

## Urban Freeway Signing and the Freeway Signing Handbook

By providing navigational information that can be read and understood at high speed, freeway guide signs help road users reach their desired destinations in a safe and efficient manner. However, providing effective freeway guide signs can present many challenges due to the variety of destinations and geometric situations that may exist on freeways. This condition is especially true in urban conditions where high traffic volumes, multiple destinations, and closely spaced interchanges complicate the freeway signing challenges.

The *Texas Manual on Uniform Traffic Control Devices* (TxMUTCD) is the primary document that establishes the basic guidelines for the design and placement of freeway guide signs. However, this information is general in nature and leaves room for interpretation in the use of freeway guide signs, which can lead to regional differences in the way that destination information is presented in freeway guide signs. Additional information on sign layout is contained in the Texas Department of Transportation's (TxDOT) Traffic Control Standard Sheets and the *Standard Highway Signs for Texas* document. Research project O-4170, "Improved Signing for Urban Freeway Conditions," was conducted to improve consistency in freeway signing by developing improved guidelines for freeway signing guidelines, including signing on freeway frontage roads.



Figure 1. Typical Photograph Taken for Inventory of Existing TxDOT Freeway Guide Signing.

### What We Did . . .

There were four major activities associated with this project:

- a review of the literature and guidelines used by other agencies,
- an assessment of existing freeway signing in Texas,
- identification of driver needs through focus groups, and
- the development of a *Freeway Signing Handbook*.

### Literature Review

The current state-of-the-practice in freeway guide signing was determined through a review of available literature, including web sites and online documents. Past research on freeway guide signs and innovative practices/guidelines used by other transportation agencies

was reviewed to identify guidance that could be incorporated into the *Freeway Signing Handbook*. The review also identified areas where further research is needed in order to provide clear guidelines to designers and engineers. The literature review examined a variety of topics related to freeway guide signing, including:

- differences between the Texas and national MUTCDs,
- information needs of drivers,
- common deficiencies found in freeway guide signing,
- past research on innovative methods to provide guide sign information,
- guidelines for designing freeway guide signs, and
- procedures for maintaining freeway guide signs.



## Existing Freeway Signing

To evaluate existing TxDOT freeway signing, digital photographs were taken of freeway guide signs and geometric data in 11 TxDOT districts on various types of freeways, including Interstate Highways, U.S. and State Highways, and loop freeway sections. More than 3000 photographs were taken in rural and urban areas and included most types of signing and signing practices in Austin, Corpus Christi, Dallas, Fort Worth, Houston, and San Antonio. The digital photographs contained the freeway guide sign panel(s), sign structure, and associated lane geometry. [Figure 1](#) shows a typical photograph.

Existing TxDOT freeway guide signing was compared to the national and Texas MUTCD standards. This comparison allowed the researchers to identify inconsistencies in the manuals' practices with consideration of certain complications such as simultaneous exits, close interchange spacing, limitations on placement of overhead sign bridges, and other complex geometric situations.

## Driver Focus Groups

Some of the freeway signing challenges identified in the other tasks were not sufficiently addressed in existing guidelines or previous research to incorporate into the handbook. The researchers wanted to conduct evaluations of driver understanding of a few key freeway signing issues. While a standard survey was considered, the researchers opted to use a focus group approach because of a need for insight into driver interpretation of signing messages rather than an assessment of correct or incorrect understanding. Seven focus group sessions gathered input from Texas drivers regarding key issues in urban guide signing. The sessions were held in Houston, Dallas, San Antonio, and College Station. In total, 61 people participated in the focus groups. The focus groups addressed the following issues:

- position of exit number panels as a cue for an upcoming left exit,
- advance signing for a four-leg directional interchange,
- left exit advance signing for freeway-to-freeway interchange,
- freeway-to-freeway interchange with primary route continuing left at the split, and
- frontage road signs.

## Freeway Signing Handbook

Using the information gained from the other three activities, along with input from a panel of TxDOT and Federal Highway Administration staff, Texas Transportation Institute researchers developed the *Freeway Signing Handbook*. This document provides TxDOT staff and design consultants with information beyond that contained in the Texas MUTCD or the TxDOT Traffic Control Standard Sheets so that freeway signing can be designed and installed in a more uniform manner.

## What We Found . . .

### Literature Review

From the literature review, researchers identified previous studies that provided guidelines that were useful in the development of the *Freeway Signing Handbook*. Research on sign information content, types of lane assignment signs, and concurrent route and named/numbered route signing all provided guidelines that would be beneficial in improving guide sign uniformity around the state. Freeway signing manuals from other states were reviewed to help form future design guidelines for the handbook. While some of the research provided initial guidelines for the handbook, other research provided insight into areas that needed more research before they were incorporated into the document. Diagrammatic signs, freeway splits, design and placement guidelines, and frontage road signing were found to be in need of additional research, some of which was addressed in the driver focus groups.

While conducting the literature review, researchers found various differences between the Texas and national MUTCDs. Some of the discrepancies between the two manuals are due to changes that were made in the 2000 national MUTCD, while other differences were present between the previous editions of the MUTCDs. Some notable differences between the manuals include: the requirements of retroreflectorization and illumination; size of letters, numerals, and route markers on freeways; abbreviation guidance; diagrammatic signs; and interchange classification.

## Existing Freeway Signing

Researchers focused their evaluation of existing freeway guide signs on three main categories: interchange guide signs, Interchange Sequence Series signs, and NEXT X EXITS signs. Interchange guide signs include all types of interchange exits, including freeway-to-freeway interchanges. The findings of the effort were documented in an unpublished technical memorandum.

No major inconsistencies were observed for the single right-lane exit or the single and double right-lane drops. The minor inconsistencies observed include Exit Number panel placement and when to sign auxiliary lanes as lane drops. For optional right-lane exits, inconsistencies were found for the Exit Direction sign. The directional arrow orientation on the Exit Direction sign was inconsistent with the Texas MUTCD and not uniform throughout the state. In general, existing freeway guide signing for left exits was found to be inconsistent with the Texas MUTCD. For single left-lane exits, inconsistencies included the exclusion of the LEFT EXIT panel on Advance Guide and/or Exit Directions signs. For single and multiple left-lane drops, the LEFT EXIT panel was used in advance guide and/or Interchange Sequence Series signs, and for some left exits, as many as six advance guide signs were used.

The majority of freeway-to-freeway interchanges are often not signed in accordance with national and Texas MUTCD guidelines. The signs associated with a freeway-to-freeway interchange or freeway split were usually signed as an exit or lane drop. Many freeway-to-freeway interchanges present unique challenges in signing; however, only a few existing interchanges in Texas were signed like the typical interchanges presented in the national and Texas MUTCDs.

Interchange Sequence Series signs generally supplement advance guide signs where interchanges are closely spaced. A horizontal white line was uniformly used to separate a multiple destination interchange; however, no guidance on its use is in the national or Texas MUTCD. The use of NEXT X EXITS signs varies across Texas, and there is no uniformity as to when and where the signs are used. This variation can be attributed to the lack of guidance in the national and Texas MUTCDs.



## The Researchers Recommend . . .

The recommendations that evolved from the three data collection activities (literature review, existing signing, and focus groups) were implemented through the *Freeway Signing Handbook*. The handbook guidelines apply primarily to urban freeway facilities. Some portions of the handbook will also have application to freeway signing in rural areas. The main purposes of this handbook are to:

- provide design personnel with information that will help them to lay out and place freeway signing in the design stage to be more consistent and effective,
- provide freeway guide signing that will help road users find their way in a more effective and efficient manner, and
- address guide signing situations that are not covered in the Texas MUTCD or other TxDOT documents.

The handbook contains six chapters addressing various aspects of freeway signing, with an emphasis on the design elements of freeway guide signs. The six chapters address the following topics:

- Chapter 1 – This chapter describes the handbook and its relation to other freeway signing documents.
- Chapter 2 – This chapter describes the basic principles of freeway signing.
- Chapter 3 – This chapter describes when it is appropriate to use different types of freeway signs. It focuses upon the application of freeway signs.
- Chapter 4 – This chapter describes the design (or layout) of exit direction and advance guide signs. It focuses upon the spacing relationships between various elements of a freeway sign legend.
- Chapter 5 – This chapter describes the placement of freeway advance guide and exit direction signs approaching roadway interchanges and freeway-to-freeway interchanges.
- Chapter 6 – This chapter describes signing for freeway frontage roads, primarily at intersections.

At the time that the handbook was being developed, TxDOT's Traffic Operations Division was developing guidelines to implement the Clearview font for use as the legend on all green, blue, and brown freeway signs. Therefore, the drawings for all white legend signs in the handbook were prepared using the Clearview font to maximize the consistency between the handbook and the expected TxDOT guidelines. Figure 2 illustrates one of the figures from Chapter 5 that uses the Clearview font for the legend.

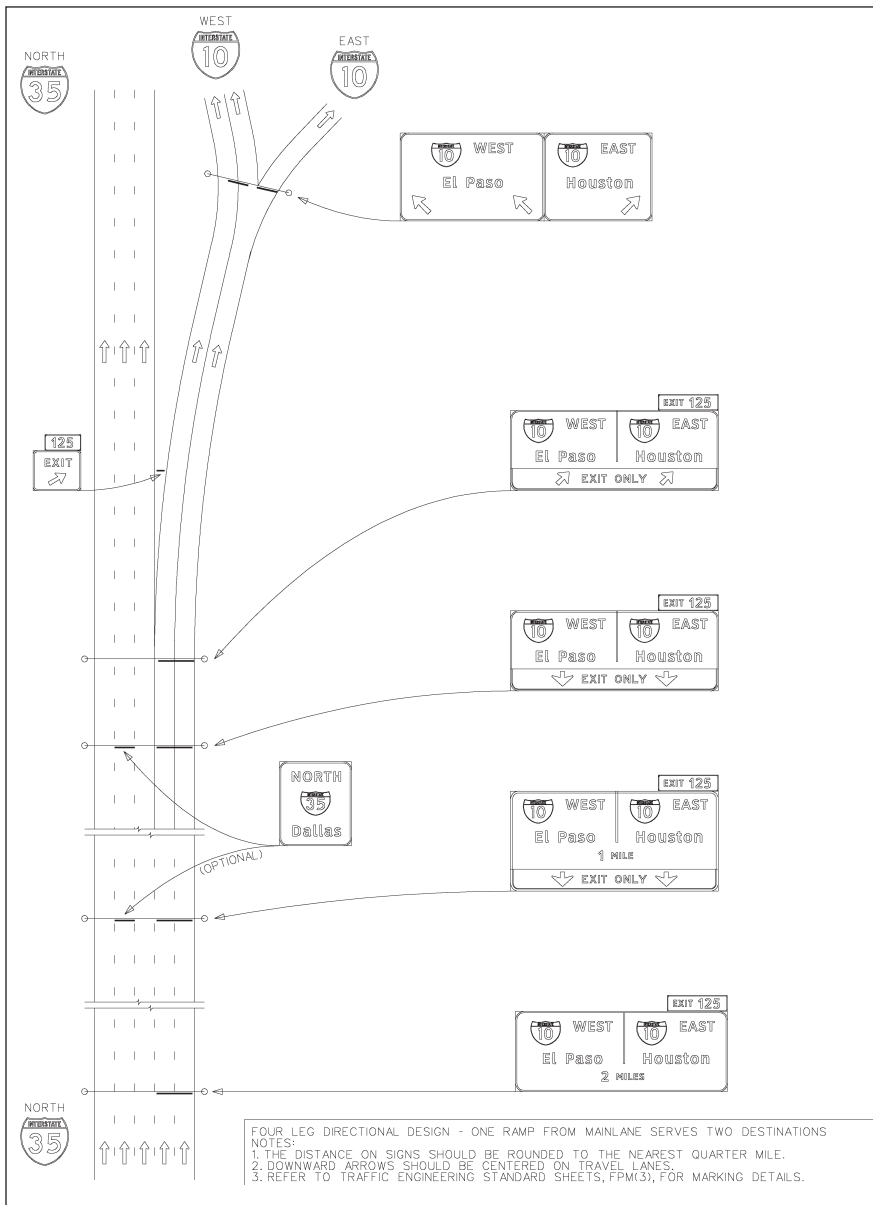


Figure 2. Signing for a Four-Leg Directional Interchange – One Ramp from the Freeway Main Lanes Serves Two Destinations, Double Lane Drop, Two-Lane Connector to the Left, and One-Lane Connector to the Right.

### Driver Focus Groups

The information gained from the focus groups indicated that:

- Drivers do not recognize the relationship between the position of the Exit Number panel and the side on which the exit is located. A more apparent notification of a left exit is needed by using the LEFT EXIT or EXIT ONLY panels on signs that are for a left exit.
- Drivers want to see destination lane assignments for freeway-to-freeway interchanges prior to exiting the freeway. The current MUTCD guidelines require only that the exit signing indicate the destinations, but not the lanes that lead to those destinations.
- Drivers associate the arrows in Exit Direction signs with the direction of the exit. When a route is exiting or continuing on any alignment other than a tangent, an upward diagonal arrow is preferred by drivers to show the direction of travel.
- Drivers can be confused by lane assignment signs used at intersections.



## For More Details . . .

The research is documented in two research reports:

- 0-4170-1: *Freeway Guide Signing: Review of Past Research*
- 0-4170-2: *Urban Freeway Guide Signing: Final Report*

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**To obtain copies of reports, contact Dolores Hott, Texas Transportation Institute, TTI Communications, (979) 845-4853, or e-mail d-hott@tamu.edu. See our online catalog at <http://tti.tamu.edu>.**

The *Freeway Signing Handbook* (0-4170-P1) is the implementation product for this project. It is available from the TxDOT Traffic Operations Division. Contact Jeanne Black at (512) 416-3134 to order a copy of the handbook.

## TxDOT Implementation Status February 2004

The objective of this research project was twofold: 1) evaluate key aspects of freeway signing and 2) develop guidelines to improve the effectiveness and uniformity of freeway signing in Texas. Two products were required for this project: 1) a freeway sign handbook and 2) recommended changes to the Texas MUTCD. The *Freeway Signing Handbook* was developed as a primary source of information for anyone involved with freeway signing principles in Texas and can be implemented immediately. Recommended changes to the Texas MUTCD have been addressed as Chapter 8 in research report 0-4170-1 from which 14 of the 16 recommendations are available for immediate implementation.

For more information, contact Mr. Wade Odell, P.E., RTI Research Engineer, at (512) 465-7403 or e-mail wodell@dot.state.tx.us.

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## Disclaimer

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the U.S. Department of Transportation, Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of TxDOT or the FHWA. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and are not for product endorsement.