with the NCUTCD recommendation for 2E.23 and 2E.25. Designers should be allowed to have the flexibility of above or below the guide sign. NCUTCD also recommends correcting references to other sections of the MUTCD.

Section 2F.10 LAST EXIT BEFORE TOLL Warning Plaques (W16-16P, W16-16aP)

Guidance:

The LAST EXIT BEFORE TOLL (W16-16P or W16-16aP) plaque (see Figure 2F-4) should be used to notify road users of the last exit from a highway before it becomes a facility on which toll payments are required. The plaque should be installed above the appropriate guide signs for the exit (see Sections 2E.3323 and 2E.3625), but below the Exit Number or LEFT plaque if used. For numbered exits, the Exit Number plaque (see Section 2E.XX) should be installed above the LAST EXIT BEFORE TOLL plaque.

Option:

If it is impractical to mount the W16-16P or W16-16aP plaque above the guide sign, the plaque may be mounted below the guide sign.

Section 2F.11 Comments: NCUTCD agrees with 2F.11 as presented in the NPA with minor editorial revisions.

Section 2F.11 TOLL Warning Plaque (W16-17P)

432 **Standard:**

433 The TOLL (W16-17P) warning plaque (see Figure 2F-3) shall have a black legend and
434 border on a yellow background and shall be mounted directly above the route sign of a
435 numbered toll highway or, if used, above the cardinal direction and alternative route
436 auxiliary signs, in any route sign assembly providing direction ~~from~~ to a toll highway or to
437 a segment of a highway on which the payment of a toll is required.
438

439
440 **Section 2F.12 Comments:** NCUTCD generally agrees with 2F.12 as presented in the NPA, but
441 recommends deleting the Standard statement on the use of Arrow Per Lane signs for toll
442 facilities until the research on these signs is complete and evaluated.
443

444 **Section 2F.12 Toll Facility and Toll Plaza Guide Signs – General**

445 **Support:**

446 Toll plazas are used on many toll highways, bridges, and tunnels for collection of tolls from
447 road users. Electronic toll collection and/or open-road tolling might also be used on such
448 facilities, either in addition to or in place of collecting toll payments at toll plazas.

449 Chapter 2G contains information regarding signs for preferential and managed lanes that are
450 applicable to toll roads.

451 Chapter 3E contains information regarding pavement markings for certain toll plaza
452 applications.

453 **Standard:**

454 Directional assemblies for entrances to a toll highway or to a road leading directly to a
455 toll highway with no opportunity to exit before paying or being charged a toll, shall clearly
456 indicate that the facility is a toll facility. Except where the State Toll Route sign (see
457 Paragraph 8) is used, the TOLL (W16-20P) warning plaque (see Section 2F.11) shall be
458 used above the route sign of a numbered toll facility in any route sign assembly that
459 provides directions to the toll route from another highway.

460 Except where the State Toll Route sign (see Paragraph 8) is used, a rectangular panel
461 with the black legend TOLL on a yellow background shall be incorporated into the guide
462 signs leading road users to a tolled highway (see Figure 2F-5).

463 Guide signs for toll highways, toll plazas, and tolled or priced managed lanes (see
464 Chapter 2G) shall have white legends and borders on green backgrounds, except as
465 specifically provided by Sections 2F.12 through 2F.16.

466 **Option:**

467 A State Toll Route sign (see Paragraph 8) may be used in lieu of the State Route (M1-5) sign
468 in combination with the TOLL (W16-20P) warning plaque or the TOLL panel (see Paragraphs
469 10 and 11).

470 **Standard:**

471 A State Toll Route sign shall incorporate into its design the word TOLL using the same
472 letter height, legend, background colors, and overall plaque dimensions specified for the
473 W16-20P plaque.

474 The Interstate, Off-Interstate, and U.S. Route signs shall not be modified for tolled
475 facilities.

476 **Option:**

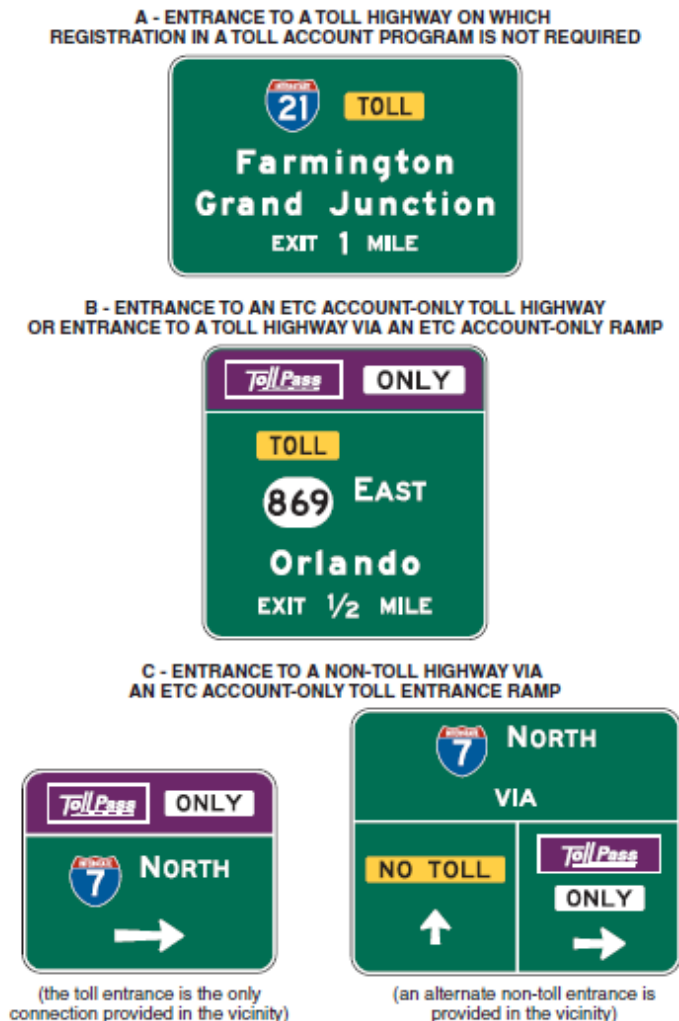
Where conditions do not accommodate separate signs, or where it is important to associate a particular regulatory or warning message with specific guidance information, regulatory and/or warning messages may be combined with guide signs for toll plazas using plaques, header panels, or rectangular regulatory or warning messages may be combined with guide signs for toll plazas using plaques, header panels, or rectangular regulatory or warning panels incorporated within the guide signs, as long as the proper legend and background colors are preserved.

Standard:

When regulatory messages are incorporated within a guide sign, they shall be on a rectangular panel with a black legend on a white background. When warning messages are incorporated within a guide sign, they shall be on a rectangular panel with a black legend on a yellow background.

NCUTCD agrees with Figure 2F-5 as presented in the NPA.

Figure 2F-5. Examples of Guide Signs for Entrances to Toll Highways or Ramps



Note: The ETC pictographs shown are examples only. The pictograph for the toll facility's adopted ETC system shall be used.

Guidance:

Guide signs for toll plazas should be designed in accordance with the general principles of guide signs and the specific provisions of Chapter 2E.

Signs for toll plazas should systematically provide road users with advance and toll plaza lane-specific information regarding:

A. The amount of the toll, the types of payment accepted, and the type(s) of registered ETC accounts accepted for payment;

B. Which lane or lanes are required or allowed to be used for each available payment type; and

C. Restrictions on the use of a toll plaza lane or lanes by certain types of vehicles (such as cars only or no trucks).

Standard:

Signs for attended lanes at toll plazas shall incorporate the Toll Taker (M4-17) symbol panel (see Figures 2F-6 through 2F-9).

Option:

Signs for attended lanes at toll plazas may also display word legends such as FULL SERVICE, CASH, CHANGE, or RECEIPTS (see Figures 2F-6 through 2F-9), to supplement the required symbol panel when lanes have different services available through them.

NCUTCD generally agrees with Figure 2F-6 as presented in the NPA, but recommends revising the figure notes to show M4-17 and M4-18 use as required to agree with the Chapter 2F text.

Figure 2F-6. Examples of Conventional Toll Plaza Advance Signs

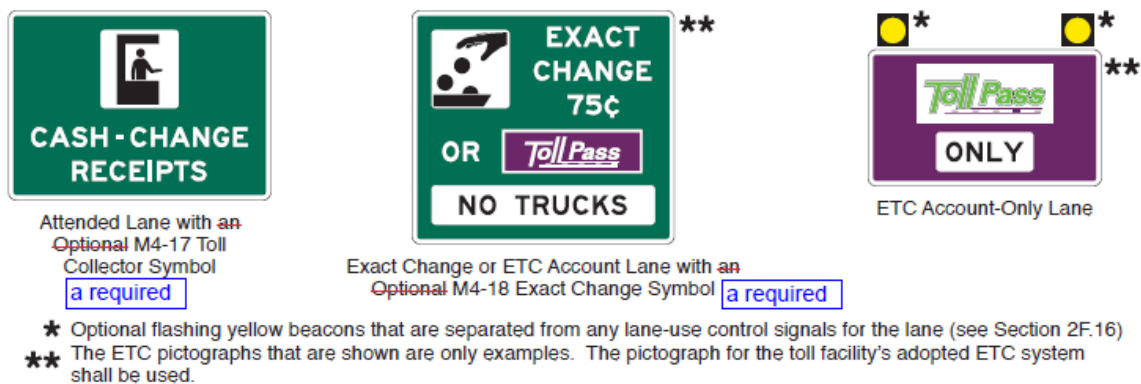


Notes:

1. The M4-17 symbol is ~~optional~~ **required** for an attended lane.
2. The M4-18 symbol is ~~optional~~ **required** for an exact change lane.
3. The ETC pictograph that is shown is only an example. The pictograph for the toll facility's adopted ETC system shall be used.

518 NCUTCD generally agrees with Figure 2F-7 as presented in the NPA, but recommends revising
519 the figure notes to show M4-17 and M4-18 use as required to agree with the Chapter 2F text.

Figure 2F-7. Examples of Toll Plaza Canopy Signs

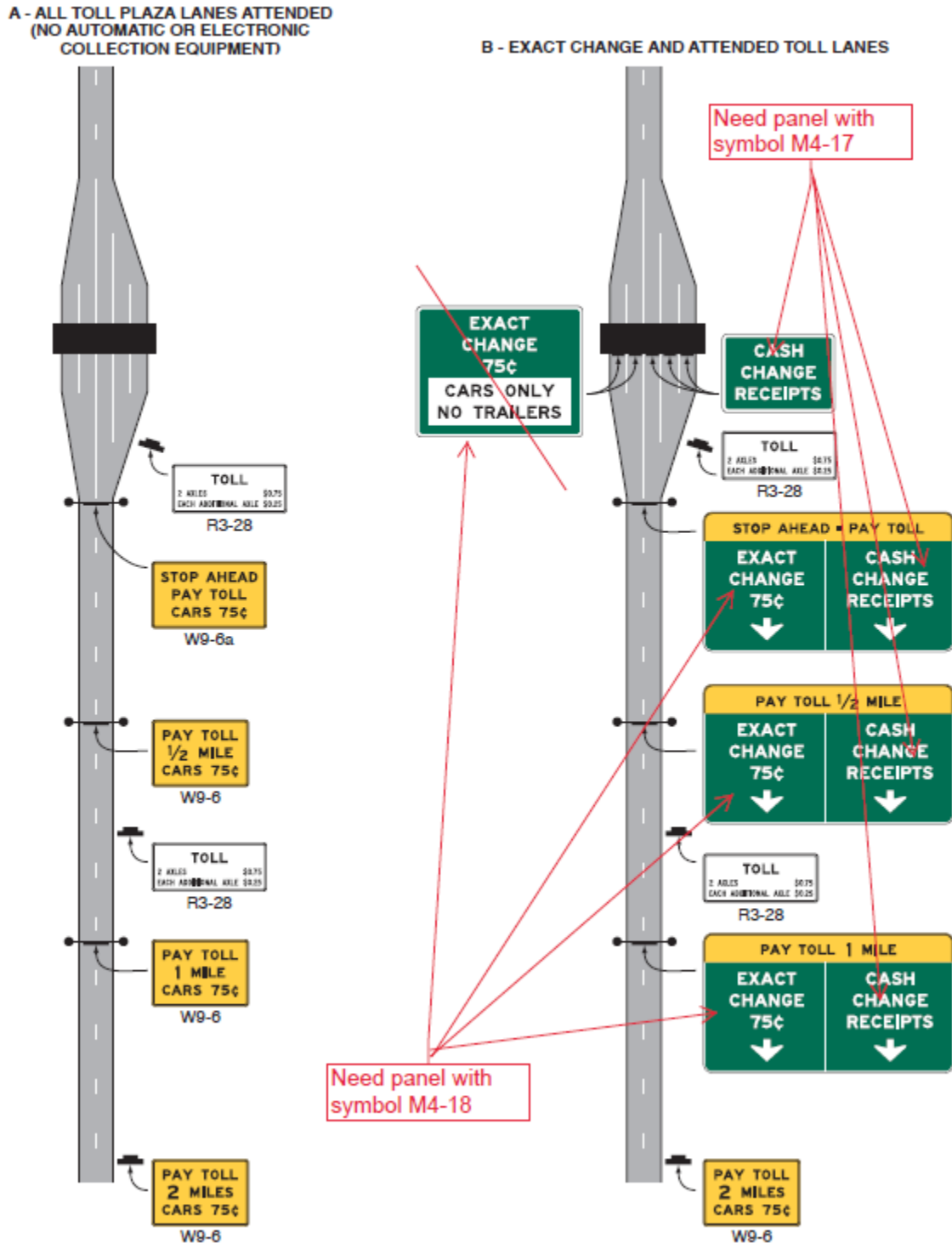


520
521

NCUTCD recommends revising Figure 2F-8 as follows:

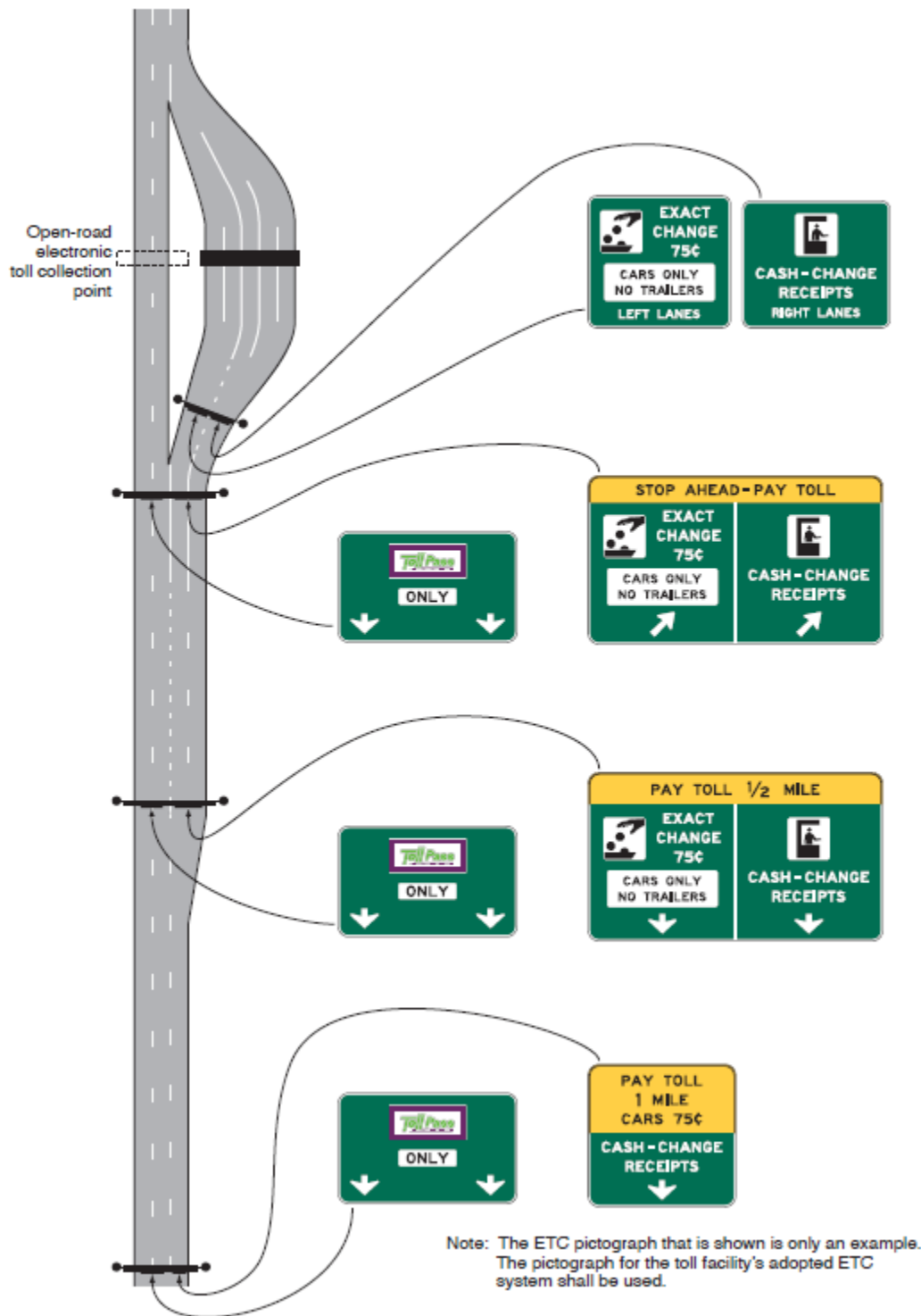
- In example B, add required M4-17 and M4-18 symbols to all signs
- In example B, delete the left-mounted Exact Change sign.

Figure 2F-8. Examples of Mainline Toll Plaza Approach and Canopy Signing



526 NCUTCD agrees with Figure 2F-9 as presented in the NPA.

Figure 2F-9. Examples of Guide Signs for a Mainline Toll Plaza on a Diverging Alignment from Open-Road ETC Lanes



527
528
529 **Standard:**

Signs for Exact Change lanes at toll plazas shall incorporate the Exact Change (M4-18) symbol

Panel and, except for ticketed systems, display the amount of the toll for passenger vehicles (see Figures 2F-6 through 2F-9).

Option:

Signs for Exact Change lanes at toll plazas may include an appropriate word legend, such as EXACT CHANGE (see Figures 2F-6 and through 2F-9), to supplement the required symbol panel.

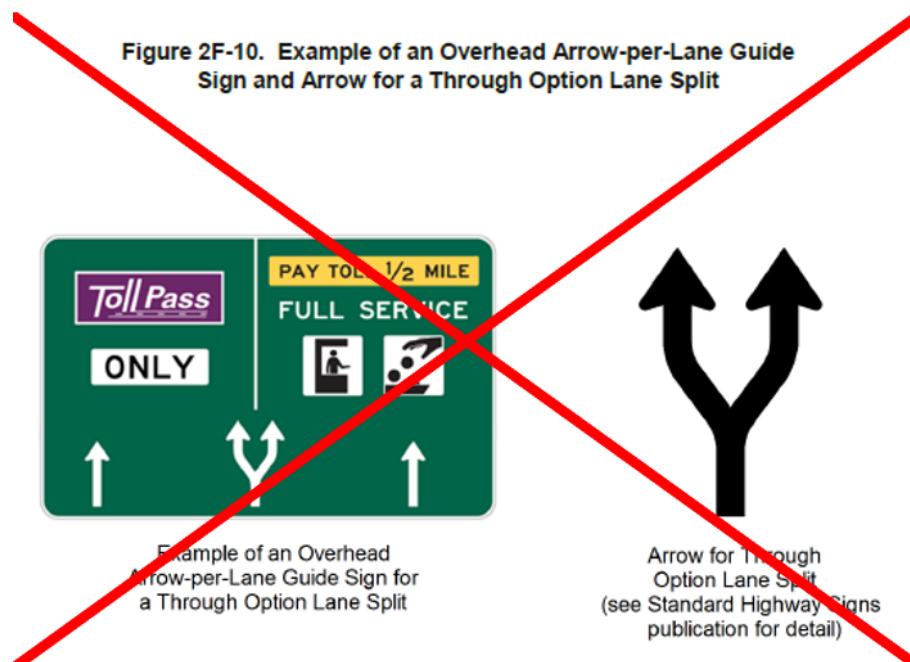
Standard:

When used, the M4-17 and M4-18 symbol panels shall be used only as panels within guide signs. The M4-17 and M4-18 symbols or panels shall not be used as an independent sign or within a sign assembly.

If only vehicles with registered ETC accounts are allowed to use a toll plaza lane, the signs for such lanes shall incorporate the pictograph adopted by the toll facility's ETC payment system and the regulatory message ONLY (see Figures 2F-1, 2F-6, 2F-7, 2F-9, 2F-10 and 2F-11). The use, size, and placement of the ETC pictograph shall comply with the provisions of Sections 2F.02 and 2F.03 .

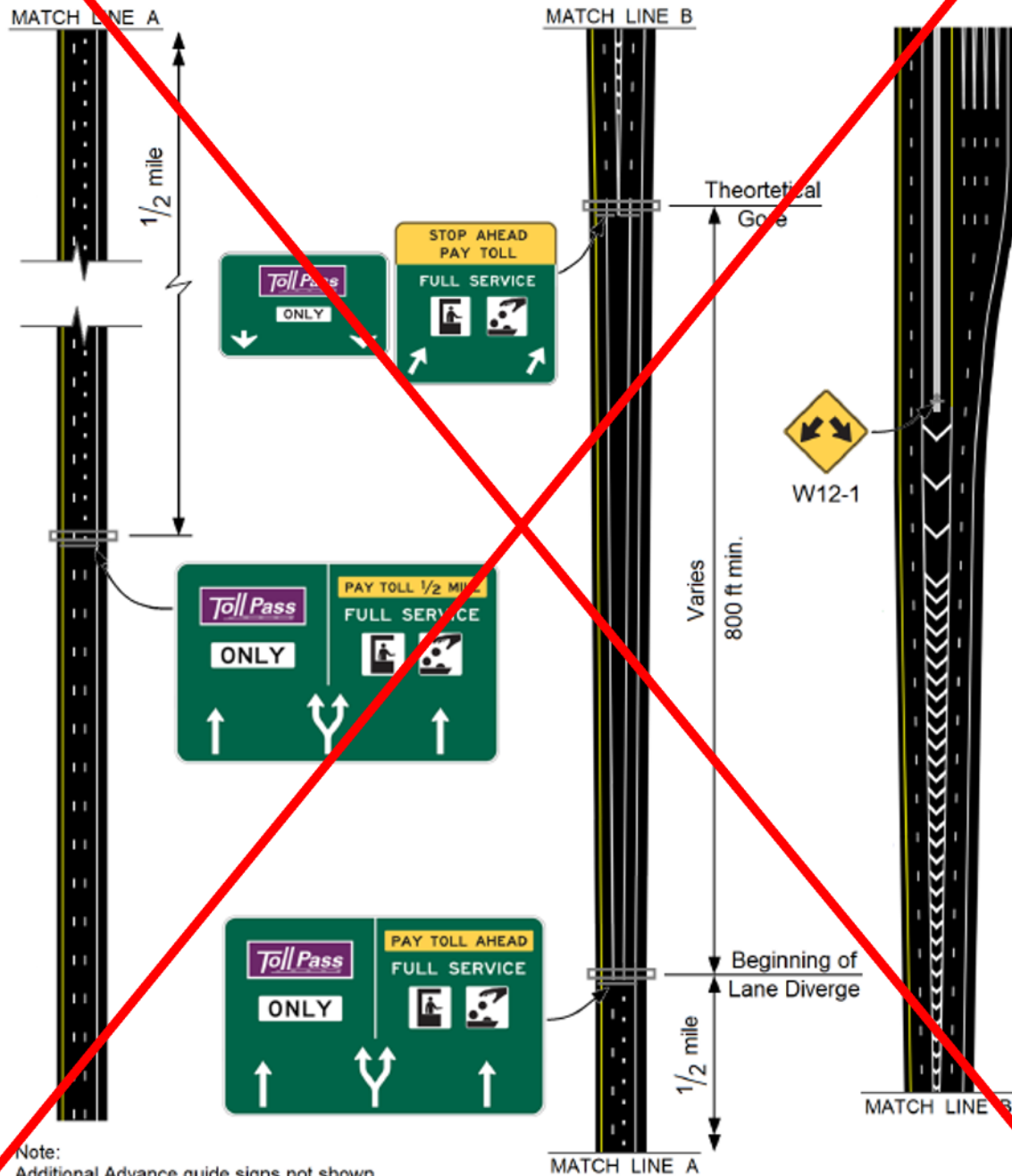
An Overhead Arrow-Per-Lane Guide sign (see Figure 2F-10) shall be used in advance of a location where the mainline lanes split to separate traffic entering Open Road ETC lanes from lanes entering a toll plaza where other methods of payment are accepted and an option lane is provided at the split (see Figure 2F-11). An Overhead Arrow-Per-Lane sign shall not be used if there is no option lane at the split.

NCUTCD recommends deleting Figure 2F-10 until the research on Arrow Per Lane signs for toll facilities is complete and evaluated.



NCUTCD recommends deleting Figure 2F-11 until the research on Arrow Per Lane signs for toll facilities is complete and evaluated.

Figure 2F-11. Examples of Guide Signs for a Split with an Option Lane for a Mainline Toll Plaza on a Diverging Alignment from Open-Road ETC Lanes



Option:

The ETC payment system's pictograph, without a purple underlay or purple header panel, may be used on signs for Exact Change or attended lanes at toll plazas to indicate that vehicles with registered ETC accounts may also use those lanes (see Figure 2F-7).

Section 2F.13 Comments: NCUTCD agrees with 2F.13 as presented in the NPA with minor editorial revisions.

Section 2F.13 Electronic Toll Collection (ETC) Signs - General

Support:

Figure 2F-5 shows examples of guide signs for entrances to various types of toll highways and for ETC account-only entrances to non-toll highways.

Standard:

Signing for entrances to toll highways where ETC is employed ~~only~~ through license plate character recognition such that road users are not required to establish a toll account or register their vehicle equipment shall comply with the provisions of Paragraphs 4 and 5 of Section 2F.12.

Support:

Figure 2F-12 shows examples of guide signs for the entrance to a toll highway on which tolls are collected electronically only and registration in a toll-account program is not required.

Standard:

If only vehicles with registered ETC accounts are allowed to use a toll highway, the guide signs for entrances to such facilities shall incorporate the pictograph adopted by the toll facility's ETC payment system and the regulatory message ONLY (see Figures 2F-1, 2F-5, 2F-10, 2F-11, and 2F-12). The use, size, and placement of the ETC pictograph and the use and color of the background and underlay panel shall comply with the provisions of Sections 2F.02 and 2F.03.

Support:

Sections 2F.05, 2F.11, and 2F.17 contain additional provisions regarding signs for toll highways that only accept ETC payments.

Sections 2G.16 through 2G.18 contain additional provisions regarding signs for priced managed lanes that only accept ETC payments.

Figure 2F-13 shows an example of guide signs for alternative toll and non-toll ramp connections to a non-toll highway (see Section 2F.19).

Many different ETC payment systems are used by the various toll facility operators. Some of these systems accept payment from other systems' accounts.

Option:

Where a facility will accept payments from other systems' accounts in addition to its primary ETC account payment system, such information may be displayed on a separate information sign near the entrances to such a facility or in advance of a toll plaza or open-road tolling lanes, as space allows between primary signs.

NCUTCD generally agrees with Figure 2F-12 as presented in the NPA, but recommends removing the note on Sheet 1 since research shows there are no facilities that only bill through license plate reading.

Figure 2F-12. Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only (Sheet 1 of 3)

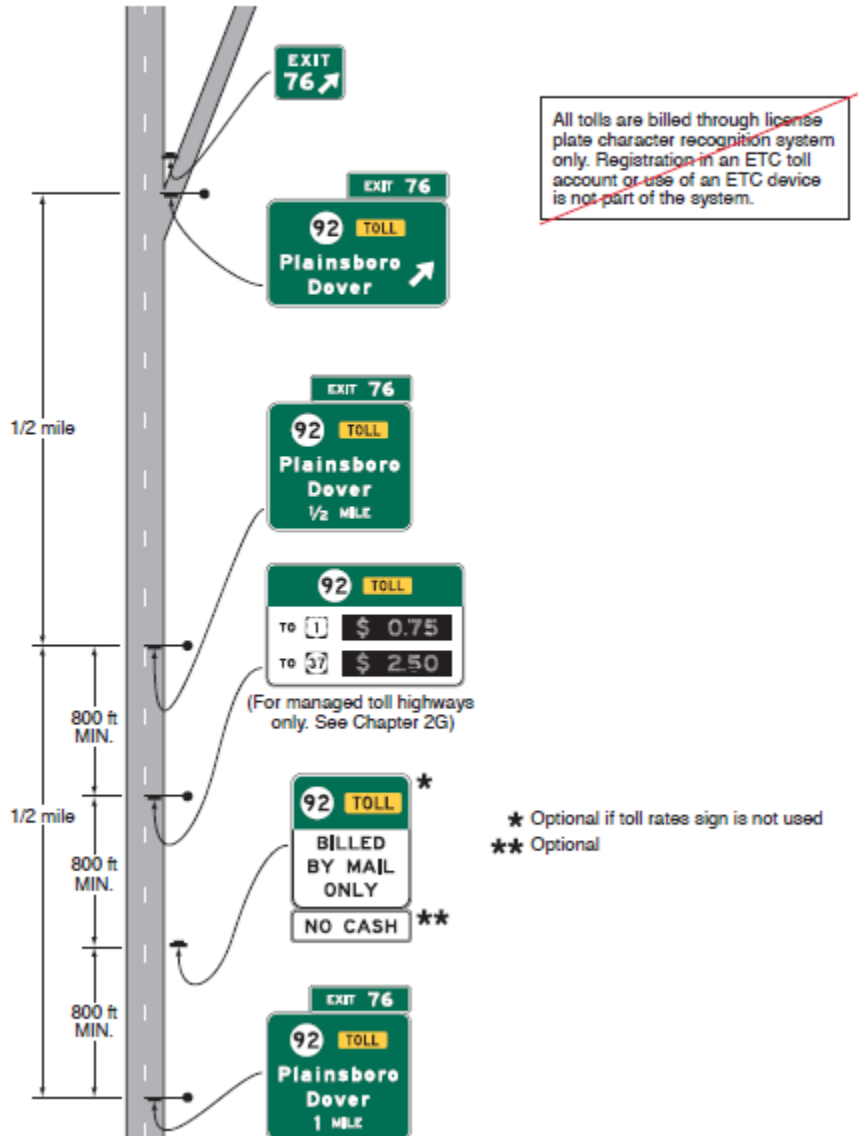
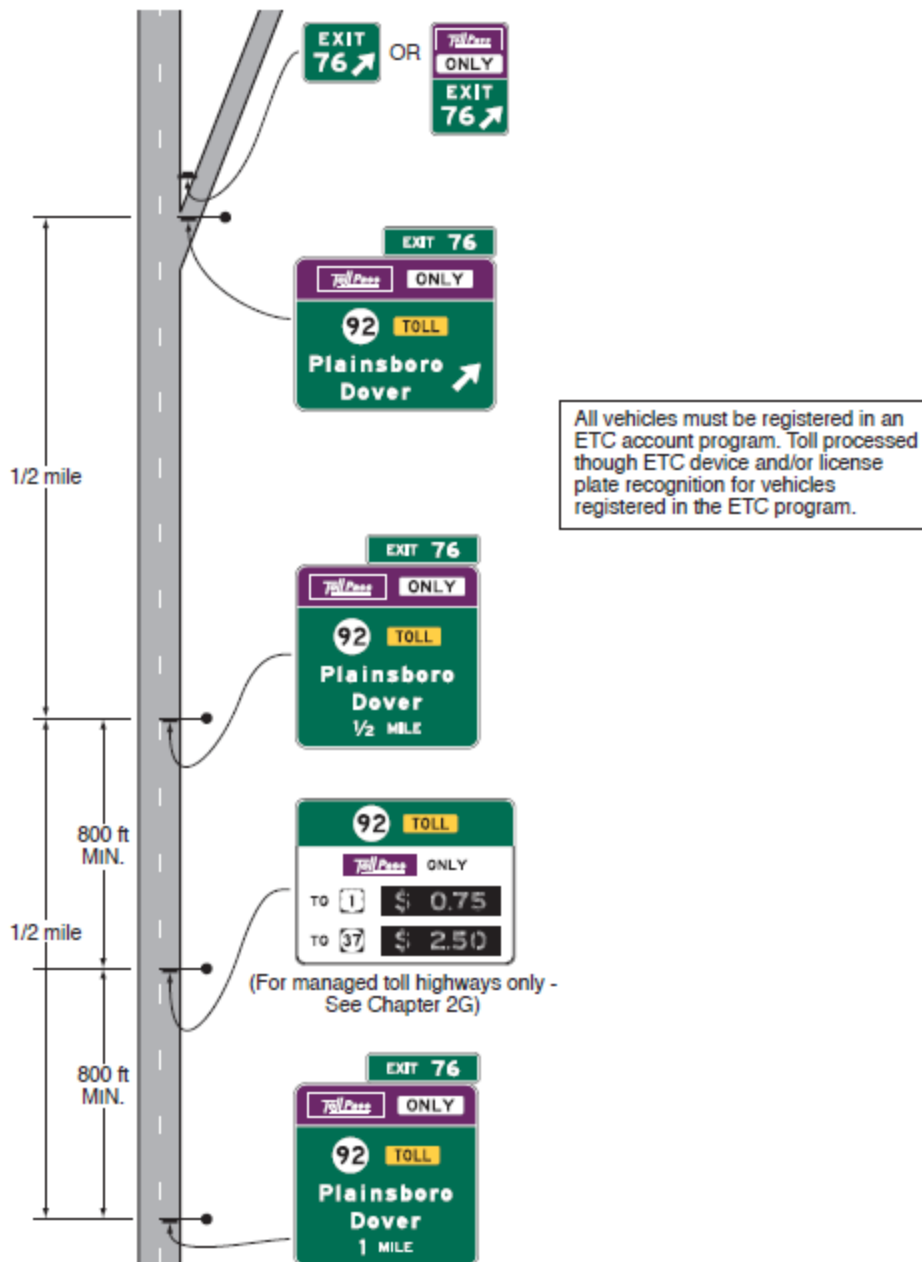


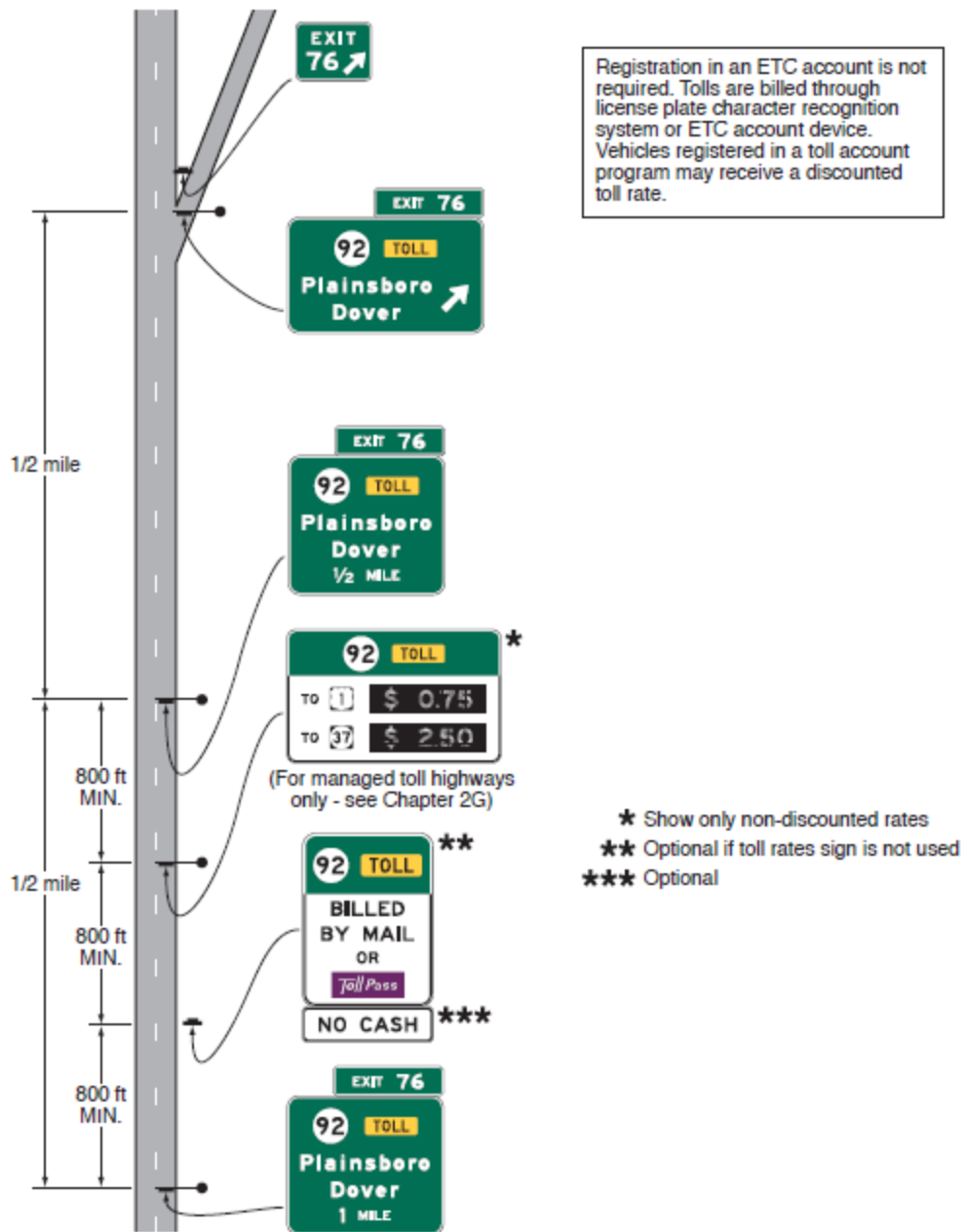
Figure 2F-12. Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only (Sheet 2 of 3)



616

617

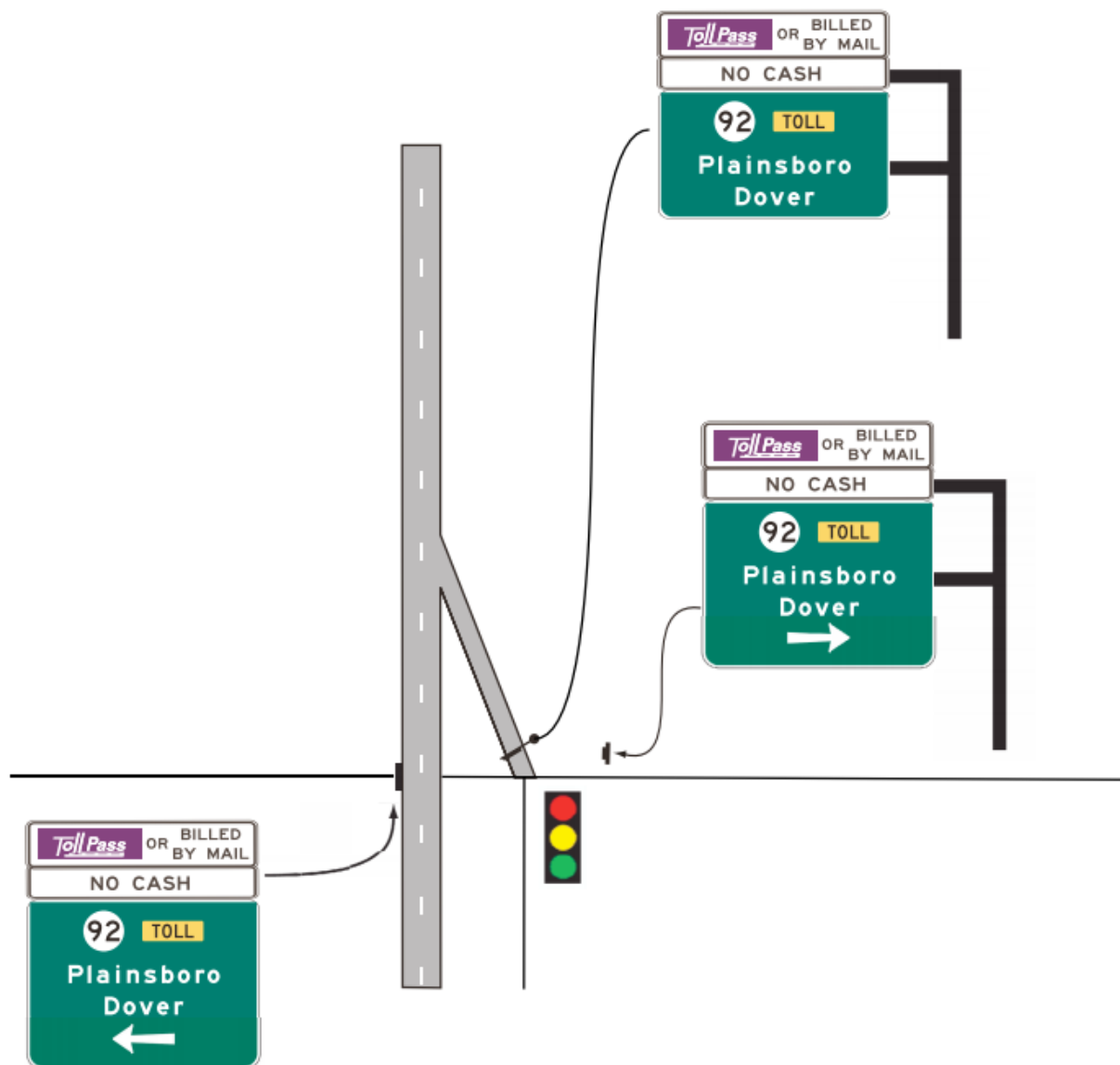
Figure 2F-12. Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only (Sheet 3 of 3)



618
 619
 620

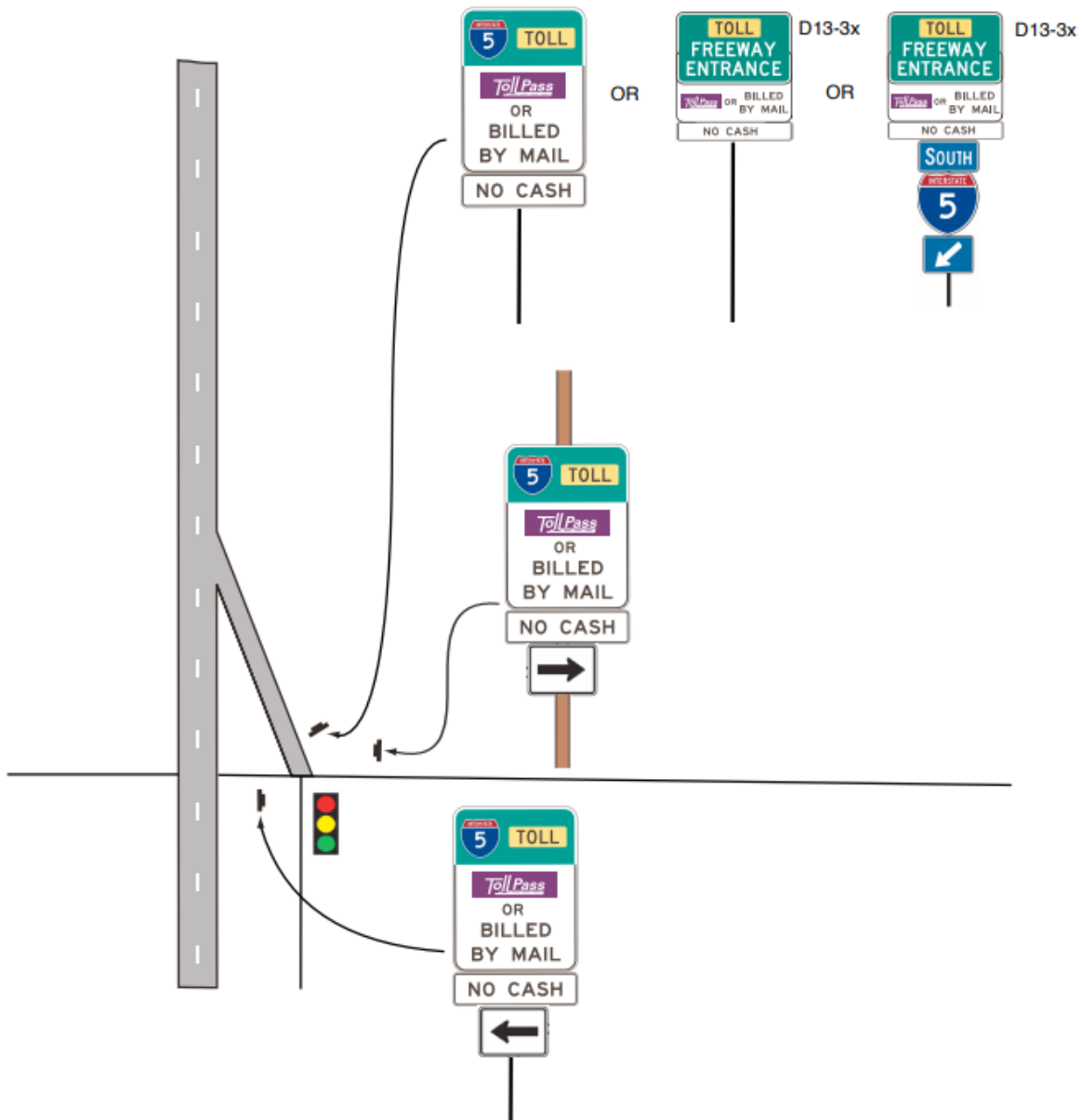
NCUTCD recommends adding a new Figure 2F-12a titled “Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only” depicting signing for a facility of this type.

Figure 2F-12a. Examples of Guide Sign for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only (Sheet x of x)



NCUTCD recommends adding a new Figure 2F-12b titled “Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only” depicting signing for a facility of this type.

Figure 2F-12b. Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only (Sheet x of x)



Section 2F.14 Comments: NCUTCD agrees with 2F.14 as presented in the NPA.

Section 2F.14 Advance Signs for Conventional Toll Plazas

Guidance:

For conventional toll plazas (those without a divergence onto a separate alignment from mainline-aligned open-road tolling or ETC-Only lanes), one or more sets of overhead advance guide signs complying with the provisions of this Section should be provided. The advance guide signs for multi-lane toll plazas should provide information regarding which lanes to use for all of the toll payment methods accepted at the toll plaza. These signs should include toll plaza lane numbers (if used), or action messages or lane-use information such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or down arrows over the approximate center of each applicable lane. These signs should also incorporate regulatory messages indicating any restrictions or prohibitions on the use of the lanes associated with the various types of payment methods by certain types of vehicles. For mainline toll plazas, these signs should be at least 1/2 mile in advance of the toll plaza, and farther if practical.

Additional guide signs with lane information for the toll payment types should be provided between approximately 1/4 mile and 800 feet in advance of the toll plaza at a location that avoids or minimizes obstruction of toll plaza canopy signs (see Section 2F.16) and lane-use control signals.

The number, mounting, and/or spacing of sets of advance signs for approaches to toll plazas on ramps, toll bridges, or tunnels, to accommodate a limited distance to the plaza from an intersection or from the start of the approach road to the bridge or tunnel, should be based on an engineering study or engineering judgment.

Support:

Figure 2F-8 shows examples of advance signs for a conventional toll plaza.

Section 2F.15 Comments: NCUTCD agrees with 2F.15 as presented in the NPA.

Section 2F.15 Advance Signs for Toll Plazas on Diverging Alignments from Open-Road ETC Account-Only Lanes

Support:

Open-Road ETC lanes are sometimes located on the normal mainline alignment while the lanes for other toll payment methods are located at a toll plaza on a separate alignment (see Figure 2F-9). Since road users paying cash tolls must diverge from the mainline alignment, similar to a movement for an exit, it is important that the guide signs in advance of and at the point of divergence clearly indicate the required lane use and/or movements.

Guidance:

For toll plazas located on a separate alignment that diverges from mainline-aligned Open-Road ETC lanes where vehicles are required to have a registered ETC account to use the Open-Road Tolling lanes, overhead advance signs should be provided at approximately 1 mile and 1/2 mile in advance of the divergence point. Both the 1-mile and 1/2-mile advance signs should include:

A. The ETC (pictograph) Account-Only guide sign (see Figures 2F-6 and 2F-9) with a down arrow over the approximate center of each lane that will become an Open-Road ETC lane;

B. For the lane or lanes which will diverge to a toll plaza, guide signs conforming to the provisions of Section 2F.12, indicating which lane or lanes will diverge to the toll plaza for the various cash toll payment methods; and

C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions of certain types of vehicles from toll plaza lanes associated with the various types of payment methods.

At or near the theoretical gore of the divergence point, an additional set of overhead guide signs should be provided and should include:

A. The ETC (pictograph) Account-Only guide sign (see Figures 2F-6 and 2F-9) with a down arrow over the approximate center of each Open-Road ETC lane;

B. Guide signs conforming to the provisions of Section 2F.12 and 2F.13, with diagonally upward pointing directional arrow(s) over the approximate center of each lane indicating the direction of the divergence, and providing lane information for all types of payment methods accepted at the toll plaza; and

C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions on the use of the toll plaza lanes associated with the various types of payment methods by certain types of vehicles.

Approximately 800 feet in advance of the toll plaza at a location that avoids or minimizes any obstruction of the toll plaza canopy signs (see Section 2F.16) and lane-use control signals, an additional set of overhead advance signs with lane information for the toll payment types should be provided.

Standard:

The use of down and directional arrows on the signs at the locations described in Paragraphs 2 through 4 shall comply with the provisions of Section 2D.08.

Support:

Figure 2F-9 shows an example of advance signs for toll plazas on a diverging alignment from Open-Road ETC Account-Only Lanes.

Section 4K.02 contains information regarding the use of lane-use control signals for Open-Road ETC lanes for temporary lane closure purposes.

Section 2F.16 Comments: NCUTCD agrees with 2F.16 as presented in the NPA.

Section 2F.16 Toll Plaza Canopy Signs

Standard:

A sign complying with the provisions of Section 2F.12 shall be provided above the approximate center of each lane that is not an Open-Road ETC lane, mounted on or suspended from the toll plaza canopy, or on a separate structure immediately in advance of the plaza located such that each sign is clearly related to an individual toll lane, indicating the payment type(s) accepted in the lane and any restrictions or prohibitions of certain types of vehicles that apply to the lane. Except for toll ticket systems, the toll for passenger or 2-axle vehicles shall be included on the canopy sign or on a separate sign mounted on the upstream side of the tollbooth.

The background color of a canopy sign for an ETC Account-Only toll plaza lane shall be purple (see Figure 2F-7).

Option:

Where vehicles are required to have a registered ETC account to use the lane, one or two flashing yellow beacons (see Section 4K.04) may supplement a canopy sign over an ETC Account-Only lane to call special attention to the location of the ETC Account-Only lane within the plaza.

The canopy sign for an ETC-Only toll plaza lane in which a regulatory speed limit is not posted and in which vehicles are not required to stop may display an advisory speed within a horizontal rectangular panel with a black legend and yellow background within the bottom portion of the canopy sign.

Standard:

Flashing beacons supplementing a canopy sign over an ETC Account-Only lane shall be mounted directly above or alongside the sign in a manner that is separated from any lane-use control signals for that lane (see Figure 2F-7).

For multi-lane toll plazas, lane-use control signals (see Section 4K.02) shall be provided above the approximate center of each toll plaza lane that is not an Open-Road ETC lane to indicate the open or closed status of each lane. Lane-use control signals shall not be used to call attention to a lane for a specific toll payment type such as ETC Account-Only lanes.

Support:

Part 6 contains information regarding the closing of a lane for temporary traffic control purposes.

Figure 2F-7 shows examples of toll plaza canopy signs.

Section 2F.17 Comments: NCUTCD agrees with 2F.17 as presented in the NPA with minor editorial revisions.

Section 2F.17 Guide Signs for Entrances to ETC Account-Only Facilities

Support:

Some toll highways, bridges, and tunnels are restricted to use only by vehicles with a specific registered ETC account.

Standard:

Where vehicles are required to have a registered ETC account to use an ETC Account-Only facility, guide signs for the facility shall comply with the applicable provisions of Chapter 2E and specifically with the applicable provisions of Section 2F.13.

Guide signs for the entrance ramps to such ETC Account-Only facilities shall incorporate the pictograph of the toll facility's ETC payment system and the word ONLY in a header panel or plaque designed in accordance with the provisions of Section 2F.13 (see Figure 2F-5).

Option:

A separate information sign displaying the route number, the TOLL warning panel (see Sections 2F.12 and 2F.13), and the legend NO CASH may be located within the sequence of the

Advance guide signs on the approach to the entrance to an ETC Account-Only facility (see Figure 2F-12).

Exit Gore signs for entrance ramps to such ETC Account-Only facilities may incorporate the pictograph of the toll facility's ETC payment system and the word ONLY in a header panel or plaque designed in accordance with the provisions of Section 2F.13 (see Figure 2F-12 and Figure 2F-13).

Support:

Section 2F.05 contains information regarding ETC Account-Only ~~auxiliary plaques~~ signs and plaques for use with route signs in route sign assemblies.

Section 2F.18 Comments: NCUTCD generally agrees with 2F.18 as presented in the NPA, but recommends revisions as follows:

- Add text to the first Support paragraph that ETC facilities are commonly referred to All Electronic Tolling.
- Delete “display a pictograph of an accepted ETC payment system” from the second Standard paragraph, since common toll facility practice is to use ETC pictographs on advanced and exit direction guide sign panels, even if other methods of toll collection are used. Pictographs on the guide signs are needed to reinforce the use of tag/transponder, as the absence of a pictograph could introduce ambiguity or confusion.
- Add a Guidance paragraph noting that a “toll billed by mail” sign message is only an example and that wording adopted by toll agencies should be used. There are a number of toll systems that already use e-mail or other electronic means of communication for billing and payment operations. Continuing innovation in connectivity and automation technology will increase opportunities for communication to occur in a fashion that does not include hardcopy postal activities.
- Add text referencing a dollar figure or administrative charges on signs to the final Option paragraph. Other monies, such as fees or administrative charges, might be owed in addition to the toll.

Section 2F.18 Guide Signs for Entrances to ETC-Only Facilities

Support:

Some toll highways, bridges, and tunnels collect tolls electronically using license plate character recognition in which the registered vehicle owner is then billed by postal mail. Registration in an ETC account program is not required. Registered ETC account users might have the option to be billed through their accounts if the facility also accepts such payments. These facilities are commonly referred to as All-Electronic Tolling (AET) or “Cashless Tolling.”

Standard:

Where vehicles are not required to have a registered ETC account to use an ETC-Only facility, guide signs for the facility shall comply with the applicable provisions of Chapter 2E and specifically with the applicable provisions of Section 2F.13.

Advance and Exit Direction guide signs for ~~the~~ entrances to ~~such~~ ETC-Only facilities that do not require the registration in an ETC toll account program shall not ~~display a pictograph of an accepted ETC payment system or~~ use purple as a background color on any portion of the signs.

If the ETC-Only facility ~~collects tolls by~~ utilizes post-travel billing of registered vehicle owners without registration in an ETC toll account program, a separate informational guide sign, if used, shall display one of the following legends (see Figure 2F-12):

A. TOLL BILLED BY MAIL ONLY, if there is no alternative payment method; or

B. TOLL BILLED BY MAIL OR [ETC Account Pictograph], if the facility also accepts payments from registered users of an ETC account program.

Guidance:

The “TOLL BILLED BY MAIL” language shown is an example only. The language adopted by the toll agencies rule making process should be used.

Option:

A plaque with the legend NO CASH may be added below the signs described in Paragraph 4 of this section.

Guidance:

The signs described in Paragraph 4 of this Section should be located within the sequence of Advance Guide signs for the entrance to the facility and/or at a location along the facility itself (see Figure 2F-12).

Option:

If the ETC-Only facility also accepts payments from other toll account programs, but does not require registration in the primary ETC account program associated with the facility in order to use the facility, then the pictographs of the other accepted ETC account programs may be displayed on the separate information sign displaying the legend TOLL BILLED BY MAIL or ETC System. (See Figure 2F-12).

If, in addition to a toll, a nominal surcharge (not a fine, penalty or violation) is assessed road users not registered in the toll account program, or registered toll account users are assessed a discounted toll, such information may be displayed, in the form of a dollar figure or a method (i.e. Administrative Charges), on a separate information sign on the approach to the entrance to such a facility (see Figure 2F-12).

Section 2F.19 Comments: NCUTCD agrees with 2F.19 as shown in the NPA.

Section 2F.19 Guide Signs for ETC-Only Entrance Ramps to Non-Toll Highways

Support:

In some cases, access to or from a non-toll route might be provided by a ramp on which a toll is charged in order to manage congestion, limit access, or for other reasons. The toll ramp might be provided as an alternative to or in lieu of a ramp providing similar access without charging a toll. Figures 2F-5 and 2F-13 show examples of guide signs for a ramp on which a toll is charged to enter a non-toll route.

Standard:

Guide signs for ETC-Only Entrance Ramps to non-toll highways shall comply with the provisions of 2F.18.

Option:

A NO-TOLL panel with a black legend and a yellow background may be included on the top section of the Exit Gore sign for an exit that provides access to the facility without charging a toll.

Section 2F.20 Comments: NCUTCD agrees with 2F.20 as shown in the NPA.

Section 2F.20 ETC Account Program Information Signs

Standard:

Except as provided in Paragraph 2, signs that inform road users of telephone numbers, Internet addresses, including domain names and uniform resource locators (URLs), or e-mail addresses for enrolling in an ETC account program of a toll facility or managed lane, obtaining an ETC transponder, and/or obtaining ETC account program information shall only be installed in rest areas, parking areas, or similar roadside facilities where the signs are viewed only by pedestrians or occupants of parked vehicles.

Option:

ETC account program information signs displaying telephone numbers that have no more than four characters may be installed on roadways in locations where they will not obscure the road user's view of higher priority traffic control devices and that are removed from key decision points where the road user's view is more appropriately focused on other traffic control devices, roadway geometry, or traffic conditions, including exit and entrance ramps, intersections, toll plazas, temporary traffic control zones, and areas of limited sight distance.