

Guide Sign Design Course

November 2017



Office of
Traffic,
Safety
& Technology

TABLE OF CONTENTS

1.	INTRODUCTION.....	1-1
1.1	Background	1-1
1.2	Acknowledgments.....	1-1
1.3	Disclaimer	1-1
1.4	Written Communications Policy	1-2
1.5	MnDOT Website.....	1-2
1.6	Associated Manuals	1-4
1.6.1	Federal Manual on Uniform Traffic Control Devices.....	1-4
1.6.2	Minnesota Manual on Uniform Traffic Control Devices	1-5
1.6.3	Traffic Engineering Manual.....	1-6
1.6.4	Minnesota Standard Signs Manual.....	1-7
1.6.5	Standard Signs Summary	1-7
1.6.6	Signs 101 Manual	1-8
1.6.7	At-Grade Signing Manual.....	1-8
1.6.8	Freeway Signing Manual.....	1-9
1.7	Engineering Standards	1-9
1.7.1	MN MUTCD Text Headings	1-9
2.	BASIC INFORMATION / BACKGROUND	2-1
2.1	Historical Perspectives	2-1
2.1.1	Guide Signs.....	2-1
2.1.2	Lettering Style and Size	2-2
2.2	MnDOT Specific Guidance for Traffic Signs	2-4
2.2.1	Basic Considerations for Installation of Traffic Signs.....	2-4
2.2.2	Functional Classifications of Traffic Signs	2-4
2.2.3	Department Classification by Sign Design Type	2-5
2.2.4	MnDOT Conventional Roads and Expressway Guide Sign Types.....	2-8
2.2.5	Supplemental and Motorist Services Signs	2-10
2.2.6	MnDOT Freeway and Expressway Guide Sign Types	2-10
3.	SIGN COMPONENTS	3-1
3.1	Panel Size, Radii, Borders and Margins.....	3-1
3.1.1	Panel Size	3-1
3.1.2	Radii.....	3-1
3.1.3	Borders	3-1
3.1.4	Margins	3-1
3.1.5	Standard Corner Radii, Margin, and Border for Non-Guide Signs	3-2
3.2	Colors.....	3-3
3.2.1	General Provisions	3-3
3.3	Word Messages.....	3-4
3.3.1	Font Styles.....	3-4
3.3.2	Font Sizes.....	3-5
3.3.3	Abbreviations Used on Traffic Control Devices	3-7
3.4	Horizontal Spacing	3-10
3.5	Vertical Spacing for Freeway Distance Signs	3-11

3.6	Horizontal and Vertical Lines	3-12
3.7	Route Markers and Sizes.....	3-14
3.8	Arrows	3-15
3.9	Fractions.....	3-19
3.10	Legend/Layout Justifications	3-20
3.11	Typical Freeway Signs	3-22
3.11.1	Freeway Advance Guide Type A Signs.....	3-22
3.11.2	Freeway Exit Direction Type A Signs.....	3-23
3.12	U-Post and Post Spacing	3-24
3.12.1	U-Post Structure Charts for Ground Mounted Signs.....	3-24
3.12.2	Sign Post Spacing Chart.....	3-26
4.	DESIGN PROCESS & EXAMPLE PROBLEMS.....	4-1
4.1	Index of Example Problems	4-1
4.2	Guide Sign Basics.....	4-2
4.3	Basic Guide Sign Design Examples.....	4-2
4.3.1	Calculating the vertical size of the sign panel.....	4-2
4.3.2	Calculating the horizontal size of the panel	4-3
4.3.3	Review vertical and horizontal spacing on the panel.....	4-3
4.3.4	Review Panel Structure for Proper Supports	4-3
4.4	Example #1, Supplemental Sign.....	4-4
4.4.1	Example #1, Supplemental Sign Calculations	4-7
4.5	Example #2, Destination Sign	4-9
4.5.1	Example #2, Destination Sign Calculations.....	4-13
4.6	Example #3, Freeway Junction (Advance Guide) Sign.....	4-16
4.6.1	Example #3, Expressway Junction (Advance Guide) Sign Calculations.....	4-20
4.7	Example #4, Supplemental Sign (Freeway)	4-22
4.7.1	Example #4, Supplemental Sign (Freeway) Calculations.....	4-26
4.8	Example #5, Directional Sign.....	4-28
4.8.1	Example #5, Directional Sign Calculation	4-31
4.9	Example #6, Exit Panel (E1-5P)	4-33
4.9.1	Example #6, Exit Panel (E1-5P) Calculations.....	4-35
4.10	Example #7, Distance Sign	4-37
4.10.1	Example #7, Distance Sign Calculations.....	4-40
4.11	Example #8, Distance Sign (Freeway)	4-42
4.11.1	Example #8, Distance Sign (Freeway) Calculations	4-44
4.12	Example #9, Directional Sign (Split Panel)	4-46
4.12.1	Example #9, Directional Sign (Split Panel) Calculations	4-50
4.13	Example #10, Supplemental Sign (Split Panel)	4-52
	Example #10, Supplemental Sign (Split Panel) Calculations	4-56
4.14	Example #11, Junction Sign.....	4-59
4.14.1	Example #11, Junction Sign Calculations.....	4-62
4.15	Example #12, Exit Direction Sign	4-64
4.15.1	Example #12, Exit Direction Sign Calculations.....	4-68
4.16	Example #13, Exit Direction Sign w/ Exit Only Panel.....	4-70
4.16.1	Example #13, Exit Direction Sign w/ Exit Only Panel Calculations	4-74

4.17	Example #14, Freeway Junction (Advance Guide) Sign.....	4-77
4.17.1	Example #14, Freeway Junction (Advance Guide) Sign Calculations.....	4-81
4.18	Example #15, Overhead Advance Guide Sign w/ Exit Only Panel.....	4-83
4.18.1	Example #15, Overhead Advance Guide Sign w/ Exit Only Panel Calculations.....	4-87
4.19	Example #16, Advance Entrance Direction Sign for Interchange Crossroad.....	4-90
4.19.1	Example #16, Adv. Entrance Direction Sign for Interchange Crossroad Sign Calculations.....	4-94
5.	APPENDIX.....	5-1
5.1	Font Spacing Charts.....	5-1
5.2	Glossary of Sign Terms.....	5-4
5.3	Index.....	5-6
5.4	References.....	5-8
6.	HANDOUTS.....	6-1

LIST OF EXHIBITS

EXHIBIT 1-1	MNDOT OTST WEBSITE.....	1-2
EXHIBIT 1-2	MNDOT SIGNING WEBSITE	1-3
EXHIBIT 1-3	FEDERAL MUTCD	1-4
EXHIBIT 1-4	MINNESOTA MUTCD	1-5
EXHIBIT 1-5	MNDOT TRAFFIC ENGINEERING MANUAL (TEM).....	1-6
EXHIBIT 1-6	MNDOT STANDARD SIGNS MANUAL.....	1-7
EXHIBIT 1-7	MNDOT STANDARD SIGNS SUMMARY	1-7
EXHIBIT 1-8	SIGNS 101 MANUAL	1-8
EXHIBIT 1-9	AT-GRADE SIGNING PLAN DESIGN COURSE MANUAL.....	1-8
EXHIBIT 1-10	FREEWAY SIGNING PLAN COURSE DESIGN COURSE MANUAL.....	1-9
EXHIBIT 1-11	TEXT HEADING EXAMPLE FROM MN MUTCD.....	1-10
EXHIBIT 3-1	STANDARD CORNER RADII, MARGIN, AND BORDER FOR NON-GUIDE SIGNS	3-2
EXHIBIT 3-2	GUIDE SIGN BORDER AND RADII	3-2
EXHIBIT 3-3	SIZE OF LETTER (MN MUTCD)	3-5
EXHIBIT 3-4	GUIDELINES FOR GUIDE SIGN (NON-FREEWAY) FONT SIZE	3-6
EXHIBIT 3-5	GUIDELINES FOR GUIDE SIGN (FREEWAY) FONT SIZE	3-7
EXHIBIT 3-6	ACCEPTABLE ABBREVIATIONS	3-8
EXHIBIT 3-7	ABBREVIATIONS THAT ARE ACCEPTABLE ONLY WITH A PROMPT WORD.....	3-9
EXHIBIT 3-8	UNACCEPTABLE ABBREVIATIONS.....	3-10
EXHIBIT 3-9	COMBINATIONS FOR FREEWAY DISTANCE SIGNS.....	3-11
EXHIBIT 3-10	STRAIGHT ARROWS (SOURCE: STANDARD SIGNS AND MARKINGS MANUAL)	3-17
EXHIBIT 3-11	DOUBLE HEAD AND DEGREE ARROWS	3-18
EXHIBIT 3-12	FRACTION FONT SIZES.....	3-19
EXHIBIT 3-13	U-POST STRUCTURE CHART FOR GROUND MOUNTED SIGNS (SOURCE: TRAFFIC ENGINEERING MANUAL)	3-25
EXHIBIT 3-14	SIGN POST SPACING CHART (SOURCE: TRAFFIC ENGINEERING MANUAL)	3-26
EXHIBIT 3-15	SIGN POST SPACING CHART FOR EXIT PANELS	3-27

1. INTRODUCTION

1.1 Background

This Traffic Guide Sign Design Manual has been developed to provide training on the design of guide signs. Participants will learn the fundamentals needed to design guide signs. The software package SignCAD® will be used to demonstrate design elements and to develop guide sign examples.

To achieve this goal, this Manual has been divided into five chapters as follows:

- ✓ Chapter 1 is the Introduction to the course.
- ✓ Chapter 2 presents Basic Information and some background information on guide signs.
- ✓ Chapter 3 covers Sign Components including panel sizes, radii, borders, margins, colors, letter sizes, fonts, horizontal and vertical lines, route markers, arrows, fractions, and abbreviations.
- ✓ Chapter 4 includes the Example Problems.
- ✓ Chapter 5 is the Appendix with Font Spacing Charts, References, List of Definitions, and the Index.

The purpose of this Traffic Guide Sign Design Manual is to present the fundamental concepts of traffic guide sign design and to use these basics to develop signs using the SignCAD® software.

1.2 Acknowledgments

The development of this Traffic Guide Sign Design Manual has been a result of the combined efforts of the MnDOT Office of Traffic, Safety and Technology, and Albeck Gerken, Inc. The contributions by Heather Lott, Rick Sunstrom, Brian Barrett and Eric Peterson are gratefully acknowledged.

1.3 Disclaimer

This Manual is disseminated under the sponsorship of MnDOT, Office of Traffic, Safety and Technology. MnDOT and Albeck Gerken, Inc., assume no liability for its contents or use thereof.

MnDOT does not endorse products or manufacturers. Trademarks of manufacturers' names may appear herein only because they are considered essential to the purpose of this manual.

The contents of this manual reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein.

This manual addresses the design layout of guide sign panels only and does not address related guide sign topics such as sign structure design, sign location and placement, or sign message content.

Mere possession of this manual does not qualify an individual to design traffic guide signs. Designing traffic guide signs is an integrated process that requires a solid understanding of signing fundamentals.

1.4 Written Communications Policy

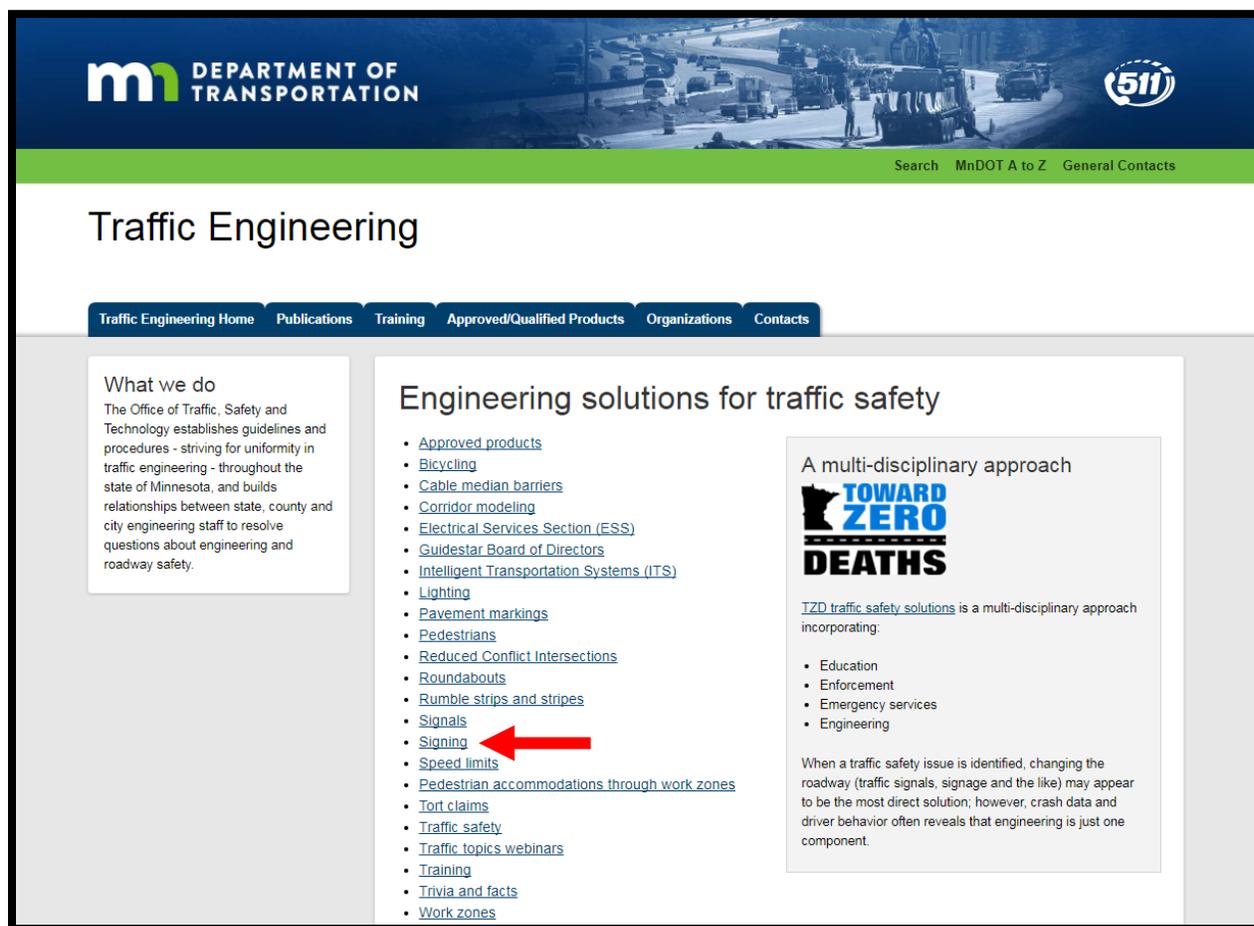
To request this document in an alternative format, please contact the Affirmative Action Office at 651-366-4723 or 1-800-657-3774 (Greater Minnesota); 711 or 1-800-627-3529 (Minnesota Relay). You may also send an e-mail to ADArequest.dot@state.mn.us. (Please request at least one week in advance).

1.5 MnDOT Website

The MnDOT Office of Traffic, Safety and Technology website (see [Exhibit 1-1](#)) includes a wide variety of traffic engineering information, including signing. The website can be visited by going to:

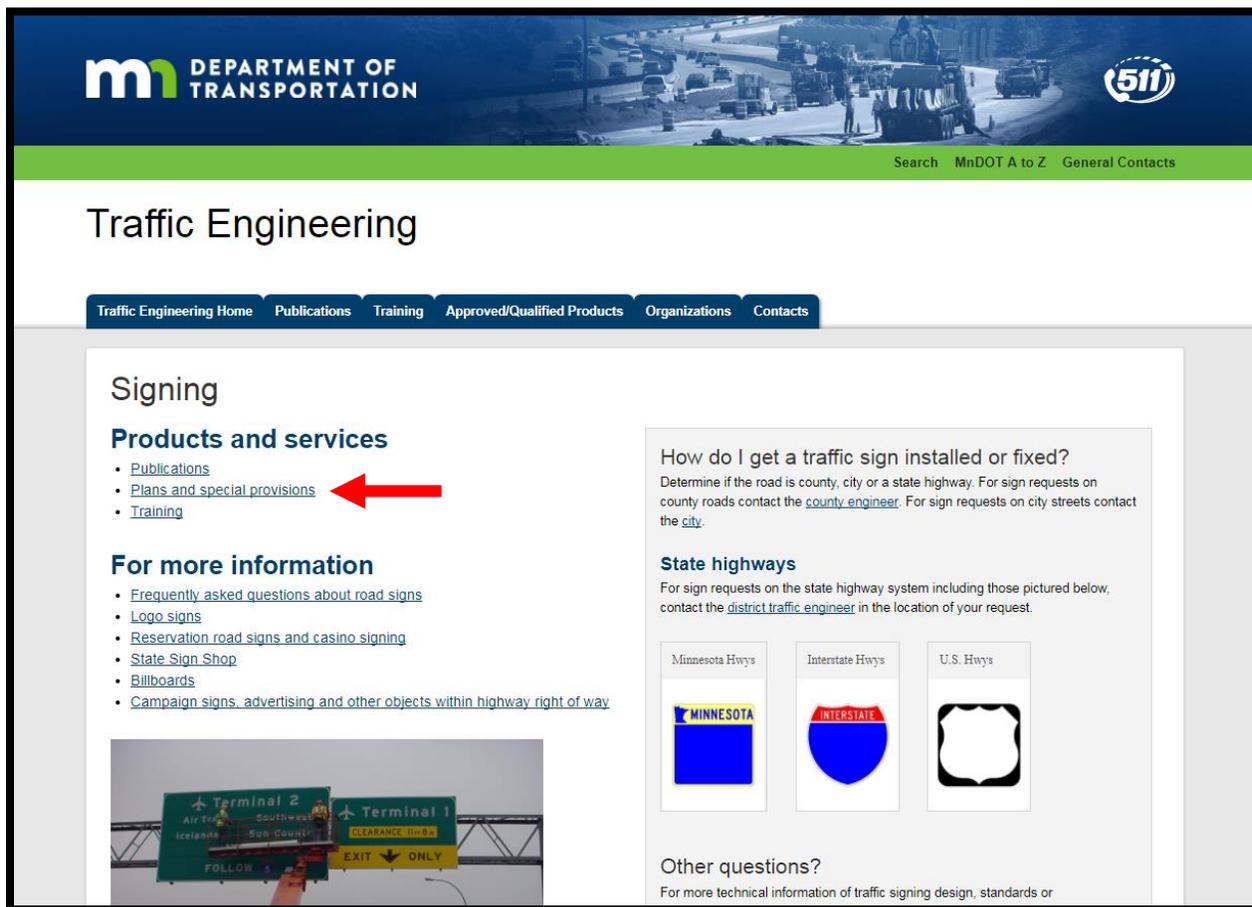
www.dot.state.mn.us/trafficeng/index.html.

Exhibit 1-1 MnDOT OTST Website



Click on the link to Signing to go to the Signing home page show in [Exhibit 1-2](#).

Exhibit 1-2 MnDOT Signing Website



The Signing page includes links to publications, plans and special provisions, training along with other important information. By clicking on the link to [Plans and special provisions](http://www.dot.state.mn.us/trafficeng/signing/plans.html) (www.dot.state.mn.us/trafficeng/signing/plans.html), you can download the following:

- ✓ Special provisions
- ✓ Signing sample plans
- ✓ Documents, checklists and worksheets
- ✓ Guide sign panel designs examples
- ✓ Plan sheets
- ✓ Sign cell library
- ✓ Placement details
- ✓ Structural details

1.6 Associated Manuals

There are a variety of manuals related to highway signs in Minnesota. In this section, some of the more common manuals are presented.

1.6.1 Federal Manual on Uniform Traffic Control Devices

The Federal Highway Administration (FHWA) publishes the MUTCD, which contains all national design, application, and placement, standards, guidance, options, and support provisions for traffic control devices. At the time of publication of this manual, the 2009 edition dated December of 2009 is the current version. The national MUTCD website is located at:

<http://mutcd.fhwa.dot.gov/index.htm>.

The purpose of the MUTCD is to provide uniformity of these devices, which include signs, signals, and pavement markings, to promote highway safety and efficiency on the Nation's streets and highways.

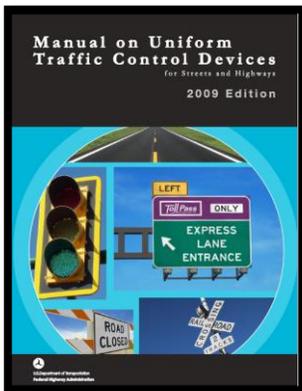
Title 23 of the Code of Federal Regulations requires all States to do one of three things within two years after a new national MUTCD edition is issued or any national MUTCD amendments are made:

1. adopt the new or revised national MUTCD as the standard for traffic control devices in the State;
2. adopt the national MUTCD with a State Supplement that is in substantial conformance with the new or revised national MUTCD; or
3. adopt a State MUTCD that is in substantial conformance with the new or revised national MUTCD.

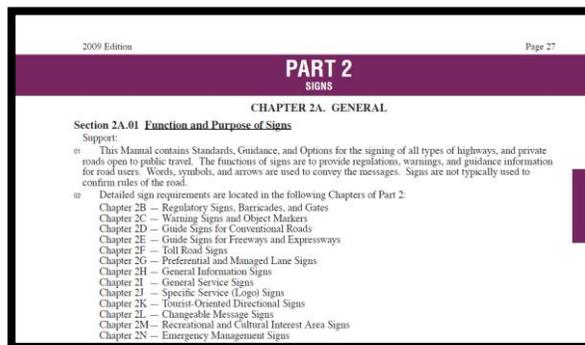


Minnesota develops and adopts a State MUTCD (3 above) that is in substantial conformance with the national MUTCD.

Exhibit 1-3 Federal MUTCD



Chapter 2 of the Federal MUTCD related to Traffic Signs

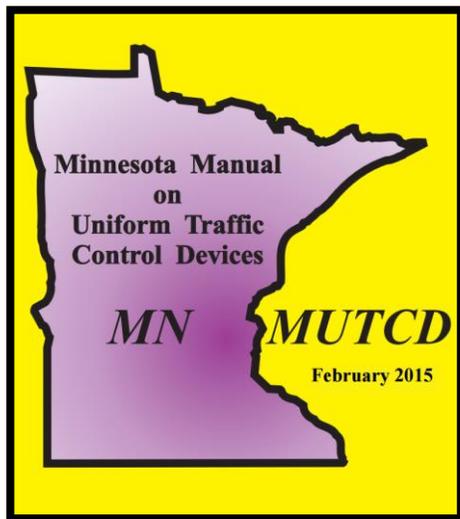


The Federal MUTCD is not just a “policy”. It is not a MnDOT document. It applies to all public roads in the United States. The MUTCD is part of Federal Law and the MN MUTCD is part of State Law. The Federal government issues the MUTCD and gives states a certain amount of time to adopt it, or lose federal funding. Some states adopt it “as is”, many states publish a supplement. Minnesota re-writes the document. Those that re-write can be more conservative, but not less. State Law, trumps the federal manual.

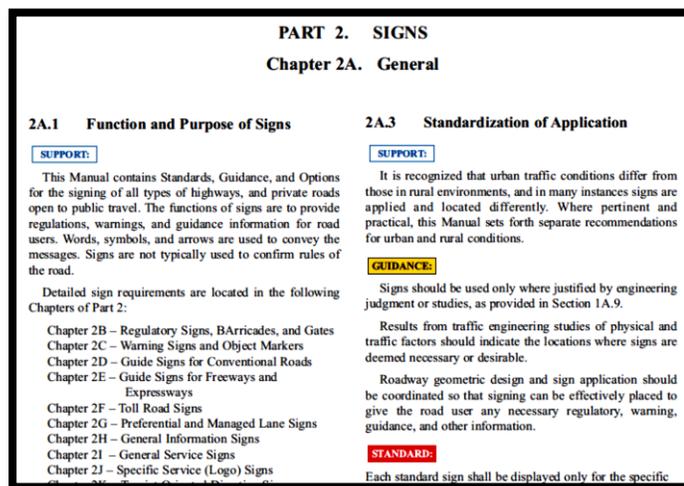
1.6.2 Minnesota Manual on Uniform Traffic Control Devices

As noted above, Minnesota develops and adopts a state MUTCD that is in substantial conformance with the Federal MUTCD. The Minnesota MUTCD (MN MUTCD) was updated in February 2015. Chapter 2 of the MN MUTCD is dedicated to traffic signs.

Exhibit 1-4 Minnesota MUTCD



Chapter 2 of the MN MUTCD related to Traffic Signs



The MN MUTCD contains Standards, Guidance, and Options for the signing of all types of highways, and private roads open to public travel. Detailed sign requirements are located in the following Chapters of Part 2 of the MN MUTCD:

- ✓ Chapter 2B — Regulatory Signs, Barricades, and Gates
- ✓ Chapter 2C — Warning Signs and Object Markers
- ✓ Chapter 2D — Guide Signs for Conventional Roads
- ✓ Chapter 2E — Guide Signs for Freeways and Expressways
- ✓ Chapter 2F — Toll Road Signs
- ✓ Chapter 2G — Preferential and Managed Lane Signs
- ✓ Chapter 2H — General Information Signs
- ✓ Chapter 2I — General Service Signs
- ✓ Chapter 2J — Specific Service (Logo) Signs
- ✓ Chapter 2K — Tourist-Oriented Directional Signs
- ✓ Chapter 2L — Changeable Message Signs
- ✓ Chapter 2M — Recreational and Cultural Interest Area Signs
- ✓ Chapter 2N — Emergency Management Signs

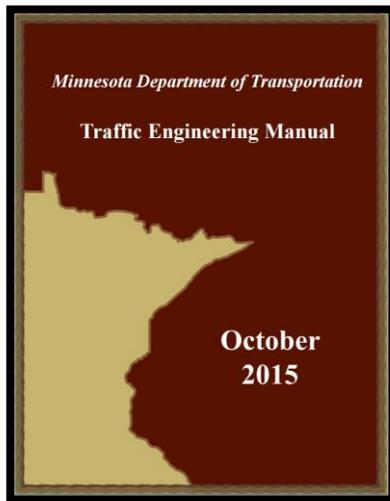
1.6.3 Traffic Engineering Manual

The Traffic Engineering Manual (TEM) is issued and updated by the MnDOT Office of Traffic, Safety and Technology (OTST). The purpose of the TEM is to establish uniform guidelines and procedures, primarily for use by personnel at MnDOT. Counties, cities, and local units of government will also find this manual useful when striving for uniformity in traffic engineering throughout the state of Minnesota. It is the intent of this Manual to set forth accepted practices, procedures, and guidelines, chiefly for the sake of uniformity of application, but there is no legal requirement for their use.

The TEM contains 14 chapters. Chapter 6 is related to Traffic Signs (see **Exhibit 1-5**). The most current version of the TEM can be found at:

<http://www.dot.state.mn.us/trafficeng/publ/tem/index.html>

Exhibit 1-5 MnDOT Traffic Engineering Manual (TEM)



Chapter 6 of the TEM related to Traffic Signs

July 2016	Traffic Engineering Manual	Chapter 6
CHAPTER 6 - TRAFFIC SIGNS AND DELINEATION		
Table of Contents		
6-1.00 INTRODUCTION		5
6-1.01 Purpose		5
6-1.02 Scope		5
6-1.03 Chapter Organization		5
6-2.00 GLOSSARY		6
6-3.00 LEGALITY - LEGAL AUTHORITY FOR PLACEMENT OF TRAFFIC SIGNS		9
6-3.01 Traffic Signs Installed by MnDOT Maintenance Forces		9
6-3.02 Traffic Signs Installed by Contract		9
6-3.03 Traffic Signs Installed by Others by Maintenance Permit		9
6-4.00 GENERAL PRINCIPLES OF TRAFFIC SIGNING		9
6-4.01 Principles of Traffic Control Devices		9
6-4.02 Basic Considerations for Installation of Traffic Signs		9
6-4.03 Functional Classifications of Traffic Signs		10

Chapter 6 of the TEM is broken into the following subsections:

- ✓ 6-1.0 Introduction
- ✓ 6-2.0 Glossary
- ✓ 6-3.0 Legality - Legal Authority For Placement of Traffic Signs
- ✓ 6-4.0 General Principles of Traffic Signing
- ✓ 6-5.0 Application Guidelines - Regulatory Signs
- ✓ 6-6.0 Application Guidelines - Warning Signs
- ✓ 6-7.0 Application Guidelines - Guide Signing
- ✓ 6-8.0 Application Guidelines - Miscellaneous Signing
- ✓ 6-9.0 Object Markers
- ✓ 6-10.0 Delineators
- ✓ 6-11.0 References

1.6.4 Minnesota Standard Signs Manual

The Standard Signs Manual contains a wide variety of standard signs that are used in the state (see [Exhibit 1-6](#)). It includes the common R, W, M, G, S, D, I, E and X series. Each Series is broken into groups. For instance, the R series is broken into 16 groups from Group 1 on Right of Way to Group 16 Miscellaneous.

The Standard Signs Manual includes detailed information on the layout of the sign.

Exhibit 1-6 MnDOT Standard Signs Manual



Sample Page from Standard Signs Manual (R1-1)

SIZE DESIGNATION	18 X 18	30 X 30
RADIUS		
MARGIN		
BORDER	5	7.5
a	10	30
b	5.27	8.79
c	7.46	12.43
d	3	5
e	7.8	12.6
f	7.8	12.6
z	6C	10C

SIZE DESIGNATION	36 X 36	48 X 48
RADIUS		
MARGIN		
BORDER	.88	1.25
a	36	48
b	10.55	14.06
c	14.9	19.88
d	6	8
e	15.2	20.2
f	15.2	20.2
z	12C	16C

STOP		
APPROVED	DATE OF REV	SIGN NUMBER
1/1/73	5/1/13	R1-1

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on red background, fully reflectorized.

1.6.5 Standard Signs Summary

As the name implies, the Standard Signs Summary is a summary of the standard signs used in the state (See [Exhibit 1-7](#)). It includes the sign number (nomenclature), a drawing of the sign, and the color of the sign and the sizes of the sign. Unlike the Standard Signs Manual, it does not contain the detailed layout details of the sign.

Exhibit 1-7 MnDOT Standard Signs Summary



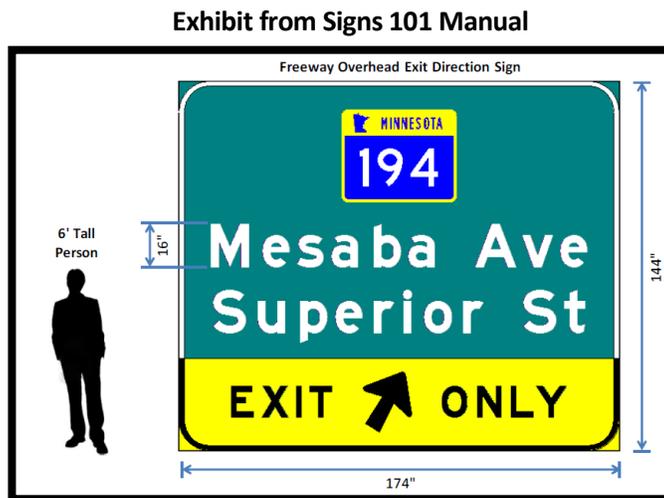
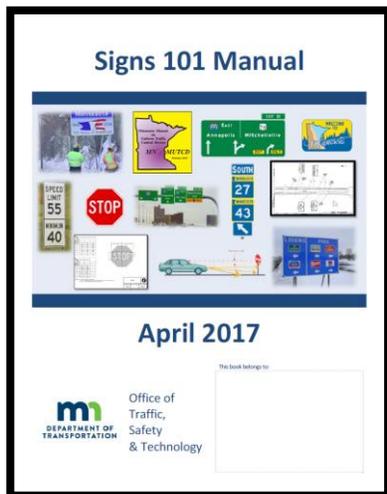
Sample R Series from Standard Signs Summary

R Series			
No.	Drawing	Color	Use & Size
R1-1		White on Red	B-P 18 x 18 B/RT 30 x 30 CR-SL 30 x 30 CR-ML, E 36 x 36 O 48 x 48
STANDARD:			
A minimum size of 36 x 36 inches shall be used for STOP signs that face multi-lane approaches.			
Where side roads intersect a multi-lane street or highway that has a speed limit of 45 mph or higher, the minimum size of the STOP signs facing the side road approaches, even if the side road only has one approach lane, shall be 36 x 36 inches.			
Where side roads intersect a multi-lane street or highway that has a speed limit of 40 MPH or lower, the minimum size of the STOP signs facing the side road approaches shall be as shown above based on the number of approach lanes on the side street approach.			
Multi-Lane - more than one lane moving in the same direction. A multi-lane street, highway, or roadway has a basic			
R1-6a		Black, Red and White on Fluorescent Yellow-Green	CR-SL 12 x 36 ** CR-ML 12 x 36 ** CR-SL 12 x 44 * CR-ML 12 x 44 *
* In-Street version ** Post-Mounted version			
R1-6c		Black, Red and White on Fluorescent Yellow-Green	CR-SL 12 x 36 ** CR-ML 12 x 36 ** CR-SL 12 x 44 * CR-ML 12 x 44 *
* In-Street version ** Post-Mounted version			
R1-9b		Black and White on Fluorescent Yellow-Green	CR-SL 90 x 30 CR-ML 90 x 30
R1-X1		Black on White	24 x 30

1.6.6 Signs 101 Manual

The Signs 101 Manual (see **Exhibit 1-8**) is designed to enable participants to acquire a basic understanding of how and why the determination is made to place a traffic sign at a particular location.

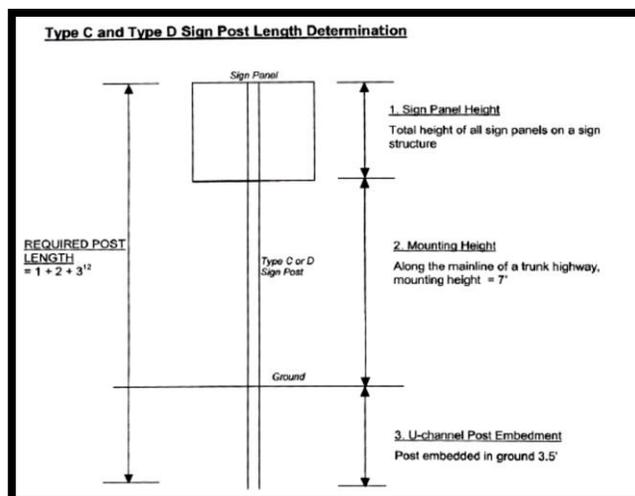
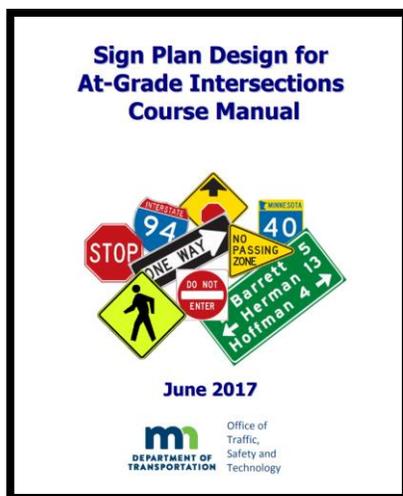
Exhibit 1-8 Signs 101 Manual



1.6.7 At-Grade Signing Manual

This Signing Plan Design (At-Grade) Manual (see **Exhibit 1-9**) has been developed to provide training to traffic personnel to acquire basic design skills in assembling signing plans for at-grade intersections on conventional highways and expressways.

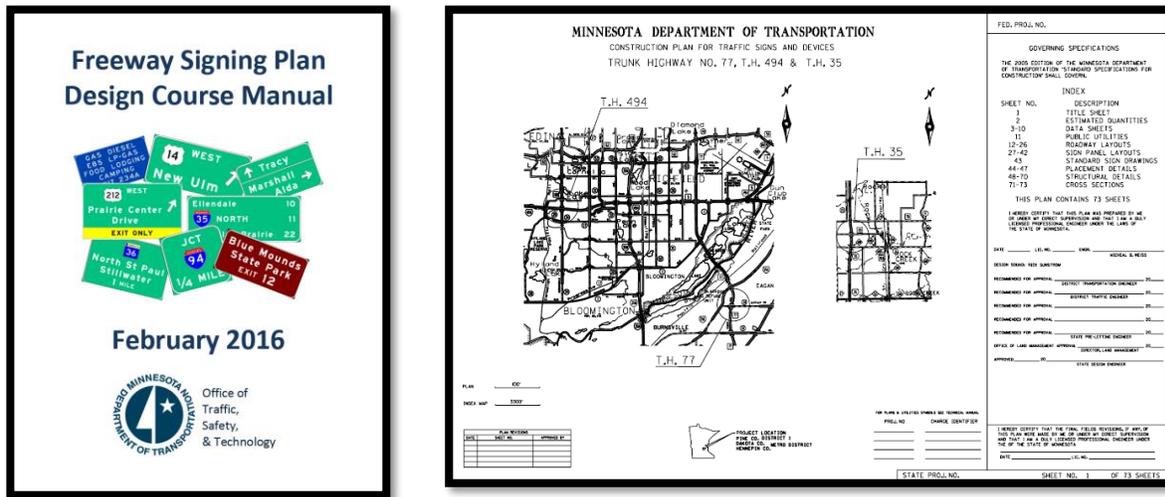
Exhibit 1-9 At-Grade Signing Plan Design Course Manual



1.6.8 Freeway Signing Manual

This Freeway Signing Plan Design Manual (see [Exhibit 1-10](#)) has been developed to provide training to traffic personnel to acquire basic design skills in assembling freeway signing plans. This course is designed for persons who need to acquire signing plan design skills. A sample signing plan set is provided as a reference in the manual and the title sheet is illustrated in the exhibit below.

Exhibit 1-10 Freeway Signing Plan Course Design Course Manual



1.7 Engineering Standards

1.7.1 MN MUTCD Text Headings

When used in the sections of the MN MUTCD, the text headings shall be defined as follows:

STANDARD: A statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. The verb **“shall”** is typically used. Standards are sometimes modified by Options.

GUIDANCE: A statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. The verb **“should”** is typically used. Guidance statements are sometimes modified by Options.

OPTION: A statement of practice that is a permissive condition and carries no requirement or recommendation. Options may contain allowable modifications to a Standard or Guidance. The verb **“may”** is typically used.

SUPPORT: An informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. The verbs **“shall”**, **“should”**, and **“may”** are **not** used in Support statements.

[Exhibit 1-11](#) is an example of the text headings used for Section 2C.2 from the MN MUTCD.

Exhibit 1-11 Text Heading Example from MN MUTCD

2C.2 Application of Warning Signs

STANDARD:

The use of warning signs shall be based on an engineering study or on engineering judgment.

GUIDANCE:

The use of warning signs should be kept to a minimum as the unnecessary use of warning signs tends to breed disrespect for all signs. In situations where the condition or activity is seasonal or temporary, the warning sign should be removed or covered when the condition or activity does not exist.

OPTION:

Consistent with the provisions of Chapter 2L, changeable message signs may be used to display a warning message.

Consistent with the provisions of Chapter 4L, a Warning Beacon may be used in combination with a standard warning sign.

SUPPORT:

The categories of warning signs are shown in Table 2C-1.

Warning signs specified provided herein in this Manual cover most of the conditions that are likely to be encountered. Additional warning signs for low-volume roads (as defined in Section 5A.1), temporary traffic control zones, school areas, highway-rail grade crossings, and bicycle facilities, and highway-light rail transit grade crossings are discussed in Parts 5 through 9, respectively.

Section 1A.9 contains information regarding the assistance that is available to jurisdictions that do not have engineers on their staffs who are trained and/or experienced in traffic control devices.

2. BASIC INFORMATION / BACKGROUND

There are several basic provisions for regulating, warning, and guiding traffic. For signing to be effective it should meet the following five basic requirements:

- ✓ Fulfill a need
- ✓ Command attention
- ✓ Convey a clear, simple meaning
- ✓ Command respect of road users
- ✓ Give adequate time for proper response

The purpose of this Manual is to develop the knowledge and tools needed so that traffic guide signs are properly designed prior to implementation to ensure maximum effectiveness and driver understanding.

2.1 Historical Perspectives

This section provides some historical perspective on guide sign development.

2.1.1 Guide Signs

Excerpts are taken from Traffic Control Devices: Historical Aspects Thereof by Gordon M. Sessions.

When Minnesota established its trunk highway system in 1921, it made prompt plans for full-scale marking and signing. It adopted a star-shaped design, with lemon yellow and black as the color combination for all official route signs placed by the state along a trunk highway, and suggested white and black for signs erected by other jurisdictions.

Then, in the fall of 1922, three men took a trip that became the first solid impetus toward standardization. As recalled by the late Walter F. Rosenwald, maintenance engineer (later traffic engineer) for the Minnesota Department of Highways:

"At the invitation of Mr. J.T. Donaghey of Wisconsin, the writer and Mr. A.H. Hinkle, the superintendent of maintenance of the Indiana highway commission, joined in a trip through several states to try to work out some uniformity or standardization in the marking of highways.

"At first, it appeared rather hopeless, but it finally was agreed that there was possibility of standardizing shapes and classifying signs with a different shape for each group. The underlying thought was that, if each shape had a definite meaning, it would be a great advantage for night driving as undoubtedly the shape could be distinguished long before the words could be."

The committee reported its findings to the Mississippi Valley Association of State Highway Departments; and that body, at its annual meeting in Chicago in January 1923, agreed on a signing and marking plan which was destined to become the basis of the national standards agreed upon two years later.

The plan's basic contribution was the classification of the more important types of signs, and the assignment of distinctive shapes to them. Its plan called for all signs to have white background with letters and/or symbols in black:

1. Round signs, to be used only as warnings of railroad crossings.
2. Octagonal signs, always signifying "Stop".
3. Square signs with diagonal vertical (diamond- shaped) for "slow" warnings.
4. Square signs with sides vertical for caution or "attention" signs.

5. Rectangular signs for directional and regulatory information.
6. Route markers of some characteristic or conventional shape different from the above.

The Mississippi Valley Association passed its recommendations along to AASHO.

Without waiting for further guidance, the Minnesota Highway Department on April 1, 1923, published what is believed to have been the first state Manual of Markers and Signs.

The manual provided: "Markers and signs will generally consist of black letters and figures on a lemon yellow field surrounded by a narrow black border..." The existing trunk highway marker was retained: a lemon yellow star on a black circular field, with the route number in black within the star.

Shapes followed the recommendations of the Mississippi Valley Association. The yellow background was new.

In 1924 further work on this topic concluded that "Distance and direction signs should be black and white."

The recommendation as to directional and distance signs:

"No road can be considered satisfactorily equipped with signs unless it has direction and distance signs containing sufficient information in legible form to permit a traveler to go anywhere he desires without the aid of maps or keys. To this end, black and white signboards of adequate size should be placed at every cross-road and function setting forth clearly the information as to direction and distance."

Finally, in 1927 exceptions to black and white guide signs were provided as: "A unique place in the color scheme was provided for one sign in the direction-information-restriction classification. All were to be black-on-white except "...Rest Station is white on a green background" and thus is the origin of the white lettering on green background.

2.1.2 Lettering Style and Size

Information that follows was assembled by Mike Weiss, MnDOT.

Highway signs were first standardized on a national basis in the late 1920's. Standard alphabets for highway signs at that time consisted of mechanical, rectangular characters. These alphabets remained a national standard until 1945. In 1945, the Standard Alphabets for Highway Signs, designed by the U.S. Public Roads Administration, was issued. The new style of alphabets contained in this document were approved by the Joint Committee on Uniform Traffic Control Devices and its constituent agencies, the American Association of State Highway Officials, the Institute of Traffic Engineers and the National Conference on Street and Highway Safety. The new "rounded" style of capital letter alphabets, designated as Series A, B, C, D, E and F not only had a more pleasing appearance than the old alphabets, but also were shown to be consistently more legible based on extensive testing. The letter width varies from the slender Series B through the thicker (bolder) letters provided in Series F.

The 1966 Edition of the Standard Alphabets for Highway Signs, A Reference Guide for the Standardization of Letters and numerals on Highway Signs specified in the Manual on Uniform Traffic Control Devices for Streets and Highways, was issued by the U.S. Department of Commerce, Bureau of Public Roads. This document eliminated the Series A alphabet since it was no longer acceptable for use on highway signs. In addition, the standard lower case alphabet was issued in this document. This lower case alphabet, based on the research and development of the California Division of Highway, is the approved standard for directional signs on the National System of Interstate and Defense Highways. It was recommended that the

initial capitals and numerals used with these lower case letters be Series E uppercase, with the stroke width modified to approximately one-fifth of letter height.

The 1977 Metric Edition of the Standard Alphabets for Highway Signs and Pavement Markings included Series E modified capital letters and numerals to be used as initial capitals and numerals with the lower case alphabet series. These capitals and numerals were the same dimensions as the Series E uppercase, except that the stroke width was widened to approximately one-fifth of the letter heights (as referenced in the 1966 Edition).

In general, both sign and letter size have been established for all regulatory and warning signs. The Federal Manual on Uniform Traffic Control Devices sets forth criteria establishing the series of letters to be used and the spacing between letters for these two classifications of signs.

Only minimum sizes have been established for guide signs. The letter size needed to give motorists ample opportunity to read a sign easily at normal approach speed will, in general, determine the size of sign needed. Sign design is dependent upon many variables:

1. The sign reading behavior of drivers is a highly adaptive process - the manner in which a driver obtains information from a sign heavily depends on the following factors:
 - a. Visual loads on the driver's visual information acquisition and processing functions
 - b. Driver's informational need
 - i. type of informational need
 - ii. urgency associated in obtaining information
 - iii. driver's familiarity with the route
 - c. Size of letters displaying information on the sign
 - d. Amount of message displayed on the signs and its relevancy to driver's informational need
 - e. Driver's visual capabilities
 - f. Vehicle velocity
 - g. Location of the sign with respect to the path of the driver
2. Drivers do not concentrate on a sign until they obtain the required information from the sign - they share their time between the sign, objects on the road and performing other driving tasks

2.2 MnDOT Specific Guidance for Traffic Signs

2.2.1 Basic Considerations for Installation of Traffic Signs

As stated in the Minnesota Manual of Uniform Traffic Control Devices (MN MUTCD), five basic considerations are employed to ensure that the basic requirements identified previously are met. These considerations are:

1. **Design:** the combination of physical features such as size, colors, and shape needed to command attention and convey a clear message.
2. **Placement:** the installation of devices should assure that they are within the viewer's cone of vision, so they will command attention and allow time for response. A 20 degree cone of vision should be used for placement of signs. Signs must remain within this cone of vision to be read.
3. **Operation:** the application of devices so that they meet traffic requirements in a uniform and consistent manner, fulfill a need, command respect, and allow time for response.
4. **Maintenance:** the upkeep of devices to retain legibility and visibility, or the removal of devices if not needed, to aid in commanding respect and attention while fulfilling the needs of users.
5. **Uniformity:** the uniform application of similar devices for similar situations so that they fulfill the needs of users and command their respect. THE IMPORTANCE OF UNIFORMITY IN SIGNING CANNOT BE OVEREMPHASIZED.

2.2.2 Functional Classifications of Traffic Signs

The MN MUTCD classifies signs by their functional usage as follows:

1. **Regulatory signs** inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.
2. **Warning signs** are used to call attention to unexpected conditions on or adjacent to a highway, street or private road open to public travel and to situations that would not be readily apparent to the motorist.
3. **Guide signs** are used to provide directions to motorists, informing them of intersecting routes, directing them to cities and other important destinations, and guiding them to available services, points of interest, and other geographic, recreational, or cultural sites.

Further, guide signs for expressways and freeways have two (2) sub-classifications:

1. **Primary guide signs** consist of advance junction signing, exit directional signs, exit gore signs and destination signs. On interstate freeways, exit numbers are included. Distance signs are also primary guide signs.
2. **Supplemental guide signs** further provide the driver geographic orientation and secondary destinations at certain interchanges. Destinations include cities, motorist services, or traffic generators.

2.2.3 Department Classification by Sign Design Type

While the previous sign classifications describe general functions, MnDOT has further classified signs by “design” type.



**Type A Sign
(with EA panel)**

Type A signs are large breakaway guide, directional, or informational signs normally installed on mainline freeways, expressways, and occasionally on conventional roads. They are supported on wide-flange steel posts.



Around the year 1960, MnDOT did have a Type B sign. These signs were on one small wide flange post (W4X13 or W5X16) in concrete and Type C signs were installed on wood posts or U posts. Around 1962 MnDOT dropped the Type B signs and installed only Type C signs on U posts or X posts (two U posts back to back).



Type C Sign

Type C signs are primarily regulatory, warning, route marker assemblies, and auxiliaries, as found in the Standard Signs Manual. They are the most common sign type and typically installed on driven U posts or square tube posts.

Type D signs are the smaller guide, destination, or informational signs. They are supported on driven U posts or mounted on overhead structures with punching and stringer spacing as indicated in the Standard Signs Manual.



Type D – Ground Mounted



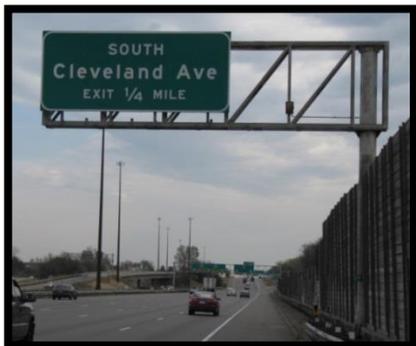
Type D – Bridge Mounted



Type D – Mast Arm Mounted

Note: The sign above is out of date. The current standard is to use all caps for cardinal directions with the first letter larger.

Type OH signs are large overhead guide, directional, or informational signs, either spanning a roadway, cantilevered over the roadway/shoulder, or bridge-mounted. The requirements of the structural support system generally require installation or maintenance by contract. There are three kinds of Type OH signs: sign supports which include no walkway or sign lighting, trusses which may or may not include walkway and sign lighting, and bridge-mounted structures which may or may not include walkway and sign lighting.



Type OH Sign – Cantilever (Design A Truss)



Type OH Sign – Cantilever (Design B Truss)



Note: The sign to the left is out of date. For a Left Exit, the text "LEFT" is used, not the text "LEFT EXIT".

Type OH Sign – Sign Bridge (Design C Truss)

Type OH signs are necessary where ground-mounted signs are not deemed effective. Applications include, but are not limited to the following:

1. Freeway signing where space is not available for ground mounted signs or where there are three or more lanes of travel.
2. Guide and/or lane use control signing approaching intersections in urban areas.
3. Approach warning sign/flasher for mid-block pedestrian crosswalks.
4. Locations with restricted sight distance (may be coupled with other factors cited).



Type OH – Sign Support



Type OH Sign – Bridge Mounted



Type EA signs are exit number panels attached with U-posts to Type A sign panels.



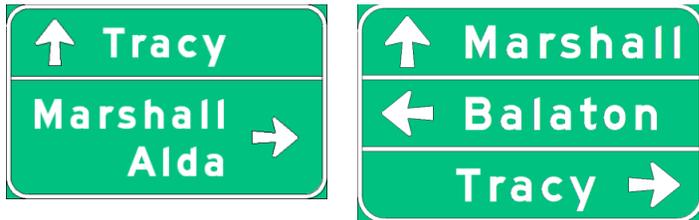
Type EO signs are exit number panels attached with U-posts to Type OH sign panels.

2.2.4 MnDOT Conventional Roads and Expressway Guide Sign Types

In addition to sign design type, MnDOT considers the facility the guide sign will serve. Guide signs designed for conventional roads and expressways typically are designed in the same manner.

- ✓ **Conventional Road (Single Lane)** – A two-lane, two-way roadway
- ✓ **Conventional Road (Multilane)** – An undivided highway with more than one lane in each direction of travel and having a posted speed equal to or less than 60 mph or a divided highway with more than one lane in each direction of travel and having a posted speed equal to or less than 55 mph.
- ✓ **Expressway** – A high speed, multilane, divided highway which is generally an arterial road with a posted speed greater than 55 mph. Most intersections are at-grade, although grade separated interchanges may exist.

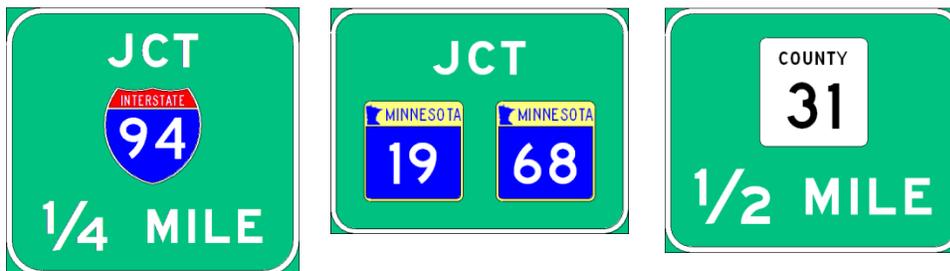
Destination signs typically have a destination(s) with an accompanying arrow(s) indicating direction. Normally only one destination per route or direction should be identified. No more than three city names should be on a sign. A few exceptions have been made where multiple routes intersect at junctions.



Distance signs typically have a destination(s) with mileage(s) indicating the distance from the sign location. No more than three city names should be on a sign. A few exceptions have been made where multiple routes intersect at junctions.



Junction signs indicate the intersection of two or more routes.

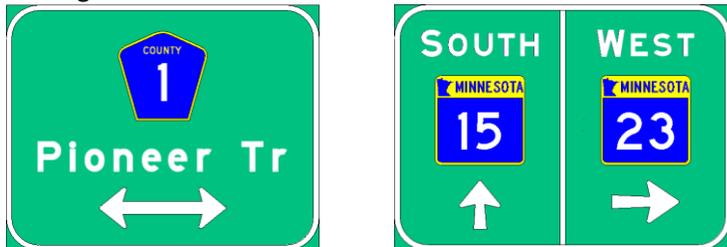


Conventional

Conventional

Expressway at grade

Directional signs typically have a route marker(s), possibly city or street names, and an arrow(s) indicating turning direction.



Supplemental signs show secondary destinations such as airports or tourist attractions. Under MnDOT policy supplemental signs may be provided for the following:

1. National Parks
2. National monuments
3. State parks, with certain amenities
4. Airports
5. Educational institutions
6. Traffic generator signing



Street name signs mounted overhead on mast arms or bridges.



Specific service signs(D9-X6).



2.2.5 Supplemental and Motorist Services Signs

Numbered Interchanges



Unnumbered Interchanges



2.2.6 MnDOT Freeway and Expressway Guide Sign Types

Distance (Sign Type A or OH)



Advance Guide



Numbered

Unnumbered

Exit Directional Guide (A or OH)

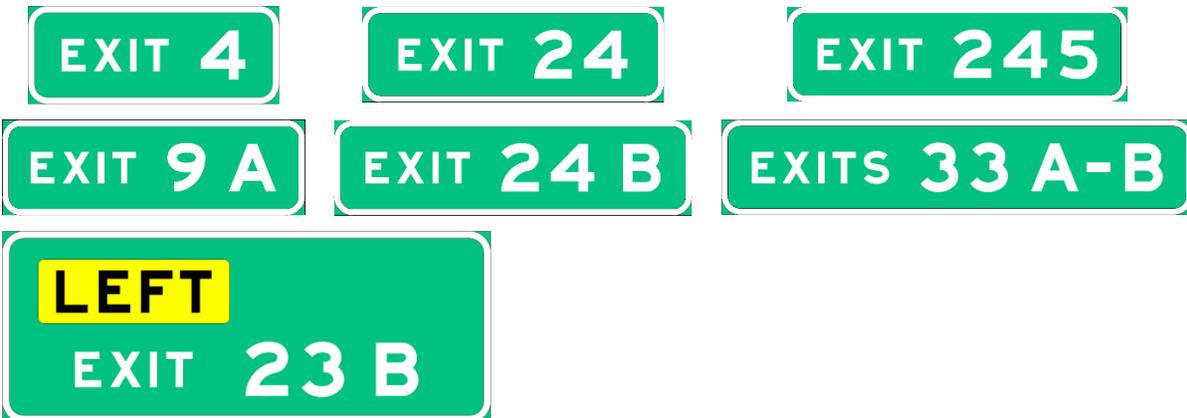


Sign Type A



Sign Type OH

Exit Panel (Sign Type EA or EO)



Supplemental Guide (Sign Type A or OH)



Numbered

Numbered

Unnumbered

(This page is intentionally left blank)

3. SIGN COMPONENTS

In this Chapter you will be introduced to some of the basic background information related to traffic sign design and practice. The items covered include:

- ✓ Panel Size, Radii, Borders, Margins
- ✓ Colors
- ✓ Font Styles and Font Sizes
- ✓ Horizontal and Vertical Lines
- ✓ Route Markers
- ✓ Arrows
- ✓ Fractions
- ✓ Abbreviations

Guide signs are developed with numerous components, many of which dynamically change based on their inter-relation.

3.1 Panel Size, Radii, Borders and Margins

The panel size (typically derived from the sign components) will dictate the radii, borders and margins.

3.1.1 Panel Size

Panels for guide signs are sized in 6" increments in all cases. Sign panel sizes are always listed with the horizontal dimension first; e.g., a 96" x 48" sign is 96" wide by 48" high. Panel size is typically determined by the spacing and the final components.

3.1.2 Radii

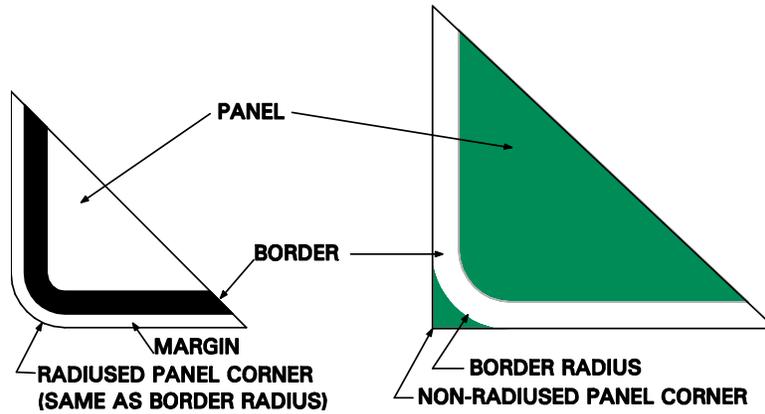
Generally, guide signs do not have radiused corners. The border will be radiused, but the panel will not be. If there is a concern that a pedestrian may be injured by a sharp sign corner then the panel should be radiused.

3.1.3 Borders

Unless specifically stated otherwise, each sign illustrated herein shall have a border of the same color as the legend. The corners of the sign border shall be rounded (radiused), except for stop signs. A dark border on a light background should be set in from the edge, creating a margin between the border and panel edge, while a light border on a dark background should extend to the edge of the panel (no margin).

3.1.4 Margins

The widths of the margins listed in the following tables are based on the length of the SHORTEST sign panel side. To determine whether or not to use a margin follow this rule: If the border and legend have a brighter reflectivity than the background of the sign, DON'T use a margin. If the background is brighter, DO use a margin.



3.1.5 Standard Corner Radii, Margin, and Border for Non-Guide Signs

The following dimensions shall be used for trimming corners and for application of borders on standard sign blanks. Where a complete sign is furnished the radius, margin, and border dimensions shall be as shown on the standard sign drawing.

Exhibit 3-1 Standard Corner Radii, Margin, and Border for Non-Guide Signs

Length of Shortest Side	Radius	Margin	Border
Under 24"	1.5"	.38"	.38"
24"	1.5"	.38"	.63"
30"	1.88"	.5"	.75"
36"	2.25"	.63"	.88"
42"	2.25"	.63"	.88"
48" – 60"	3"	.75"	1.25"

Exhibit 3-2 Guide Sign Border and Radii

Length of Shortest Side	Border Width	Border Radius
≤ 36"	1"	3"
42" – 60"	1.25"	6"
66" – 84"	1.5"	9"
≥ 90"	2"	12"

Exceptions for MnDOT Signs:

1. A sign having 20" legend shall use a 3" border width and a border radius based on the above table.
2. 16"-12" or 13.3"-10" legend on Type "A" or Type "OH" signs shall use a 2" border width and a border radius based on the above table.

3.2 Colors

3.2.1 General Provisions

Black: Used as legend color for signs with orange, white or yellow backgrounds. Black also is used as the background color for some regulatory signs.

Blue: Indicates services available to road users. It is used as the background color in motorist information signs, interstate, Minnesota, and county route markers, and auxiliary markers. Blue is not used as a legend color except on Adopt-a-Highway signing.

Brown: Indicates recreational and cultural facilities. It is used only as the background color in recreational and cultural interest signs. It is not used as a legend color.

Green: Indicates movement permitted or gives directional guidance. It is used as the background color in guide signs and as the legend color in permissive parking signs.

Orange: Warns of temporary traffic conditions with a higher than normal potential hazard level. It is used as the background color in temporary traffic control signs and is most commonly seen in construction zones. It is not used as a legend color.

Red: Indicates right-of-way control, prohibition or exclusion. It is used as the background color for STOP, DO NOT ENTER, WRONG WAY, and interstate route marker signs and as the legend color for YIELD, parking prohibition and prohibitory (circular with slash) signs.

White: White either indicates a law, regulation or legal requirement in effect at or near the sign or provides directional guidance. It is used as the background color for regulatory signs, route markers and route marker auxiliaries. It also is used as the legend color for signs with a black, blue, brown, green or red background.

Yellow: Warns of a potential hazard. It is used as the background color for warning signs and as the legend color for county route marker signs.

Fluorescent-Yellow Green: Designated for use as background color for warning signs and their supplemental plaques associated with pedestrians, bicyclists, playgrounds and schools. SCHOOL plaque is also included.

Fluorescent Pink: Incident Management

Purple: Electronic Toll Accounts (ETC) such as Minnesota's MnPASS lanes. More details on color usage can be found in the MN MUTCD Section 2F.3.

3.3 Word Messages

Except as provided in Section 2A.6 of the MN MUTCD, all word messages shall use standard wording and letters as shown in this Manual, the MnDOT "Standard Signs Manual", and the Federal "Standard Highway Signs and Markings" book.

Word messages should be as brief as possible and the lettering should be large enough to provide the necessary legibility distance. A minimum ratio of 1 inch of letter height per 30 feet of legibility distance should be used.

Abbreviations should be kept to a minimum.

Word messages should not contain periods, apostrophes, question marks, or other punctuation or characters that are not letters, numerals, or hyphens unless necessary to avoid confusion.

The solidus (slanted line or forward slash) is intended to be used for fractions only and should not be used to separate words on the same line of legend. Instead, a hyphen should be used for this purpose, such as "TRUCKS - BUSES."

Fractions shall be displayed with the numerator and denominator diagonally arranged about the solidus (slanted line or forward slash). The overall height of the fraction is measured from the top of the numerator to the bottom of the denominator, each of which is vertically aligned with the upper and lower ends of the solidus. The overall height of the fraction shall be determined by the height of the numerals within the fraction, and shall be 1.5 times the height of an individual numeral within the fraction.

3.3.1 Font Styles

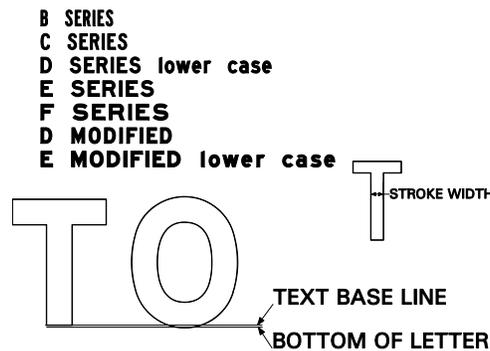
All sign lettering shall be in upper-case letters as provided in the MnDOT "Standard Signs Manual" and the Federal "Standard Highway Signs and Markings" book (see Section 1A.11 of the MN MUTCD)), unless otherwise provided in the MN MUTCD for a particular sign or type of message.

The sign lettering for names of places, streets, and highways shall be composed of a combination of lower-case letters with initial upper-case letters.

Use of the Series B alphabet is restricted to street-name signs, parking signs, and other similar signs where limited breadth and stroke widths are required for design purposes.

As a guide to choice of alphabets, tests have shown that, for any given legend, better legibility can be obtained by using a relatively wide spacing between letters than by using wider and taller letters with a cramped space.

Available letter series are B, C, D, E, F, D modified, and E modified as illustrated in the following graphic:



3.3.2 Font Sizes

MnDOT uses highway gothic font styles on all MnDOT highway signs. These range from B to F Series (F Series is only used on "EXIT" panels). As you progress alphabetically through the font series the letters widen and the stroke widths thicken. Two of the series have lower-case lettering - D and E Modified Series. D Series lower-case is typically used on temporary (construction) or unique interest signing (Adopt-A-Highway signing, for example).

With all fonts it should be noted that all characters rounded at the top ("2"), bottom ("U"), or both top and bottom ("S") are slightly taller than the straight characters (See above). This becomes important when fabricating a sign to correctly position the text base line.

Letters and numerals used on guide signs are the E modified font style. This font has a lower-case height which is ¾ of the upper-case (capital) height. If the upper-case height is 8" the lower-case will be 6". This particular size is referred to as 8"-6" E Modified. Approved upper-lower letter heights, in inches, are as follows: 4-3 (urban 25 mph or less only), 6-4.5, 8-6, 10.67-8, 13.33-10, 16-12, 20-15. Also see **Exhibit 3-3**.

Proper names are spelled out in upper-lower case, while generic names and other messages use upper-case lettering only. Upper case lettering is also used with cardinal directions: NORTH, SOUTH, EAST, and WEST **with the first letter larger**. See the MN MUTCD Section 2D.15 and **Exhibit 3-4** and **Exhibit 3-5** of the manual for guidance.

Lettering sizes for specific signs are based on the characteristics of the roadway: facility type, speed, and number of lanes. The exhibits included here give details of preferred design standards.

Construction, regulatory, and warning signs are designed more often by panel shapes and size restrictions than by the parameters used for guide signs. Hence, narrower and smaller letters are sometimes employed to "squeeze" a message onto these panels. An extreme example of this is an urban parking restriction sign, 12" x 18", which may have letters as small and narrow as 2" B on it.

In all cases, reducing spacing between letters (within words) should be avoided, as that will severely diminish legibility. In addition, font sizes should not be reduced.

Exhibit 3-3 Size of Letter (MN MUTCD)

<p>2D.6 Size of Lettering</p> <p>SUPPORT: Sign legibility is a direct function of letter size and spacing. Legibility distance has to be sufficient to give road users enough time to read and comprehend the sign. Under optimum conditions, a guide sign message can be read and understood in a brief glance. The legibility distance takes into account factors such as inattention, blocking of view by other vehicles, unfavorable weather, inferior eyesight, or other causes for delayed or slow reading. Where conditions permit, repetition of guide information on successive signs gives the road user more than one opportunity to obtain the information needed.</p> <p>STANDARD: Design layouts for conventional road guide signs showing interline spacing, edge spacing, and other specification details shall be as shown in the MnDOT "Standard Signs Manual", and the Federal "Standard Highway Signs and Markings" book (see Section 1A.11).</p>	<p>The principal legend on guide signs shall be in letters and numerals at least 6 inches in height for all upper-case letters, or a combination of 6 inches in height for upper-case letters and 4.5 inches in height for lower-case letters. On low-volume roads (as defined in Section 5A.1) with speeds of 25 mph or less, and on urban streets with speeds of 25 mph or less, the principal legend shall be in letters at least 4 inches in height for all upper-case letters, or a combination of 4 inches in height for upper-case letters and 3 inches in height for lower-case letters.</p> <p>GUIDANCE: Lettering sizes should be consistent on any particular class of highway.</p> <p>The minimum lettering sizes provided in this Manual should be exceeded where conditions indicate a need for greater legibility..</p> <p>SUPPORT: Guidelines for designing guide signs can be found in the Minnesota Traffic Engineering Manual, Chapter 6, Charts 6.1A through 6.1E.</p>
--	--

Exhibit 3-4 Guidelines for Guide Sign (Non-Freeway) Font Size

Guidelines for Conventional Road and Expressway Guide Sign Font Size						
Sign Type		Conventional Roads			Expressway*	
		<45mph	45-60 mph	45-60 mph	60	65 mph
		Single Lane and Multilane	Single Lane	Multilane	Divided Multilane	Divided Multilane
Destination	City/Street Name	6-4.5	8-6	10.7-8	10.7-8	13.3-10
	Arrow Size	3 or 13 head	5 or 14 head	6 or 15 head	6 or 15 head	7 or 16 head
	Numerals	6	8	10.7	10.7	13.3
Distance	Cardinal Direction					
	First Letter	6	6	7	7	12
	Rest of word	5	5	6	6	10
	Route Marker					
	2 Digit	18 x 18	18 x 18	24 x 24	24 x 24	24 x 24
	3 Digit	22.5 x 18	22.5 x 18	30 x 24	30 x 24	30 x 24
	City/Street Name	6-4.5	6-4.5	8-6	8-6	10.7-8
	Numerals	6	6	8	8	10.7
Junction	Fraction Numerals	4	4	6	6	8
	JCT	8	8	8	8	10
	Cardinal Direction					
	First Letter	7	7	10	10	10
	Rest of word	6	6	8	8	8
	Route Marker	24	24	24	24	24
	Word	8	8	8	8	10
	Numerals	12	12	12	12	15
Directional	Fraction Numerals	8	8	8	8	10
	Cardinal Direction					
	First Letter	7	7	10	10	10
	Rest of word	6	6	8	8	8
	Route Marker					
	2 Digit	18 x 18	24 x 24	24 x 24	24 x 24	24 x 24
	3 Digit	22.5 x 18	30 x 24	30 x 24	30 x 24	30 x 24
	City/Street Name	6-4.5	8-6	10.7-8	10.7-8	10.7-8
	Arrow Size					
	with City/Street Name	3 or 13 head	5 or 14 head	6 or 15 head	6 or 15 head	6 or 15 head
without City/Street Name	3 or 13 head	5 or 14 head	5 or 14 head	5 or 14 head	5 or 14 head	
Supplemental	Generic	6	6	8	8	8
	Proper Name	6-4.5	6-4.5	8-6	8-6	10.7-8
	Action Message	5	5	6	6	8
	Arrow Size	3 or 13 head	3 or 13 head	5 or 14 head	5 or 14 head	6 or 15 head
Non Standard Overhead Signs	Cardinal Direction					
	First Letter	7	7	10		
	Rest of word	6	6	8		
	Route Marker					
	2 Digit	24 x 24	24 x 24	24 x 24		
	3 Digit	30 x 24	30 x 24	30 x 24		
	City/Street Name	8-6	8-6	10.7-8		
Arrow Size	5 or 14 head	5 or 14 head	5 or 14 head			

* Ground Mounted signs for Expressways interchanges use Table 4, US & MN Highways column. All overhead signs use Table 4 Overhead Mounted Signs column.

NOTES:

1. Letter fonts are E Modified unless otherwise noted.
2. In urban areas there may be limited horizontal space in which to place a sign. It is then permissible to reduce the size of the letters of a sign by one step. Modified cardinal directions may be used on mast arm signs if load restrictions exist.
3. These minimum and recommended sizes are shown in inches.
4. For signing on freeway and expressway ramps use the sizes shown under the speed 45-60 mph, single lane heading.
5. When a sign includes both destination and supplemental information, and letter sizes stipulated above are different for each, upsize the supplemental legend to the destination legend size.

Exhibit 3-5 Guidelines for Guide Sign (Freeway) Font Size

Guidelines for Freeway Guide Sign Font Size						
Sign Type		Overhead Mounted Signs	Ground Mounted Signs			
			Interstates	US & MN Highways		
Guide	Cardinal Direction					
	Advance Guide	First Letter	15	15	15	
	Exit Direction	Rest of word	12	12	12	
	Overhead Guide Signs	Aux/Alt Route Legend	12	12	12	
		Route Marker				
		2 Digit	36 x 36	36 x 36	36 x 36	
		3 Digit	45 x 36	45 x 36	45 x 36	
		City/Street Name	16-12	20-15	16-12	
		Arrow Size	17-36	17-36	17-36	
		EXIT ONLY	12			
	Diagonal Upward Pointing Arrow	8-25	N/A	N/A		
	Down Arrow	22-32				
	Distance	Distance	Numeral	15	18	15
			Fraction Numerals	10	12	10
Word			10	12	10	
Distance	Cardinal Direction					
	First Letter	12	12	12		
	Rest of word	10	10	10		
	Route Marker					
	2 Digit	24 x 24	24 x 24	24 x 24		
	3 Digit	30 x 24	30 x 24	30 x 24		
	City/Street Name	13.3-10	13.3-10	13.3-10		
	Numerals	13.3	13.3	13.3		
	Fraction Numerals	10	10	10		
Supplemental	Generic	12	12	12		
	Proper Name	13.3-10	13.3-10	13.3-10		
	Action Message	10	10	10		
	Word	10	10	10		
	Numeral	15	15	15		
Exit Panel	Word	10	10	10		
	Numeral	15	15	15		
	Letter	15	15	15		

Notes:

*For further guidelines see MnMUTCD, Section 2-E

3.3.3 Abbreviations Used on Traffic Control Devices

When the word messages shown in [Exhibit 3-6](#) need to be abbreviated in connection with traffic control devices, the abbreviations shown in [Exhibit 3-6](#) shall be used. When the word messages shown in [Exhibit 3-7](#) need to be abbreviated on a portable changeable message sign, the abbreviations shown in [Exhibit 3-7](#) shall be used. Unless indicated by an asterisk, these abbreviations shall only be used on portable changeable message signs. Unacceptable abbreviations are shown in [Exhibit 3-8](#).

Exhibit 3-6 Acceptable Abbreviations

Word Message	Standard Abbreviation	Word Message	Standard Abbreviation
Afternoon / Evening	PM	Mile(s)	MI
Alternate	ALT	Miles Per Hour	MPH
AM radio	AM	Minimum	MIN
Avenue	AVE, AV	Minute(s)	MIN
Bicycle	BIKE	Monday	MON
Boulevard	BLVD*	Morning / Late Night	AM
Bridge	(See Table 1A-2)	Mount	MT
CB Radio	CB	Mountain	MTN
Center (as part of a place name)	CTR	National	NATL
Circle	CIR*	North	N
Civil Defense	CD	Parkway	PKWY*
Compressed Natural Gas	CNG	Pedestrian	PED
Court	CT*	Place	PL*
Crossing (other than highway-rail)	X-ING	Pounds	LBS
Drive	DR*	Road	RD*
East	E	Saint	ST
Electric Vehicle	EV	Saturday	SAT
Expressway	EXPWY*	South	S
Feet	FT	State, county, or other non-US or non-Interstate numbered route	(See Table 1A-2)
FM Radio	FM	Street	ST*
Freeway	FRWY, FWY*	Sunday	SUN
Friday	FRI	Telephone	PHONE
Hazardous Material	HAZMAT	Temporary	TEMP
High Occupancy Vehicle	HOV	Terrace	TER*
Highway	HWY*	Thursday	THUR
Hospital	HOSP	Thruway	THWY*
Hour(s)	HR, HRS	Tons of Weight	T
Information	INFO	Trail	TR*
Inherently Low Emission Vehicle	ILEV	Tuesday	TUE
International	INTL	Turnpike	TPK*
Interstate	(See Table 1A-2)	Two-Way Intersection	2-WAY
Junction/Intersection	JCT	US Numbered Route	(See Table 1A-2)
Lane	(See Table 1A-2)	Wednesday	WED
Miles Per Hour	MPH	West	W
Liquid Propane Gas	LP-GAS		
Maximum	MAX		

* This abbreviation shall not be used for any application other than the name of a roadway

MN Rev. 1

Exhibit 3-7 Abbreviations That Are Acceptable Only with a Prompt Word

Word Message	Standard Abbreviation	Prompt Word that should Precede the Abbreviation	Prompt Word that should Follow the Abbreviation
Access	ACCS	----	Road
Ahead	AHD	Fog	----
Blocked	BLKD	Lane	----
Bridge	BRDG	[Name]*	----
Cannot	CANT	----	----
Center	CNTR	----	Lane
Chemical	CHEM	----	Spill
Condition	COND	Traffic	----
Congested	CONG	Traffic	----
Construction	CONST	----	Ahead
Crossing	XING	----	----
Do Not	DONT	----	----
Downtown	DWNTN	----	Traffic
Eastbound	E-BND	----	----
Emergency	EMER	----	----
Entrance, Enter	ENT	----	----
Exit	EX	Next	----
Express	EXP	----	Lane
Frontage	FRNTG	----	Road
Hazardous	HAZ	----	Driving
Highway-Rail Grade Crossing	RR XING	----	----
Interstate	I-*	----	[Number]
It Is	ITS	(Roadway Name)*, Right, Left, Center	----
Lane	LN	----	----
Left	LFT	----	----
Local	LOC	----	Traffic
Lower	LWR	----	Level
Maintenance	MAINT	----	----
Major	MAJ	----	Accident
Minor	MNR	----	Accident
Normal	NORM	----	----
Northbound	N-BND	----	----
Oversized	OVRSZ	----	Load
Parking	PKNG	----	----
Pavement	PVMT	Wet	----
Prepare	PREP	----	To Stop
Quality	QLTY	Air	----
Right	RT	Keep, Next	----
Right	RT	----	Lane
Roadwork	RDWK	----	Ahead (Distance)
Route	RT, RTE	Best	----
Service	SERV	----	----
Shoulder	SHLDR	----	----
Slippery	SLIP	----	----
Southbound	S-BND	----	----
Speed	SPD	----	----
State, county, or other non-US or non-Interstate numbered route	(Route Abbreviation determined by highway agency)*	----	(Number)**
Tires With Lugs	LUGS	----	----
Traffic	TRAF	----	----
Travelers	TRVLRS	----	----
Two-Wheeled Vehicles	CYCLES	----	----
Upper	UPR	----	Level
US Numbered Routs	US	----	(Number) **
Vehicle(s)	VEH, VEHS	----	----
Warning	WARN	----	----
Westbound	W-BND	----	----
Will Not	WONT	----	----

* This abbreviation when accompanied by the prompt word, may be used on traffic control devices other than portable changeable message signs.

** A space and no dash shall be placed between the abbreviation and the number of the route.

Exhibit 3-8 Unacceptable Abbreviations

Abbreviation	Intended Word	Common Misinterpretations
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong

3.4 Horizontal Spacing

Spacing between words and symbols and within words is just as important as the font size itself. If interested in the requirements and guidelines for spacing within words and between words and symbols, see Appendix A for the appropriate charts based on font.

Horizontal spacing between objects is typically equal to the font size. An exception is with city names such as La Crosse or Le Roy, where 60% of the font size is used between the two parts of the name. This 60% spacing has been programmed into SignCAD®, so no special spacing need be created.

Spacing between objects and borders is between ½ and ¾ of the font size. Distance signs, where the spacing between objects and borders is 13" (constant value).

When designing freeway distance signs, a minimum of 21" space is required between a destination and its corresponding mileage, while a minimum of 18" horizontal space is maintained between the longest destination line and the longest mileage.

3.5 Vertical Spacing for Freeway Distance Signs

Special vertical spacing for Freeway Distance Signs has been developed by MnDOT and is summarized in [Exhibit 3-9](#).

Exhibit Key: Combinations – Tallest component on each horizontal line.

- | | | |
|-------------------------------|--|---------------------------------|
| 1 = 3 overlays | 5 = 2 fractions, 1 overlay | 9 = 2 fonts, 1 fraction |
| 2 = 3 fonts | 6 = 2 overlays, 1 font | 10 = 2 fractions, 1 font |
| 3 = 3 fractions | 7 = 2 overlays, 1 fraction | |
| 4 = 2 fonts, 1 overlay | 8 = 1 overlay, 1 font, 1 fraction | |

Exhibit 3-9 Combinations for Freeway Distance Signs

Combination	1	2	3	4	4	4	5	5	5	6	6	6	7	7
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Space	7	10	9	7.5	10	10.4	6.5	9	9	7	9	7.4	7	8.5
Component	24	13.3	15	24	13.3	13.3	24	15	15	24	13.3	24	24	15
Space	6	10	8.5	7	7.6	10.4	6	7	9	6	8.2	8	6	7.5
Component	24	13.3	15	13.3	24	13.3	15	24	15	24	24	13.3	24	24
Space	6	10	8.5	10.4	7.6	7	9.5	7	7	7.7	6	8	7.5	6
Component	24	13.3	15	13.3	13.3	24	15	15	24	13.3	24	24	15	24
Space	7	10	9	10.4	10	7.5	10	9	7	10	7.5	7.3	8.5	7
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Panel height	102"	84"	84"	90"	90"	90"	90"	90"	90"	90"	96"	96"	96"	96"

Combination	7	8	8	8	8	8	8	9	9	9	10	10	10	
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	
Space	7	7	9	10	7	9.6	10	9.6	9.5	9.6	9	9.2	9.2	
Component	24	24	15	13.3	24	13.3	15	13.3	15	13.3	15	13.3	15	
Space	7.5	7	7	9.6	7	7	9.6	9.6	9.6	9.6	9.2	9.2	9.2	
Component	15	13.3	24	15	15	24	13.3	13.3	13.3	15	15	15	13.3	
Space	7.5	9.7	7	7	9	7	7	9.6	9.6	9.5	9.2	9.2	9.2	
Component	24	15	13.3	24	13.3	15	24	15	13.3	13.3	13.3	15	15	
Space	7	10	10.6	7	10.6	10	7	9.5	9.6	9.6	9.2	9	9	
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	
Panel height	96"	90"	90"	90"	90"	90"	90"	84"	84"	84"	84"	84"	84"	

Notes:

1. All dimensions are in inches.
2. All signs will have 2" borders.
3. All signs of this category have three lines of legend.
4. Components of three different heights may be used: Route markers (24"), standard fonts (13.33"), and fractions (15"). This results in 10 combinations. When taking into account the order from top to bottom of the line possibilities, this is expanded to 27.

3.6 Horizontal and Vertical Lines

Horizontal lines, border to border, are used to separate independent subjects on a single sign panel. Horizontal lines are used primarily on destination signing. The examples below are the only instances where a horizontal line is needed on a two-destination sign panel.



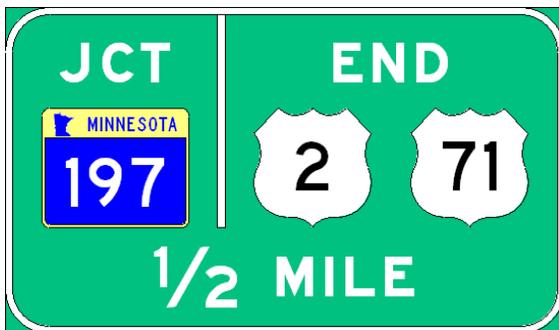
On destination signs with three or more lines of legend a horizontal line is needed if two lines share an arrow. Again, the line is border to border. Examples of this follow.



Indented horizontal lines are used on panels with more than one message about a single subject. They may act as a form of punctuation, separating phrases to avoid confusion.



Vertical lines separate different directional movements and subjects to prevent confusion.



3.7 Route Markers and Sizes

The route markers are listed in the M series of the Standard Signs Manual and the Standard Signs Summary. One or two digit route markers will have the same width and height dimensions, but three digit markers have a width that is 25 percent greater than their height. Route markers attached to the surface of a guide sign panel are referred to as overlays.



On a sign panel containing two or more route marker overlays the more important route marker is placed on the left side in accordance with the MN MUTCD. Interstate routes are the most important, with U.S., state, county, and township in descending order of importance. Where route markers are of equal importance the lowest number will be on the left side. However, arrow placement overrides these rules.



Important marker first



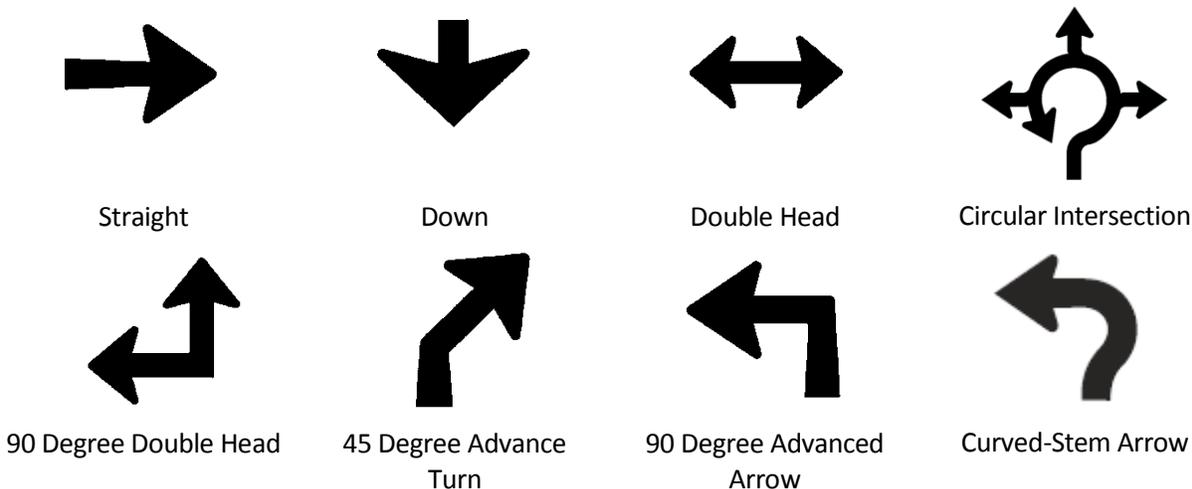
Like markers – Lowest to the left

Cardinal directions are always to the right of Route Markers and Top justified unless on Distance signs, where they are center justified.



3.8 Arrows

Arrows for guide signs are divided into several types:



Straight arrows can be installed at different angles, from 0 to 180 degrees, with 0 degrees designated right, 90 degrees straight up, and 180 degrees left.

Specifically, 60 degree arrows are used for exit ramps, and 45 degree arrows for exit loops.

Down arrows shall be used only on overhead guide signs that restrict the use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used unless an arrow can be located over and pointed to the approximate center of each lane that can be used to reach the destination displayed on the sign.

If down arrows are used, having more than one down arrow pointing to the same lane on a single overhead sign (or on multiple signs on the same overhead sign structure) shall not be permitted.

The 90 degree double head, 45 degree advance turn, and 90 degree advance turn arrows are designated left or right.

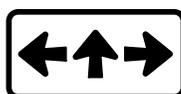
If used, the Directional Arrow auxiliary sign shall be mounted below the route sign and any other auxiliary signs in Directional assemblies (see Section 2D.32), and displays a single- or double-headed arrow pointing in the general direction that the route follows.

A Directional Arrow auxiliary sign that displays a doubleheaded arrow shall not be mounted in any Directional assembly in advance of or at a circular intersection.

When more than one arrow is used on a sign, the arrows, with corresponding legends, are to be placed in the order specified below:



Vertical Placement



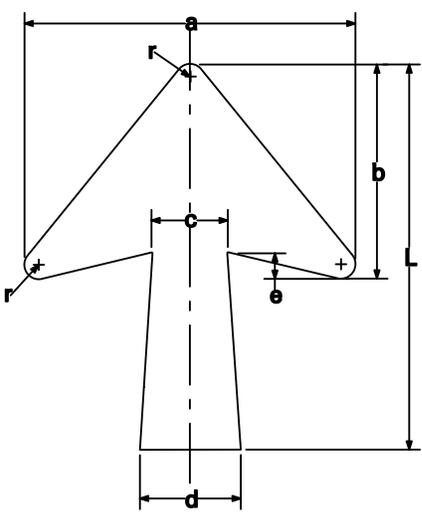
Horizontal Placement



These alignments override route marker placements.

The information on arrow dimensions and the corresponding legends is found on the next page. The legend size can be matched to the appropriate arrow size by using that table.

Exhibit 3-10 Straight Arrows (Source: Standard Signs and Markings Manual)



NOTES:
 1. Arrow Code: First number specifies the head to be used. Second number specifies the length L. Thus, a 5-13 arrow has head #5 and length 13".
 2. For each legend size there is a corresponding short shaft and long shaft arrow.

TABLE 1 - SHORT SHAFT ARROWS

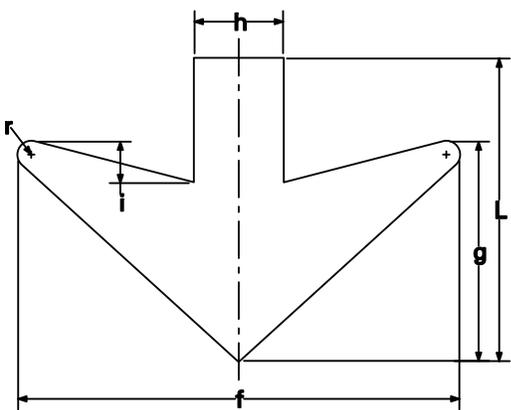
Head	Matching Letter Size	Standard Length L	Dimensions in Inches					
			a	b	c	d	e	r
1	4", 4.3"	6"	5.58	3.63	1.28	1.72	.47	.26
2	5"	8"	7.06	4.60	1.61	2.18	.56	.32
3	6", 6.45"	10"	8.35	5.44	1.91	2.58	.67	.38
4			9.75	6.35	2.23	3.02	.78	.44
5	8", 8.8"	13"	11.16	7.27	2.55	3.44	.89	.51
6	10", 10.87-8"	17"	15.09	9.83	3.45	4.65	1.21	.69
7	10", 12", 13.33-10"	20"	17.72	11.54	4.05	5.47	1.42	.81
8	16-12"	25"	21.88	14.25	5.00	6.75	1.75	1.00

TABLE 2 - LONG SHAFT ARROWS

Head	Matching Letter Size	Standard Length L	Dimensions in Inches					
			a	b	c	d	e	r
11	4", 4.3"	9"	5.70	4.36	1.38	1.83	.45	.26
12	5"	12"	7.18	5.48	1.74	2.30	.56	.32
13	6", 6.45"	14"	8.56	6.54	2.07	2.74	.67	.38
14	8", 8.8"	18"	11.41	8.72	2.76	3.66	.90	.51
15	10", 10.87-8"	24"	15.14	11.56	3.66	4.85	1.19	.68
16	10", 12", 13.33-10"	29"	18.24	13.93	4.41	5.84	1.43	.82
17	16-12", 20-15"	36"	22.25	17.00	5.38	7.13	1.75	1.00
17		42"	22.25	17.00	5.38	8.39	1.75	1.00
18		36"	26.18	20.00	6.33	7.13	2.06	1.18
18		42"	26.18	20.00	6.33	8.39	2.06	1.18

OVERHEAD SIGNS ONLY

Arrow	Letter and Overlay Size	Dimensions in Inches					
		f	g	h	i	L	r
16"	13.33-10", 10" & less	24.0	12.0	4.88	2.25	16.5	.75
22"	16-12", 12" & greater	32.0	16.0	6.5	3.0	22.0	1.00



ARROW SELECTION:
 Adjacent to one line of legend - use Table 1 for vertical, horizontal, or diagonal arrow.
 Adjacent to two or more lines of legend - use Table 2 for vertical or diagonal arrow; Table 1 for horizontal arrow.
 Beneath one or more lines of legend - use Table 2 for horizontal or diagonal arrow ≤ 45°; Table 1 for vertical or diagonal arrow > 45°.
ALL FREEWAY SIGNS & EXPRESSWAY INTERCHANGE SIGNS - use Table 2.

ARROW SIZE:
 Arrow head numbers determine which straight arrow corresponds with which advance turn, double head, and double head 90° arrows and legend.
 For example, a 5-13 arrow and a 5-24 double head arrow (both have #5 heads) would be appropriate arrows to use with an 8-6" legend.

APPROVED
9/1/73

DATE OF REV.
1/1/03

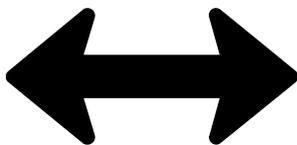
STRAIGHT ARROWS
Table 6: Arrow Selection and Sizes



PAGE NUMBER
102

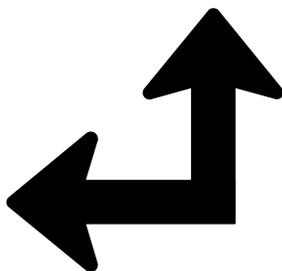
Exhibit 3-11 Double Head and Degree Arrows

DOUBLE HEAD ARROWS



Arrow Designation	1 Head	3 Head	5 Head	6 Head	7 Head
Height	5.58	8.35	11.16	15.09	17.72
L - Minimum	12	18	24	30	36

DOUBLE HEAD 90 DEGREE ARROWS



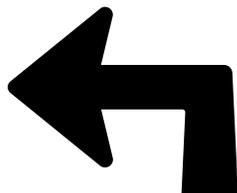
Arrow Designation	1-11	3-16	5-22	6-29
Height	10.5	15.75	21	28
Length	11	16.5	22	29.5

45 DEGREE ADVANCE TURN ARROWS



Arrow Designation	6 X 8	9 X 12	12 X 16	15 X 20	17 X 24
Arrow head	1	3	5	6	7
Height	8	12	16	20	24
Length	6	9	12	15	17

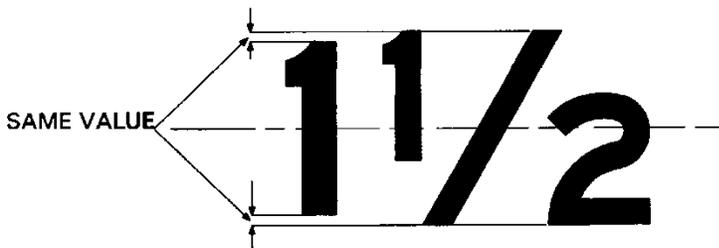
90 DEGREE ADVANCE TURN ARROWS



Arrow Designation	8 X 6.5	12 X 10	16 X 13	18 X 16	22 X 18	25 X 21
Arrow head	1	3	5	14	6	7
Height	6.5	10	13	16	18	21
Length	8	12	16	18	22	25

3.9 Fractions

A fraction is always 1.5 times the height of the numerals used in it. When using a whole number with a fraction see **Exhibit 3-12** below for the correct numeral height. Alignment is shown below. Note that the fraction is centered vertically on the numeral.



If a fraction is used on a line with additional legend (as in "1/2 MILE ON RIGHT") the fraction numerals should be the same height as the legend letter height, as shown below.

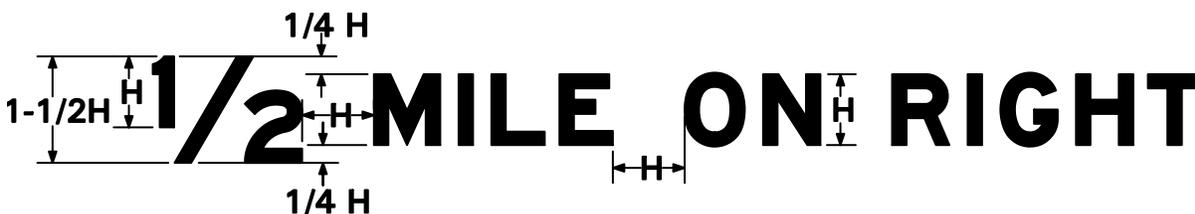


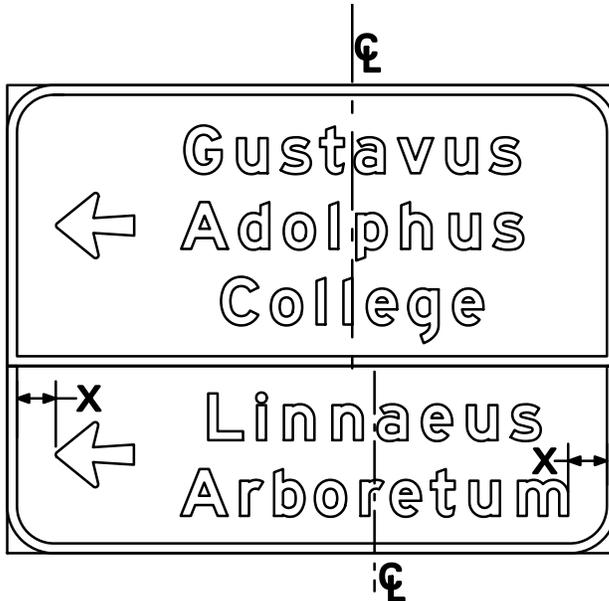
Exhibit 3-12 Fraction Font Sizes

Fraction Height	Preceding Whole Number Height	Numeral Height in Fraction	Space From Whole Number 1 to Fraction	Space From Whole Numbers 2 - 9 to Fraction
6"	6"	4"	2.5"	2"
9"	8"	6"	3"	2.5"
12"	10.67"*	8"	4.5"	4"
12"	12"	8"	5"	4"
15"	13.33"*	10"	5"	4"
15"	15"	10"	6"	5"
18"	18"	12"	7"	6"

*On distance signs

3.10 Legend/Layout Justifications

Along with Arrow placements (Section 3.8 on page 3-15) the wording on a panel is aligned, or justified, left, center, or right. Various suggested layouts are illustrated on the following pages.



**A single subject
center justified on itself.**

**A single subject
center justified on itself.**

Arrow + Arboretum is the longest line and is centered on panel.



**Two subjects
left aligned on arrow side.**

**Arrow and subject
right justified.**

Arrow + Long Prairie is the longest line and is centered on panel.



**Arrow and subject
left justified.**

**Two subjects
right aligned on arrow side.**

Arrow + Long Prairie is the longest line and is centered on panel.



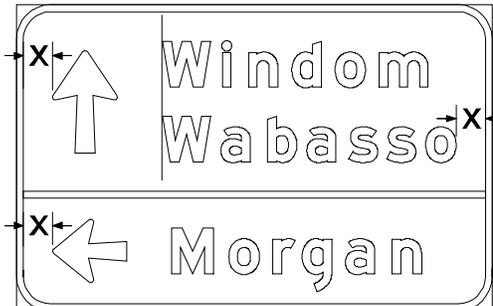
Vertical and left arrows
centered on each other.
Two subjects
left aligned on arrow side.

Horizontal arrow and Pipestone protrude the most on each side and are spaced the same to the border.



Arrow and subject
right justified.

Arrow + Redwood Falls is the longest line and is centered on panel.



Two subjects
left aligned on arrow side.

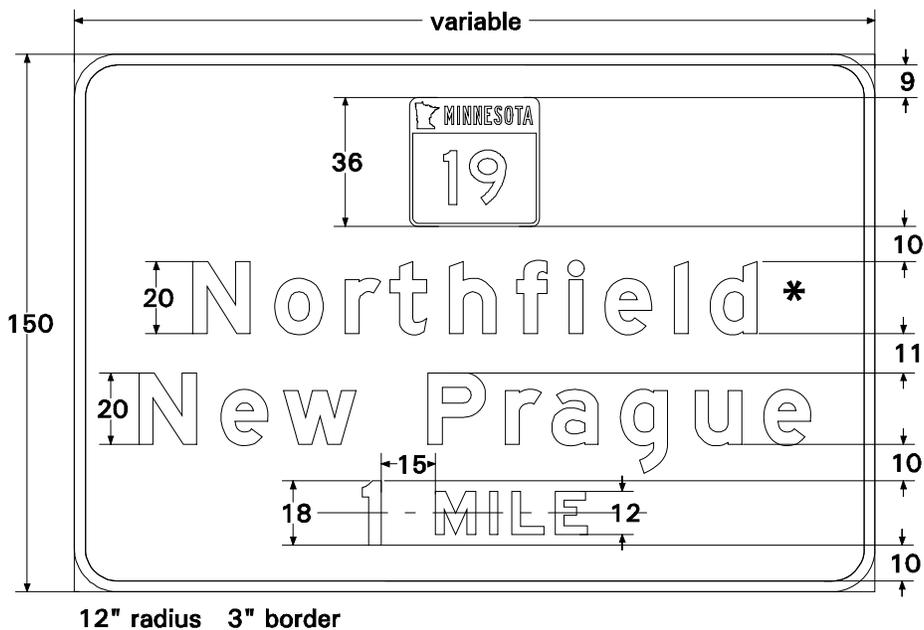
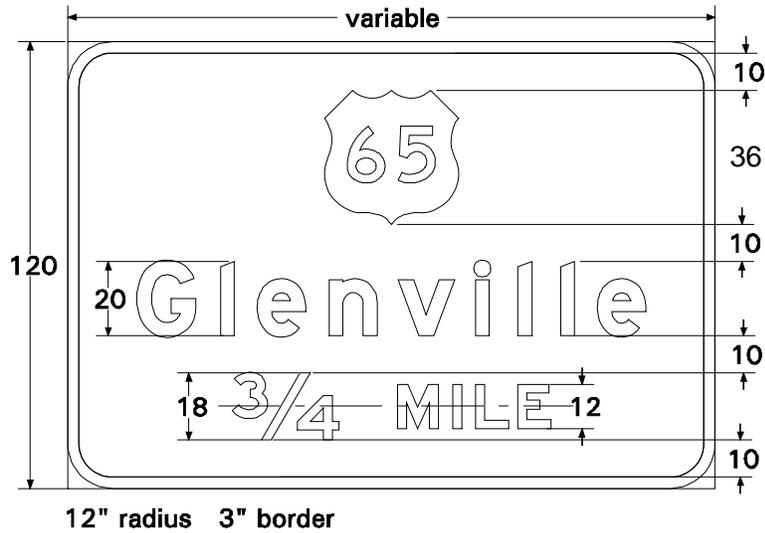
Arrow and subject
left justified.

Vertical arrow + Wabasso is the longest line and is centered on panel.
Because of horizontal bar it is not necessary to center arrows on each other.

3.11 Typical Freeway Signs

3.11.1 Freeway Advance Guide Type A Signs

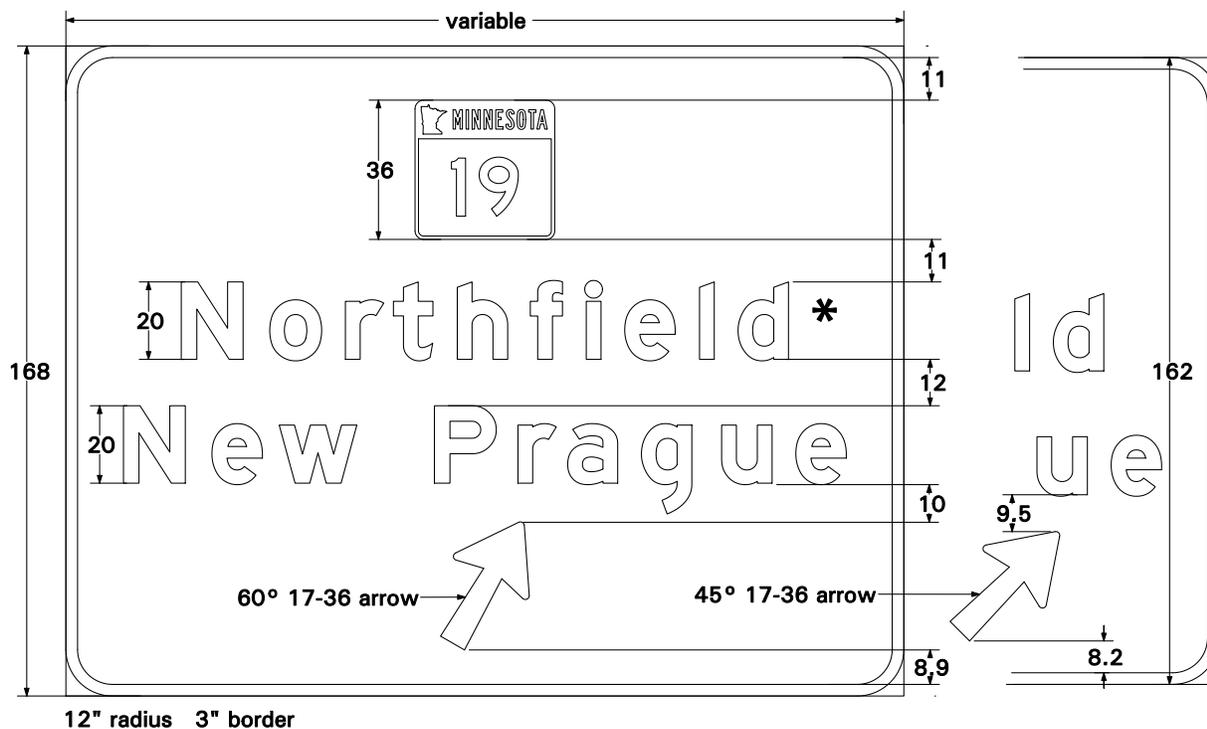
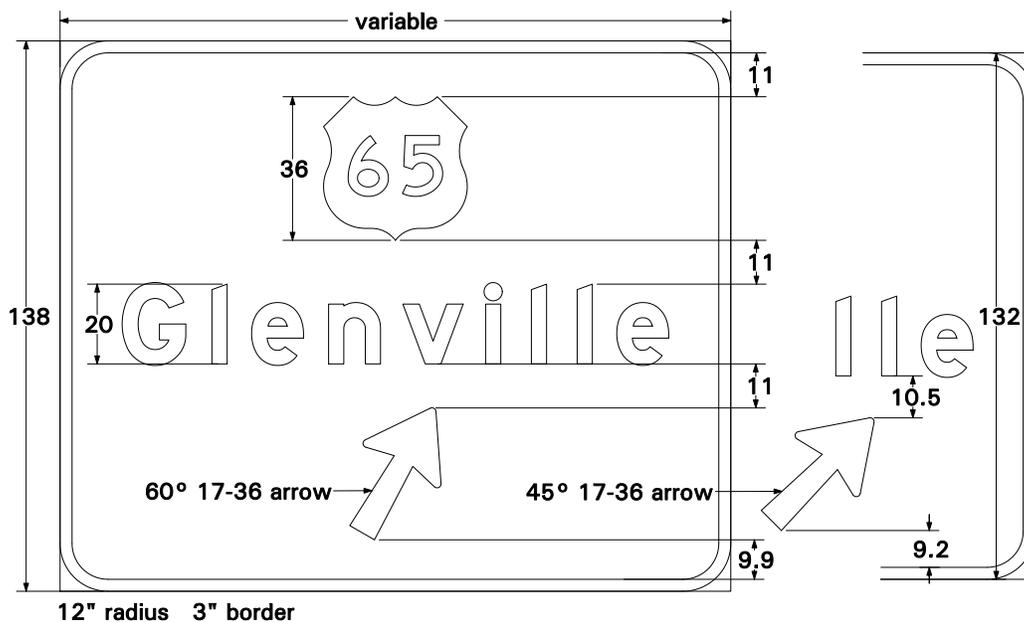
There are two formats to this classification, one or two city names. The border shall be three inches wide due to the use of 20-15" legend (complies with [Exhibit 3-2](#), Note 1). The spacing is standardized, as follows:



* City names shall appear in the same order as those on the ramp destination guide sign.

3.11.2 Freeway Exit Direction Type A Signs

There are two formats to this classification, one or two city names. The border shall be three inches wide due to the use of 20-15" legend (complies with [Exhibit 3-2](#), Note 1). The spacing is standardized, as follows:



* City names shall appear in the same order as those on the ramp destination guide sign.

3.12 U-Post and Post Spacing

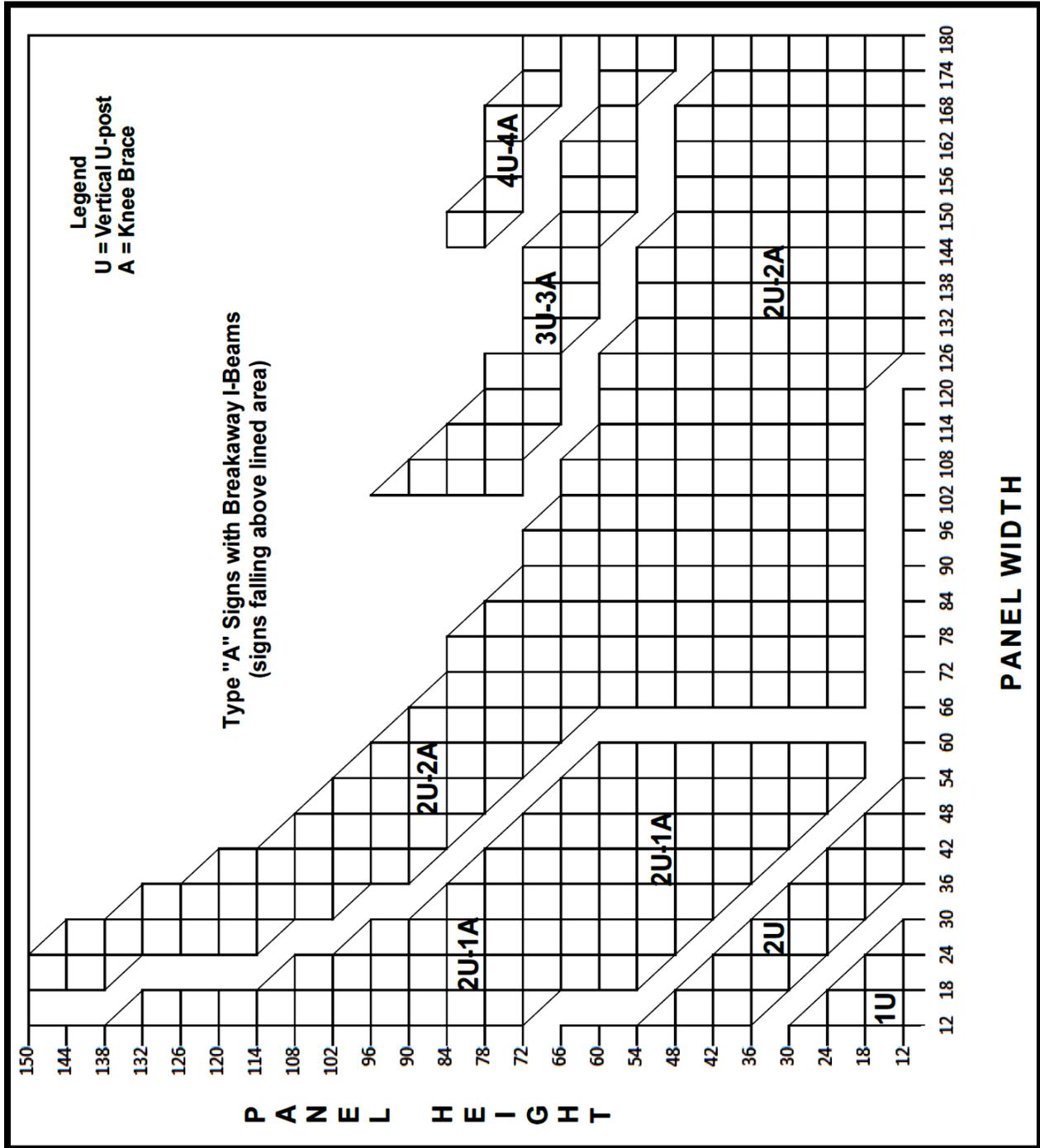
3.12.1 U-Post Structure Charts for Ground Mounted Signs

The following charts determine the number of posts and knee braces needed to erect a sign panel so the sign and structure can adequately resist wind loads. Note the Type “A” sign areas that require I-beam sign posts which are installed under contract.

While adhering to the required letter height for a sign panel, it is desirable to stay within the U-post area of the tables due to cost and ease of installation and maintenance. This may be possible by simply designing the sign panel with a greater width, which can create horizontal space for an additional U-post. For example, a 102” x 84” sign panel (on the 3 #/ft chart), which is more square footage than a 90” x 84” sign panel, can be installed on U-posts, while the smaller area sign panel becomes a Type “A” sign on I-beam sign posts.

Signs designed for signing contracts use 3 #/ft sign structures.

Exhibit 3-13 U-Post Structure Chart for Ground Mounted Signs (Source: Traffic Engineering Manual)



3.12.2 Sign Post Spacing Chart

Proper U-post spacing is essential for sign structures to meet FHWA breakaway requirements. It is also important when redesigning a sign panel to determine if the existing U-post sign structure will be reused. For example, an existing 2 post (54" spacing) sign structure with an 84" x 48" sign panel could accommodate a 78", 84", 90" or 96" sign panel that is 48 inches high on the existing sign structure without moving the vertical posts.

See **Exhibit 3-14** for proper sign post spacing.

Exhibit 3-14 Sign Post Spacing Chart (Source: Traffic Engineering Manual)

PANEL WIDTH (inches)	POST SPACING		
	2 POSTS (inches)	3 POSTS (inches)	4 POSTS (inches)
36	24	---	---
42	30	---	---
48	30	---	---
54	30	---	---
60	36	---	---
66	42	---	---
72	42	---	---
78	54	---	---
84	54	---	---
90	54	---	---
96	54	---	---
102	60	45	---
108	66	45	---
114	66	45	---
120	72	45	---
126	78	45	---
132	78	45	---
138	78	48	---
144	90	51	45
150	90	54	45
156	90	54	45
162	96	57	48
168	96	60	48
174	102	63	54
180	108	63	54

Use this chart if punch codes cannot be found in the Standard Signs and Markings Manual.

Sign Post Spacing Chart for Exit Panels (Type EA and EO)

Use **Exhibit 3-15** mounting exit panels to the upper edges of Type A signs and Type OH signs.

Exhibit 3-15 Sign Post Spacing Chart for Exit Panels

Panel Length (inches)	Post Spacing (inches)		
	2 Posts	3 Posts	4 Posts
48	30		
54	30		
60	36		
66	36		
72	42		
78	48		
84	48		
90	54		
96	54		
102		36	
108		36	
114		42	
120		42	
126		48	
132		48	
138		54	
144			42
150			42
156			42
162			42
168			48
174			48
180			

(This page is intentionally left blank)

4. DESIGN PROCESS & EXAMPLE PROBLEMS

4.1 Index of Example Problems

Use the following table to navigate to the examples. Click on the Number to jump to the example.

No.	Page	Description	Thumbnail
1	4-4	Supplemental Sign	
2	4-9	Destination Sign	
3	4-16	Freeway Junction (Advance Guide) Sign	
4	4-22	Supplemental Sign (Freeway)	
5	4-28	Directional Sign	
6	4-33	Exit Panel (E1-SP)	
7	4-37	Distance Sign	
8	4-42	Distance Sign (Freeway)	
9	4-46	Directional Sign (Split Panel)	
10	4-52	Supplemental Sign (Split Panel)	
11	4-59	Junction Sign	
12	4-64	Exit Direction Sign	
13	4-70	Exit Direction Sign w/ Exit Only Panel	
14	4-77	Freeway Junction (Advance Guide) Sign	
15	4-83	Overhead Advance Guide Sign w/ Exit Only Panel	
16	4-90	Advance Entrance Direction Sign for Interchange Crossroad	

4.2 Guide Sign Basics

The following guidelines are simply that – guidelines. Engineering judgment should be used for unique situations based on these guidelines.

1. First, use the guidelines for Font Sizes (Section **3.3.2** on page **3-5**) to determine correct letter size and overlay size, based on speed, number of lanes, and roadway type (freeway or non-freeway).
2. The matching arrow size can be found in Section **3.8** on page **3-15**.
3. Vertical spacing between lines: $\frac{1}{2}$ to $\frac{3}{4}$ of letter height. This requirement may not be feasible with all overheads due to restrictions caused by existing mounting structures.
4. Vertical spacing between text and inside of border: $\frac{1}{2}$ to $\frac{3}{4}$ of letter height.
5. Horizontal spacing between objects (fractions, overlays, arrows): $\frac{3}{4}$ to full letter height.
6. Horizontal spacing between text and inside of border: $\frac{1}{2}$ to $\frac{3}{4}$ of letter height.
7. The appropriate arrow will be larger than the matching font height, and spacing around it will be less than the vertical spacing between lines ($\frac{1}{2}$ to $\frac{3}{4}$ letter height). Due to the shapes of arrows, compressing space around them doesn't make them appear crowded.
8. Vertical spacing around fractions can be compressed somewhat because fractions are much taller than the rest of the legend on the same line.
9. Whenever possible, allow no more than three destinations or street names on a guide sign.

4.3 Basic Guide Sign Design Examples

4.3.1 Calculating the vertical size of the sign panel

Use the following formulas and equivalents to determine the specific dimension:

A = Letter height

B = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2}$ A to $\frac{3}{4}$ A)

C = Arrow/fraction height

D = Horizontal spacing from inside border to legend ($\frac{1}{2}$ to $\frac{3}{4}$ A)

E = Vertical spacing from arrow to wording, or from arrow to inside border (less than B)

1. Add the heights of all objects in the sign, including border thicknesses. The border thickness may have to be estimated if the length of the panel's shortest side – height or width – is not known (typical borders widths are summarized in [Exhibit 3-2](#)). Add the thickness of horizontal lines, which will be the same as the value given for border thickness. On signs with Font size combinations on the same line, use the largest size when determining component spacing.
2. Add the heights of the spaces between legend lines as well as the spaces between legend lines and borders.
3. Add the two totals from Steps 1 and 2, rounding to the nearest number divisible by 6 (6" increments). This figure is the panel height. Bear in mind that an adjustment may have to be made in border and horizontal line thickness to achieve the right size.

4. Because of the rounding of the panel height in Step 3, spacing likely will need to be adjusted. To do this, find the difference between the rounded panel height and the actual total from Step 3. Then distribute this difference between the spaces on the panel, ensuring to keep 'B' measurements equivalent, 'D' measurements equivalent, and 'E' measurements equivalent. Exceptions to this rule may be necessary in some cases to account for words containing low-hanging letters, such as g, j, p, q, and y, or in other situations.

4.3.2 Calculating the horizontal size of the panel

Horizontal spacing is fairly automatic in most cases. Primarily, it involves maintaining proper spacing from borders to legend and from legend to vertical lines. The example problems illustrate this in more detail. In the few complicated instances instructions are given as to how horizontal spacing can be done. Spacings from legends to borders and vertical lines should be between $\frac{1}{2}$ and $\frac{3}{4}$ letter height in most cases.

4.3.3 Review vertical and horizontal spacing on the panel

Sign panel design is an iterative process. Even after performing the calculations to solve for vertical and horizontal spacing, the panel may not be complete. Once the values are entered into SignCAD, it may become apparent that there is too much space on the panel. Likewise, the panel may appear cramped by not having enough space between components.

This can happen because of the range of values possible for variables B, E, and D. If the panel appears too spacious, try recalculating these values starting with a smaller B or D space. Likewise, start with larger values if the panel appears cramped. Doing so can make the difference of 6" or even a full foot in total panel size.

4.3.4 Review Panel Structure for Proper Supports

Once the panel has been sized using vertical and horizontal spacing guidelines refer to section **3.12.1** on page **3-24** to ensure U-Posts will be used versus I-beams.

4.4 Example #1, Supplemental Sign

Purpose of Example:

- ✓ Color selection
- ✓ Font type and letter height selection
- ✓ Horizontal and vertical spacing



Return to Index

Given Conditions:

- ✓ Posted speed limit: 35 mph
- ✓ Lane Configuration: Undivided Multilane
- ✓ Intersections: At Grade Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD, paying particular attention to component location, justification, and spacing. **Exhibit 3-4** provides the components to use.

Object and spacing values for this example:

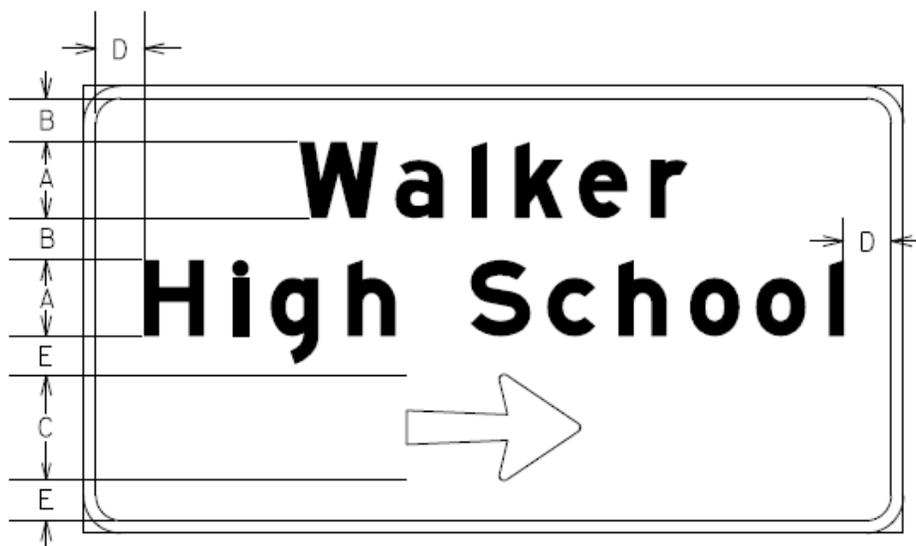
A = Letter height

B = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

C = Arrow height

D = Horizontal spacing from inside border to text ($\frac{1}{2} A$ to $\frac{3}{4} A$)

E = Vertical spacing from arrow to text, or from arrow to inside border (less than B).



SignCAD Methods:

1. Panel tool -

Sign type - guide

Panel color - green

Border color - white

2. Install components into panel one at a time

3. Text tool –

Type the two lines of text (use the enter key to get to the second line)

Font - E modified

Size - 6-4.5

Proper name - Upper-lower case

4. Arrow tool -

Angle - 0 degrees

Arrowhead - 13 (13-14 arrow)

5. Adjust vertical spacing

Right mouse click on object to be spaced - select object spacing (left click)

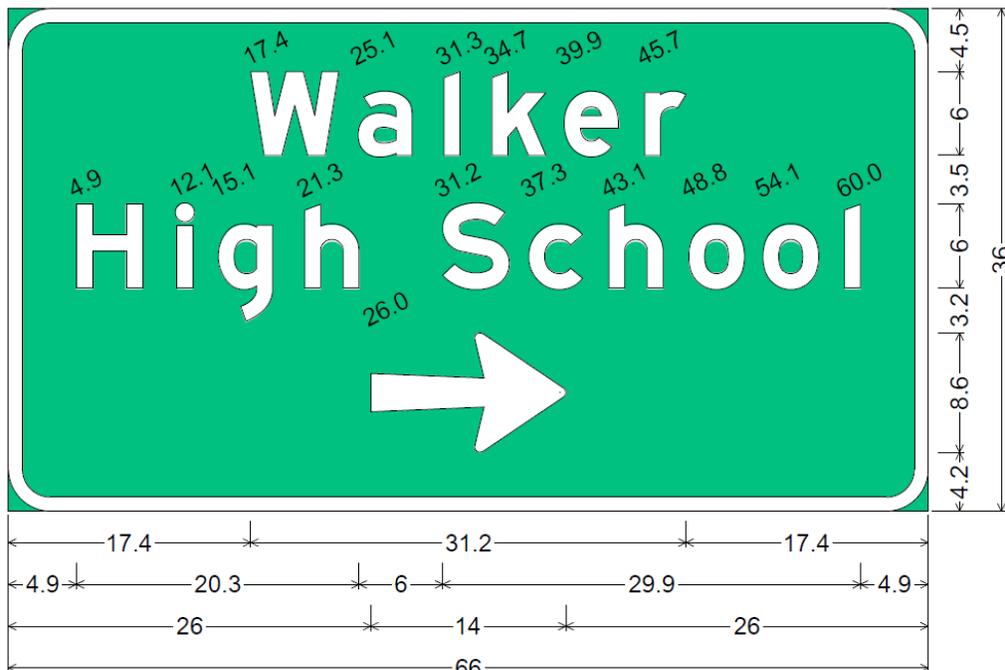
Enter calculated values for B and E

6. Adjust horizontal spacing

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for D

Final Sign Panel



3.0" Radius, 1.0" Border, White on Green;
 "Walker" E Mod; "High School" E Mod; Arrow 13 - 14.0" 0°;

Typical Mistakes

- ✓ Vertical spacing - kept as automatic spacing
- ✓ Horizontal spacing - Legend not centered

4.4.1 Example #1, Supplemental Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 2 text, 1 arrow
- ✓ Font size (**Exhibit 3-4**) = 6-4.5, based on speed and number of lanes
- ✓ Arrow size (**Exhibit 3-4 & Exhibit 3-10**) = 13-14, based on speed, number of lanes, and sign layout

1. Assume border = 1" (**Exhibit 3-2**)

From top to bottom:

1" - top border

6" - top row of text

6" - second line of text

8.56" - arrow height

1" - bottom border

total of 22.56" of space needed for objects

2. Four spaces exist:

Two text spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (6"), between 3" and 4.5", use 4"

$2 * 4" = 8"$ of space required

Two arrow spaces (E), less than B = 3.5"

$2 * 3.5" = 7"$ of space required

$8" + 7" = 15"$

3. $22.56" + 15" = 37.56"$

37.56" is between 36" and 42" (valid panel sizes), closest to 36"

4. Spacing Adjustments:

Rounded Panel Height (36") - Step 3 totals (37.56") = -1.56"

Therefore, we need to remove 1.56" of spacing from the sign.

There are multiple ways to accomplish this, but remember to keep each (B) measurement equal as well as each (E) measurement equal. In this example, we will remove 0.5" from each (B) measurement, and 0.26" from each (E) measurement. This allows the removal of 1.56" of spacing to arrive at a 36" tall sign panel design.

5. Final vertical component and object spacing summary :

Border	1"
(B) Space	3.5"
(A) Letter Height	6"
(B) Space	3.5"
(A) Letter Height	6"
(E) Space	3.22"
(C) Arrow Height	8.56"
(E) Space	3.22"
Border	1"
TOTAL	36"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined, the horizontal spacing is based on the longest line of legend.

Use between ½ and ¾ of the font size for measurement (D), the horizontal spacing between inside of border and legend. Remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The High School text line is the longest object; horizontal spacing defaults to 6" (font size) between words.

1" border + 4" (D) space + 20.3" High + 6" text space + 29.9" School + 4" (D) space + 1" border → 66.2".

Round this down to 66" panel size by removing at least 0.1" from each (D) space.

Final horizontal component and object spacing summary (longest line):

Border	(D) Space	High	Space	School	(D) Space	Border	TOTAL
1"	3.9"	20.3"	6"	29.9"	3.9"	1"	66"

Key Placement Issues

- ✓ Arrow centered
- ✓ All text centered

4.5 Example #2, Destination Sign

Purpose of Example:

- ✓ Font and arrow selection
- ✓ Using tabular arrangements
- ✓ Left and right justification
- ✓ Horizontal and vertical spacing



Return
to Index

Given Conditions:

- ✓ Posted speed limit: 55 mph
- ✓ Lane Configuration: Undivided Multilane
- ✓ Intersections: At Grade Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD, paying particular attention to component location, justification, and spacing. **Exhibit 3-4** provides the components to use.

Object and spacing values for this example:

A = Letter height

B = Vertical spacing from text to text, or from wording to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

C₁ = Vertical arrow height

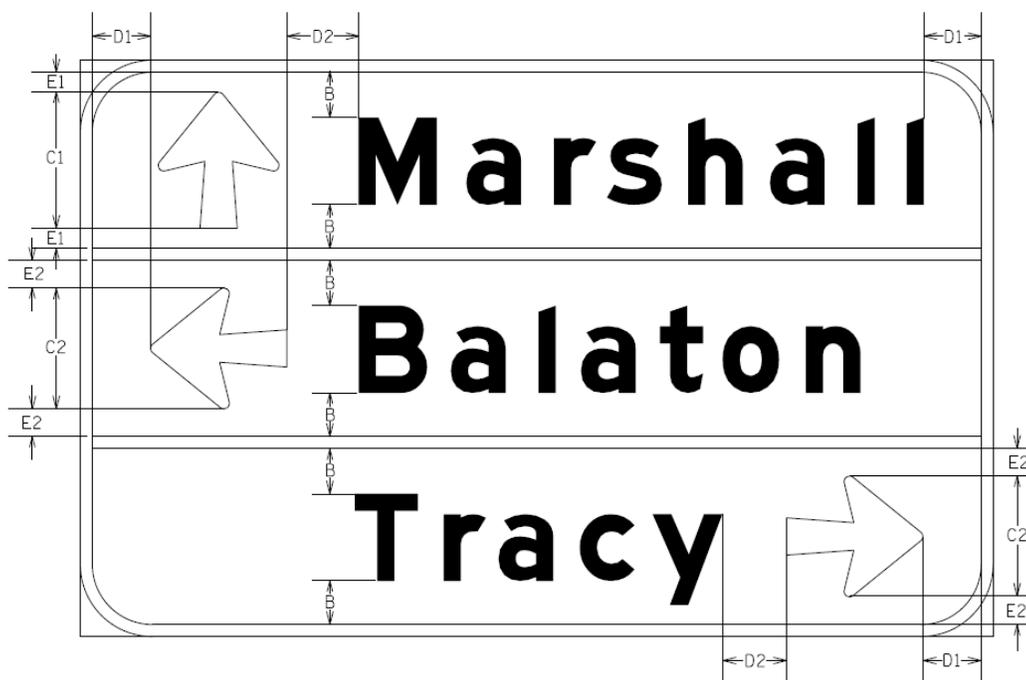
C₂ = Horizontal arrow height

D₁ = Horizontal spacing from inside border to text ($\frac{1}{2} A$ to $\frac{3}{4} A$)

D₂ = Horizontal spacing from horizontal arrow to text (A)

E₁ = Vertical spacing from vertical arrow to text, or from arrow to border

E₂ = Vertical spacing from horizontal arrow to text, or from arrow to border



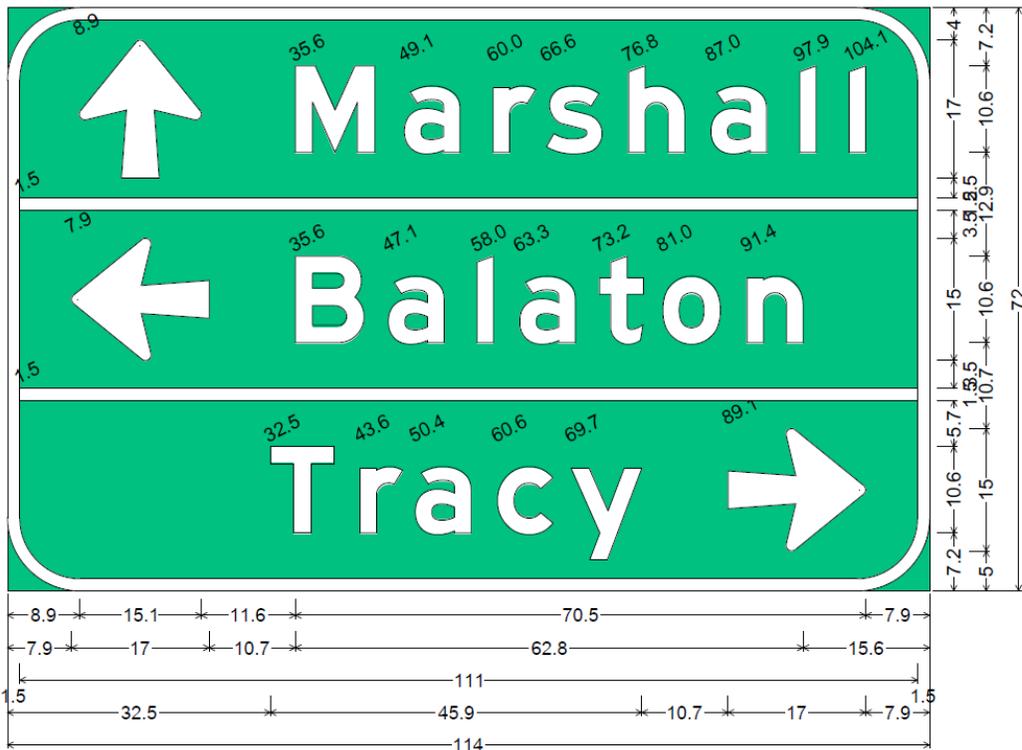
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color - white
2. Text tool –
 - Create three separate lines of text
 - Font - E modified, Size – 10.7-8
 - Proper name - Upper-lower case
3. Arrow tool –
 - Create three arrows
 - Angles – 90 degrees, 180 degrees, and 0 degrees
 - Arrowhead - 6 (6-17 arrow)
4. Open arrangement tool
 - Select tabular and create a 2 column, 2 row arrangement
 - Install top two city names and arrows into arrangement
 - Edit tabular arrangement data to show horizontal lines, set minimum space to zero
 - Drag the tabular arrangement to the panel
5. Drag last city name and arrow to the bottom of the panel
 - Right align the bottom line – right click the arrow, select Object Align, choose Right
6. Horizontal line tool –
 - Add a horizontal line between the tabular arrangement and the bottom city name, setting the spacing to zero
7. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B, E_1 , and E_2
8. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D_1 and D_2

Typical Mistakes

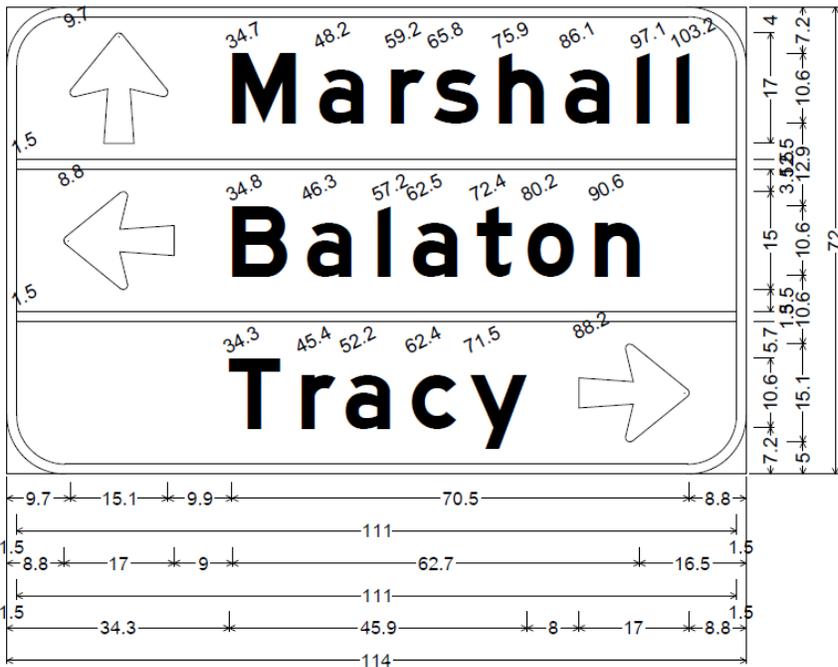
- ✓ Vertical spacing - Left to run automatically, spacing around arrows incorrect
- ✓ Horizontal spacing – spacing between arrows and text incorrect
- ✓ Alignment – Top two cities not in tabular arrangement or left aligned, bottom arrow not right aligned

Final Sign Panel



9.0" Radius, 1.5" Border, White on Green;
 Arrow 6 - 17.0" 90°; "Marshall" E Mod; Arrow 6 - 17.0" 180°; "Balaton" E Mod; "Tracy" E Mod;
 Arrow 6 - 17.0" 0°;

Alternative Panel Design



4.5.1 Example #2, Destination Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 3 object/text
- ✓ Font size (**Exhibit 3-4**) = 10.7-8, based on speed and number of lanes
- ✓ Arrow size (**Exhibit 3-4 & 6**) = 5-13, based on speed, number of lanes, and sign layout

1. Assume border = 1.5" (**Exhibit 3-2**)

From top to bottom:

1.5" - top border

17" - top arrow (the arrow is taller than the font size)

1.5" – first horizontal line

15.09" – middle arrow (the arrow is taller than the font size)

1.5" – second horizontal line

15.09" – bottom arrow (the arrow is taller than the font size)

1.5" - bottom border

total of 53.18" needed for components

2. Six spaces exist:

All will be controlled by arrow objects when performing object spacing in SignCAD, so we need spacings (E_1) and (E_2). First, we need to make sure that each of the three sections of the panel will be the same size, accomplished by having equal spacing on each side of all text. Therefore, we will need to calculate space (B) before finding (E_1) and (E_2).

Space (B) is only relevant while summing the vertical text components and lines/borders as follows:

$$1.5'' + 10.67'' + 1.5'' + 10.67'' + 1.5'' + 10.67'' + 1.5'' = 38.01'' \text{ needed for components}$$

(B) @ $\frac{1}{2}$ A to $\frac{3}{4}$ A = 5.34" to 8", use 6" (trying to keep the panel smaller since there are 6 of these spaces)

$$6 * 6'' = 36'' \text{ of space required}$$

3. 38.01" (from Step 2) + 36" = 74.01"

74.01" is between 72" and 78" (valid panel sizes), closest to 72"

4. Spacing Adjustments:

$$\text{Rounded Panel Height (72'')} - \text{Step 3 totals (74.01'')} = -2.01''$$

Therefore, we need to remove 2.01" from the sign. This should be done by removing 0.335" from each of the (B) measurements, bringing (B) to 5.665."

Now, we can calculate (E₁) and (E₂). Since each of the three sections of the panel have the same (B) measurement and text height, they will be equal heights. Therefore, the distance between the borders will be equal to 5.665" (B) + 10.67" (A) + 5.665" (B) = 22". Calculate (E₁) by subtracting the vertical arrow height of 17" from 22" to get a green space measurement of 5". There are two (E₁) spaces, so divide this by two to get (E₁) = 2.5". Similarly, (E₂) is calculated to be 3.455". Use these spacing values as the object spacing for the arrows, leaving the object spacing for the text at zero.

5. Final vertical component and object spacing summary :

Border	1.5"
(E ₁) Space	2.5"
(C ₁) Arrow Height	17"
(E ₁) Space	2.5"
Horizontal Line	1.5"
(E ₂) Space	3.455"
(C ₂) Arrow	15.09
(E ₂) Space	3.455"
Horizontal Line	1.5"
(E ₂) Space	3.455"
(C ₂) Arrow	15.09"
(E ₂) Space	3.455"
Border	1.5"
TOTAL	72"

Horizontal Size of Panel and Spacing

Use between ½ and ¾ of the font size as horizontal spacing between inside of border and text/objects. Remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The top line (up arrow and Marshall) is longest, but in determining required panel width in this example, instead use the width of the arrow on the second line because it is longer than the top arrow. 1.5" border + 6" (D₁) space + 17" horizontal arrow + 10.67" (D₂) space + 70.5" Marshall + 6" (D₁) space + 1.5" border → 113.17". Round to the closest 6" increment, which is 114". Along with the rounding, center-aligning the top/middle arrow and right-aligning the bottom arrow will automatically adjust the (D₁) spaces up to 6.41".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Arrow Width	(D ₂) Space	Marshall	(D ₁) Space	Border	TOTAL
1.5"	6.41"	17"	10.67"	70.5"	6.41"	1.5"	114"

Key Placement Issues

Top and middle arrow centered, bottom arrow right-aligned, top and middle text left-aligned

4.6 Example #3, Freeway Junction (Advance Guide) Sign

Purpose of Example:

- ✓ Placement and spacing of overlays
- ✓ Placement of fractions
- ✓ Horizontal and vertical spacing of fractions



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 65 mph
- ✓ Lane Configuration: Divided Multilane
- ✓ Intersections: Mix of At-Grade Intersections and Grade-Separated Interchanges on this corridor, but this sign is located in advance of a Grade-Separated Interchange.
- ✓ Sign Location: Ground Mounted

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Destination letter height

A₂ = Distance word letter height

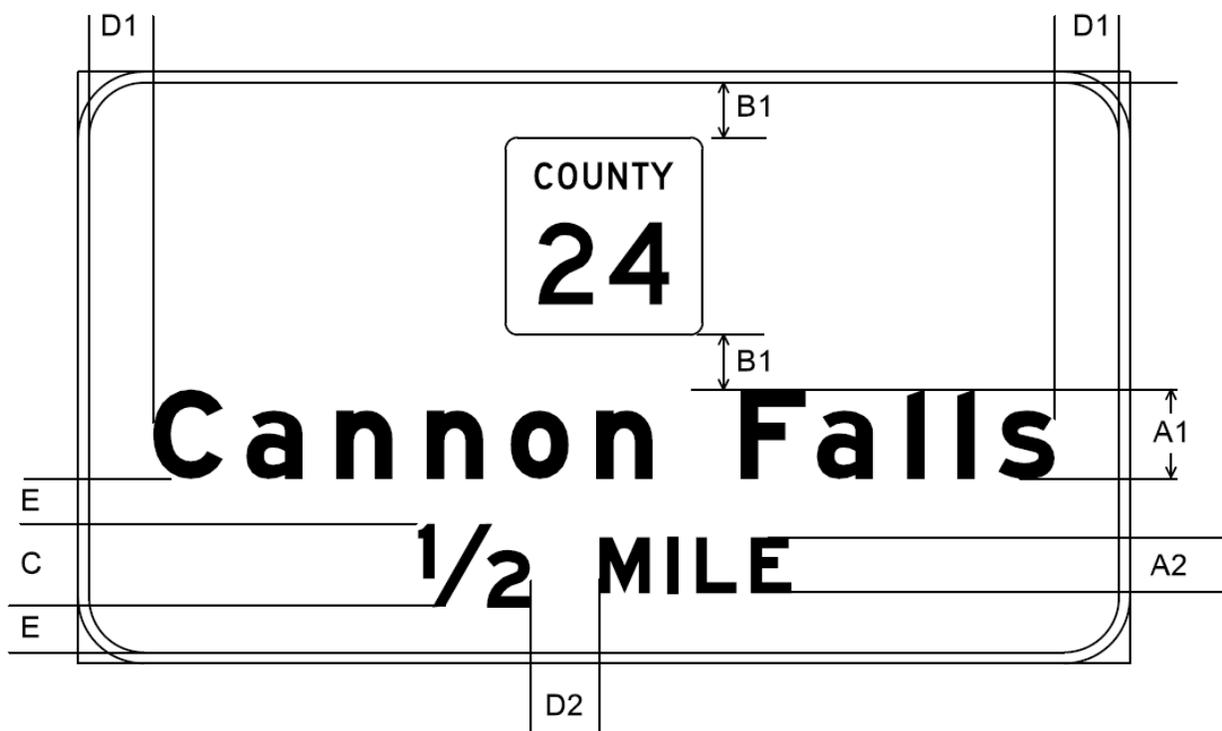
B = Vertical spacing from text to overlay, or from overlay to inside border ($\frac{1}{2} A_1$ to $\frac{3}{4} A_1$)

C = Distance fraction letter height

D₁ = Horizontal spacing from inside border to text ($\frac{1}{2} A_1$ to $\frac{3}{4} A_1$)

D₂ = Horizontal spacing from distance fraction to distance word (average of A₂ and C)

E = Vertical spacing from fraction to text, or fraction to border (less than B₁)



SignCAD Methods:

1. Panel tool -

Sign type - guide

Panel color - green

Border color - white

2. Install legend and object components into panel one at a time

Create the distance fraction by typing a space, then typing the distance, and then typing another space afterward.

After the fraction appears in the correct format, delete the spaces on each side of it.

Change the text size for the "MILE" word and insert it after the distance fraction. It should not be included as part of the same text object as the distance fraction.

Modify object spacing so that the distance between the fraction and distance is the average of the two different text sizes.

3. Adjust vertical spacing

Object spacing for the fraction will control over the MILE text because it is taller

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for B and E

4. Adjust horizontal spacing

Spacing near the fraction and overlays will likely need to be adjusted from the default

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for D_1 and D_2

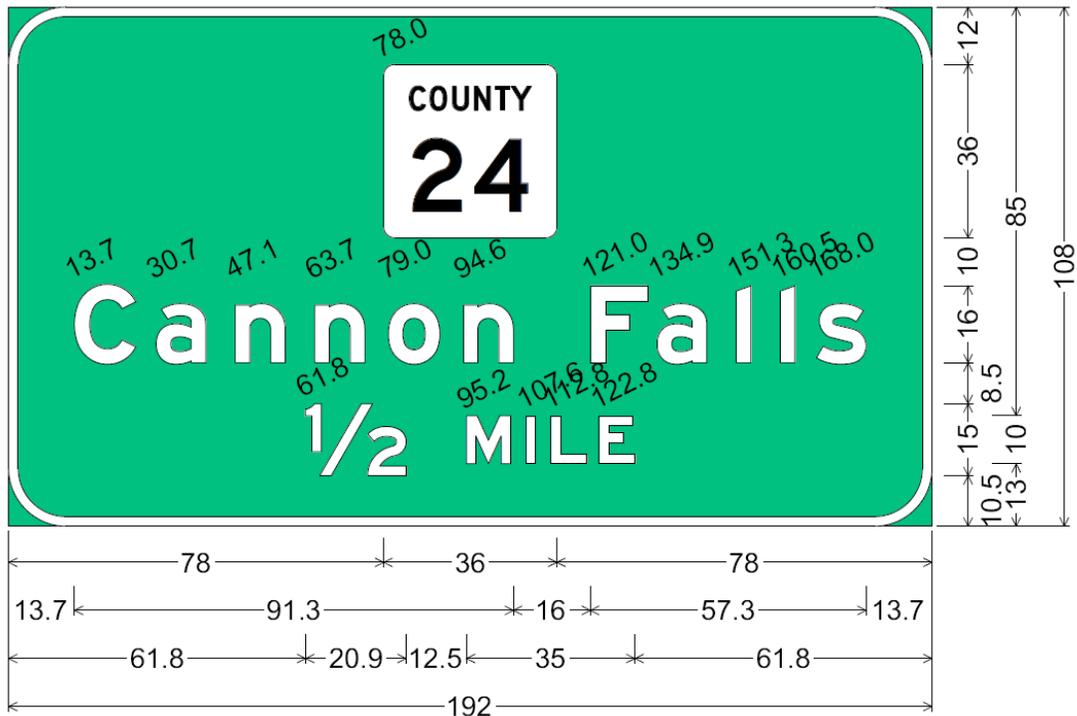
Typical Mistakes

- ✓ Fraction not formatted correctly, is wrong size, or spacing between it and MILE is incorrect
- ✓ MILE is incorrectly placed with the same font size as the distance numeral/fraction.

Key Placement Issues

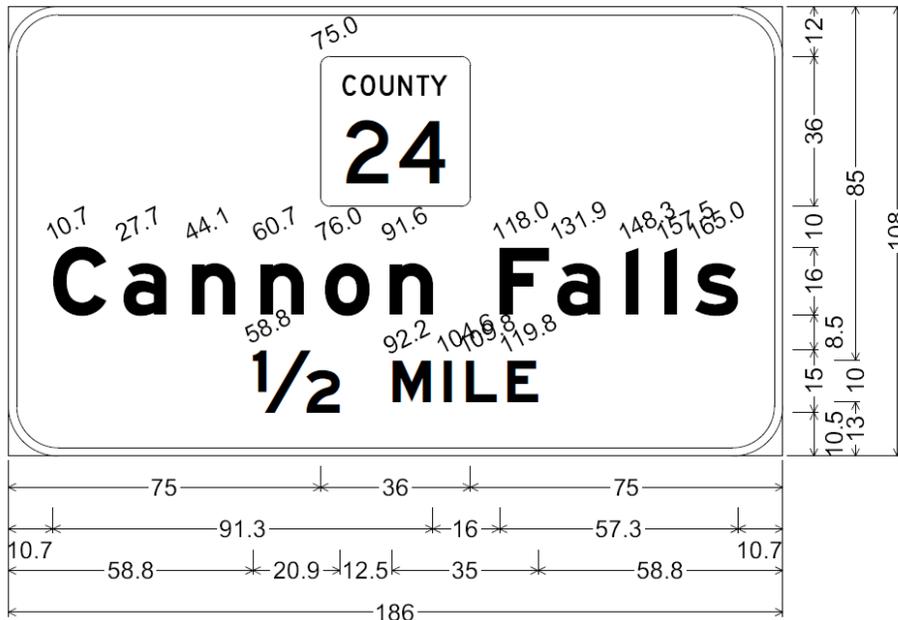
- ✓ $\frac{3}{4}$ and MILE are both horizontally and vertically centered on their line.

Final Sign Panel



12.0" Radius, 2.0" Border, White on Green;
 "Cannon Falls" E Mod; "1/2" E Mod; "MILE" E Mod;

Alternative Panel Design



12.0" Radius, 2.0" Border, White on Green;
 "Cannon Falls" E Mod; "1/2" E Mod; "MILE" E Mod;

4.6.1 Example #3, Expressway Junction (Advance Guide) Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 1 object, 1 text, 1 object/text
- ✓ Overlay size = (**Exhibit 3-5**) = 36", based on Expressway interchange. The asterisk in the **Exhibit 3-3** Expressway column refers us to **Exhibit 3-4** when the signing is for an interchange rather than an at-grade intersection.
- ✓ Destination font size (**Exhibit 3-5**) = 16-12, based on Expressway interchange
- ✓ Distance (fraction) font size (**Exhibit 3-5**) = 15, based on Expressway interchange
- ✓ Distance (word) font size (**Exhibit 3-5**) = 10, based on Expressway interchange

1. Assume border = 2" (**Exhibit 3-2**)

From top to bottom:

2" – top border

36" – overlay

16" – line of text

15" – distance fraction

2" – bottom border

total of 71" needed for components

2. Four spaces exist:

Two text/overlay spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (16"), between 8" and 12", use 10"

$2 * 10" = 20"$ of space required

Two fraction spaces (E), less than (B) = 8"

$2 * 8" = 16"$ of space required

$20" + 16" = 36"$

3. $71" + 36" = 107"$

107" is between 102" and 108" (valid panel sizes), round up to 108"

4. Spacing adjustments

Rounded Panel Height (108") - Step 3 totals (107") = 1"

Therefore, we need to add an additional 1" inch of spacing into the sign.

There are several ways to accomplish this. For this example, the chosen solution is to add the extra 1" by splitting it evenly among the two (E) measurements. This will make the (E) measurements larger by 0.5" each, for a total of 8.5" each.

5. Final vertical component and object spacing summary:

Border	2"
(B ₁) Space	10"
Overlay Height	36"
(B ₁) Space	10"
(A ₁) Letter Height	16"
(E) Space	8.5"
(C) Fraction Height	15"
(E) Space	8.5"
Border	2"
TOTAL	108"

Horizontal Size of Panel and Spacing

Use between ½ and ¾ of the font size as horizontal spacing between inside of border and legend/objects. Remember that panels are sized in 6" increments. This sign panel is too large for U-posts and will need to be placed on I-beams as a Type A sign, so post spacing does not have to be checked in this case.

The text line (Cannon Falls) is the longest; horizontal spacing defaults to 16" (font size). 2" border + 10" (D₁) space + 91.3" Cannon + 16" text space + 57.3" Falls + 10" (D₁) space + 2" border → 188.6". Round up to the closest 6" increment, which is 192". SignCAD will automatically round the panel and force the D₁ spaces to 11.7".

Alternatively, the horizontal width of the panel could be determined to be 186" if the decision was made to round down. It would result in a D₁ spacing of 8.7", not far above the minimum ½ text height requirement of 8". This smaller spacing would be acceptable in this particular example, but for signs with straight letter edges near one of the borders (B, D, E, F, H, I, K, L, M, N, P, U, etc.), often times the sign legend and border may appear too crowded. In that case, the decision may be made to round the panel width up to the next 6" increment.

The (D₂) Spacing between the fraction (3/4) and the text (MILE) should be the average of the two font sizes (15" and 12", respectively). This leads to a spacing of 12.5" between them.

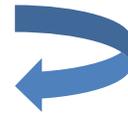
Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Cannon	Space	Falls	(D ₁) Space	Border	TOTAL
2"	11.7"	91.3"	16"	57.3"	11.7"	2"	192"

4.7 Example #4, Supplemental Sign (Freeway)

Purpose of Example:

- ✓ Font and letter height selection
- ✓ Color Selection



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 60 mph
- ✓ Lane Configuration: Divided Multilane
- ✓ Intersections: Grade Separated Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Letter height for destination

A₂ = Letter height for EXIT numeral

A₃ = Letter height for EXIT word

B = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

D₁ = Horizontal spacing from inside border to text ($\frac{1}{2} A$ to $\frac{3}{4} A$)

D₂ = Horizontal spacing between the EXIT text and EXIT number (average of A₂ and A₃)

E = Vertical spacing from EXIT numeral to text, or from EXIT numeral to inside border (less than B)



SignCAD Methods:

1. Panel tool -

Sign type - guide

Panel color - brown

Border color - white

2. Install components into panel one at a time

3. Text tool –

Type the two lines of text (use the enter key to get to the second line)

Enter EXIT and 147 separately using the text tool. This provides the ability to size and space these components separately. (Alternatively, you may place them as one object, making sure to change text height to 12.5 after the exit word, add a space, and then change the text height to 15 for the exit numeral.)

Font – E modified

Size – 13.3-10 for first 2 lines, 10 for EXIT and 15 for 147

Proper name - Upper-lower case

EXIT is capitalized

4. Adjust vertical spacing

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for B and E

5. Adjust horizontal spacing

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for D_1 and D_2

Typical Mistakes

- ✓ Vertical spacing - Left to run automatically
- ✓ Horizontal spacing - Legend not centered
- ✓ Not using correct font sizes or spacing between different fonts on the same line

Final Sign Panel



9.0" Radius, 1.5" Border, White on Brown;
 "Wild River" E Mod; "State Park" E Mod;
 "EXIT" E Mod; "147" E Mod;

4.7.1 Example #4, Supplemental Sign (Freeway) Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: all text
- ✓ Destination name font size (**Exhibit 3-5**) = 13.3-10
- ✓ Exit number font size (**Exhibit 3-5**) = 10 (word); 15 (exit number)

1. Assume border = 1.5"

From top to bottom:

1.5" - top border

13.33" - top row of text

13.33" - middle line of text

15" - bottom line of text

1.5" - bottom border

total of 44.67" of space needed for components

2. Four spaces exist

Two text spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (13.33"), between 6.65" and 10", use 9"

$2 * 9" = 18"$ of space required

Two exit numeral spaces (E), less than (B) = 8"

$2 * 8" = 16"$ of space required

$18" + 16" = 34"$

3. $44.67" + 34" = 78.67"$

78.67" is between 78" and 84" (valid panel sizes), round down to 78"

4. Spacing adjustments

Rounded Panel Height (78") - Step 3 totals (78.67") = -0.67"

Therefore, we need to remove 0.67" of spacing from the sign.

This can be done by removing 0.34" from each of the (B) space values.

5. Final vertical component and object spacing summary:

Border	1.5"
(B) Space	8.66"
(A ₁) Letter Height	13.33"
(B) Space	8.66"
(A ₁) Letter Height	13.33"
(E) Space	8"
(A ₃) Letter Height	15"
(E) Space	8"
Border	1.5"
TOTAL	78"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined, the horizontal spacing is based on the longest object.

Use between ½ and ¾ of the font size as horizontal spacing between inside of border and text, remember that panels are sized in 6" increments.

The State Park line is the longest object; horizontal spacing defaults to 13.3" (font size) between the objects. 1.5" border + 8.33" (D₁) space + 53.97" State + 13.33" text space + 45.79" Park + 8.33" (D₁) space + 1.5" border → 132.75", round to closest 6" increment which is 132". Decrease the spaces on each side of the State Park legend by 0.38" each to reach this panel size.

The (D₂) Spacing between the word (EXIT) and the exit number (147) should be the average of the two font sizes (10" and 15", respectively). This leads to a spacing of 12.5" between them.

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	State	Space	Park	(D ₁) Space	Border	TOTAL
1.5"	7.95"	53.97"	13.33"	45.79"	7.95"	1.5"	132"

Key Placement Issues

- ✓ None

4.8 Example #5, Directional Sign

Purpose of Example:

- ✓ Text and double headed arrow selection



Return to Index

Given Conditions:

- ✓ Posted speed limit: 55 mph
- ✓ Number of basic lanes: Undivided Multilane
- ✓ Intersections: At Grade Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

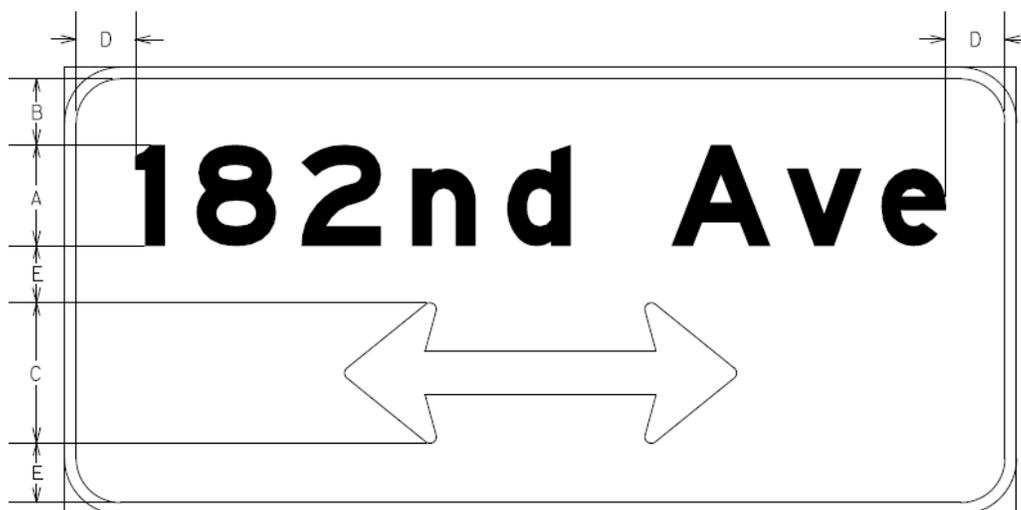
A = Letter height

B = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

C = Arrow height

D = Horizontal spacing from inside border to text ($\frac{1}{2} A$ to $\frac{3}{4} A$)

E = Vertical spacing from arrow to text, or from arrow to inside border (less than B)



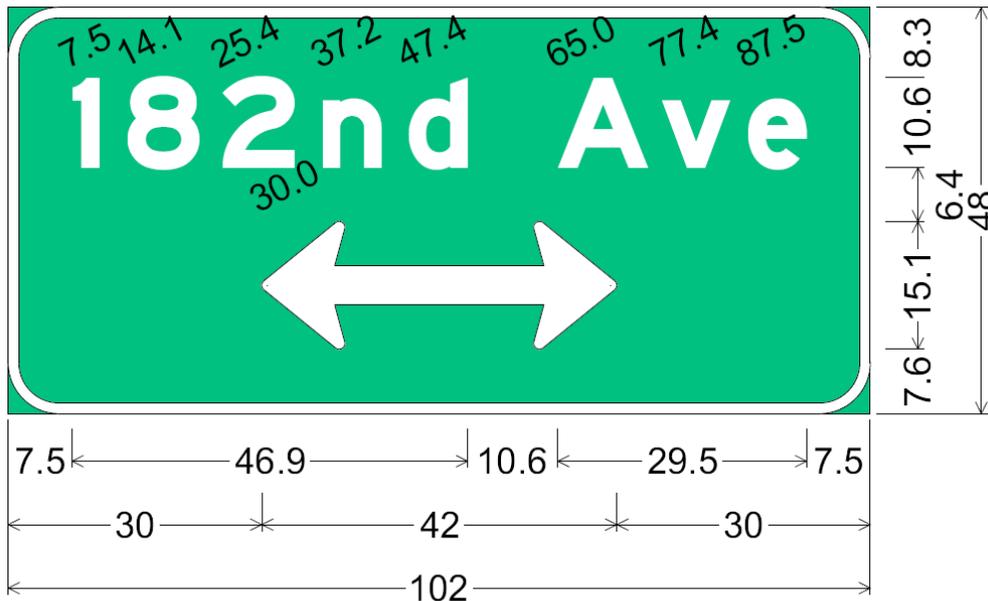
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color - white
2. Install components into panel one at a time
3. Text tool-
 - Font – E modified
 - Size – 10.7-8
 - Proper name - Upper-lower case
4. Arrow tool –
 - Angle – 0 degrees
 - Arrowhead - 6 (6-42 arrow)
5. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B and E
6. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D

Typical Mistakes

- ✓ Wrong arrow selection

Final Sign Panel



6.0" Radius, 1.3" Border, White on Green;
 "182nd Ave" E Mod;
 Double Headed Arrow 6 - 42.0" 0°;

4.8.1 Example #5, Directional Sign Calculation

Vertical Size of Panel and Line Spacing

Given:

- ✓ 2 rows of components: 1 object, 1 text
- ✓ Font size (**Exhibit 3-4**) = 10.7-8
- ✓ Arrow size (**Exhibit 3-4 & Exhibit 3-10**) = 6-42

1. Assume border = 1.25"

From top to bottom:

1.25" - top border

10.67" - text height

15.09" – arrow height

1.25" - bottom border

total of 28.26" of space needed for components.

2. Three spaces exist:

One text space (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (10.67"), between 5.34" and 8", use 7"

1 * 7" = 7" of space required

Two object (arrow to border) spaces (E), less than (B) = 6"

2 * 6" = 12" of space required

7" + 12" = 19" of space required

3. $28.26" + 19" = 47.26"$

47.26" is not divisible by 6, round to closest, use 48" → valid panel size

4. Spacing adjustments

Rounded Panel Height (48") - Step 3 totals (47.26") = 0.74"

Therefore, we need to add 0.74" of spacing to the sign.

This can be done by adding 0.37" to each of the arrow spacing values (E).

Alternative methods may be to add the full 0.74" to the top arrow spacing value, or to split it among both arrow spacings, with most of the additional spacing going to the top spacing. Both of these alternative methods serve the purpose of further separating the arrow from the street name.

5. Final vertical component and object spacing summary:

Border	1.25"
(B) Space	7"
(A) Letter Height	10.67"
(E) Space	6.37"
(C) Arrow Height	15.09"
(E) Space	6.37"
Border	1.25"
TOTAL	48"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined, the horizontal spacing is based on the longest object.

Use ½ to ¾ of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The 182nd Ave line is the longest; horizontal spacing defaults to 10.67" (font size) on both sides. 1.25" border + 6" space + 46.9" 182nd + 10.67" space + 29.5" Ave + 6" space + 1.25" (border) → 101.57". The closest valid panel size is 102", but we will technically not need to modify the 6" spacings we started with because SignCAD will automatically increase them to 6.215" each when rounding the panel up to 102".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	182 nd	Space	Ave	(D ₁) Space	Border	TOTAL
1.25"	6.215"	46.9"	10.67"	29.5"	6.215"	1.25"	102"

Key Placement Issues

- ✓ None

4.9 Example #6, Exit Panel (E1-5P)

Purpose of Example:

- ✓ Design of Type EA and EO sign panels
 - Even though they have a standard sign number, these exit panel designs are individually designed in SignCAD and are included in MnDOT's Signing Plans
- ✓ Use of [MnDOT Standard Signs Manual](#) to design a sign panel with standardized object spacing



Given Conditions:

- ✓ Roadway Type: Freeway or Expressway with numbered exits
- ✓ Sign Type: EA or EO
- ✓ Sign Location: Attached to top of Type A or Type OH sign panel
- ✓ Exit Location(s): Right side of roadway

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁= Exit word letter height (Handout: MnDOT Standard Signs Manual: E1-5P)

A₂= Exit number letter height (Handout: MnDOT Standard Signs Manual: E1-5P)

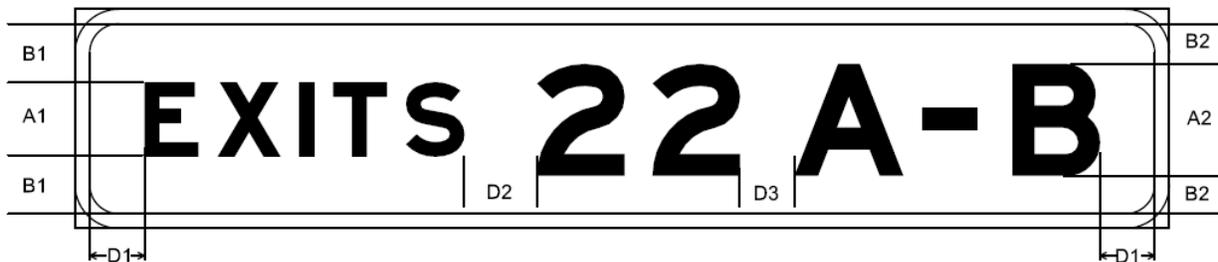
B₁ = Vertical spacing from exit word to inside border (Handout: MnDOT Standard Signs Manual: E1-5P)

B₂= Vertical spacing from exit number to inside border (Handout: MnDOT Standard Signs Manual: E1-5P)

D₁ = Horizontal spacing from inside border to legend (($\frac{1}{2}$ A₂ to $\frac{3}{4}$ A₂)

D₂ = Horizontal spacing from exit word to exit number (Handout: MnDOT Standard Signs Manual: E1-5P)

D₃ = Horizontal spacing from exit number to exit letter (Handout: MnDOT Standard Signs Manual: E1-5P)



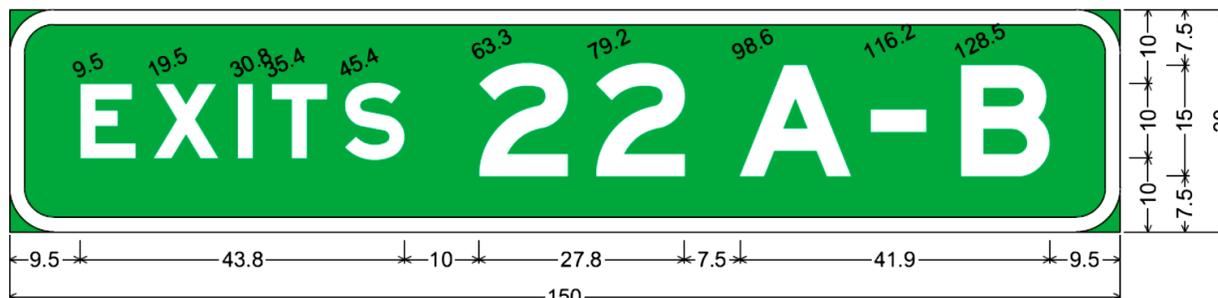
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color - white
2. Insert legend into sign panel as three separate components: exit word, exit number, exit letter
3. Manually adjust border width and radius:
 - Right click on panel and select "Edit Data"
 - Choose "Border"
 - Uncheck "Size automatically"
 - Input border width and radius requirements as per page 6-45: MnDOT Standard Signs Manual
4. Adjust D₂ horizontal spacing between exit word and exit number as per page 6-45: MnDOT Standard Signs Manual)
5. Adjust D₃ horizontal spacing between exit number and exit letter as per page 6-45: MnDOT Standard Signs Manual)
6. Adjust D₁ horizontal spacing between insider border and other legend.
 - Adjust vertical spacing for all components so that panel height is exactly 30" and all legend items are centered.

Typical Mistakes

- ✓ Panel height is larger than the 30" standard. Check vertical object spacing on each component.
- ✓ Object spacing is typically from component to inside of border in SignCAD, where standard drawings are sometimes shown from component to panel edge). Make adjustments as necessary.
- ✓ Border width is default size at 1" instead of 2".
- ✓ Spacing between exit number and exit letter was not correctly selected from the MnDOT Standard Signs Manual.

Final Sign Panel



6.0" Radius, 2.0" Border, White on Green;
 "EXITS 22 A-B" E Mod;

4.9.1 Example #6, Exit Panel (E1-5P) Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ One row of three separate components: exit word, exit number, exit letter
- ✓ For exits from freeways and expressways on the right side of the roadway, the sign panel height must be 30" as per the MnDOT Standard Signs Manual.

1. From top to bottom:

2" - top border

15" – larger font size on same line ($15'' A_2 > 10'' A_1$)

2"- bottom border

total of 19" of space needed for sign components

2. To determine vertical spacing above and below the exit number/letter:

Choose vertical spacing based upon the MnDOT Standard Signs Manual drawing. Be aware that the shown vertical distance from component to panel edge is 7.5". Subtract the 2" border to get 5.5" for the object spacing.

3. Final vertical component and object spacing summary:

Border	2"
(B ₂) Space	5.5"
(A ₂) Letter Height	15"
(B ₂) Space	5.5"
Border	2"
TOTAL	30"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined, the horizontal spacing is based on the longest horizontal object line as well as values specified in the MnDOT Standard Signs Manual.

Use ½ to ¾ of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments.

2" border + 7.5" (D₁) space + 43.8" EXITS + 10" (D₂) space + 27.8" 22 + 7.5" (D₃) space + 41.9" A-B + 7.5" (D₁) space + 2" border → 150".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	EXITS	(D ₂) Space	22	(D ₃) Space	A-B	(D ₁) Space	Border	TOTAL
2"	7.5"	43.8"	10"	27.8"	7.5"	41.9"	7.5"	2"	150"

Key Placement Issues

- ✓ All components are vertically centered within the panel.

4.10 Example #7, Distance Sign

Purpose of Example:

- ✓ Typical distance sign
- ✓ Alignment features and horizontal spacing



Return to Index

Given Conditions:

- ✓ Posted speed limit: 60 mph
- ✓ Lane Configuration: Divided Multilane
- ✓ Intersections: Mix of At-Grade Intersections and Grade-Separated Interchanges on this corridor, but this sign is located beyond an At-Grade Intersection.
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A = Letter height

B = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

D₁ = Horizontal spacing from inside border to text ($\frac{3}{4} A$ to A; ideally D₁ = A - border)

D₂ = Shortest same-line horizontal spacing from destination name to distance (min. approx. 1.5A)

D₃ = Shortest different-line horizontal spacing from destination name to distance (min. larger than A)



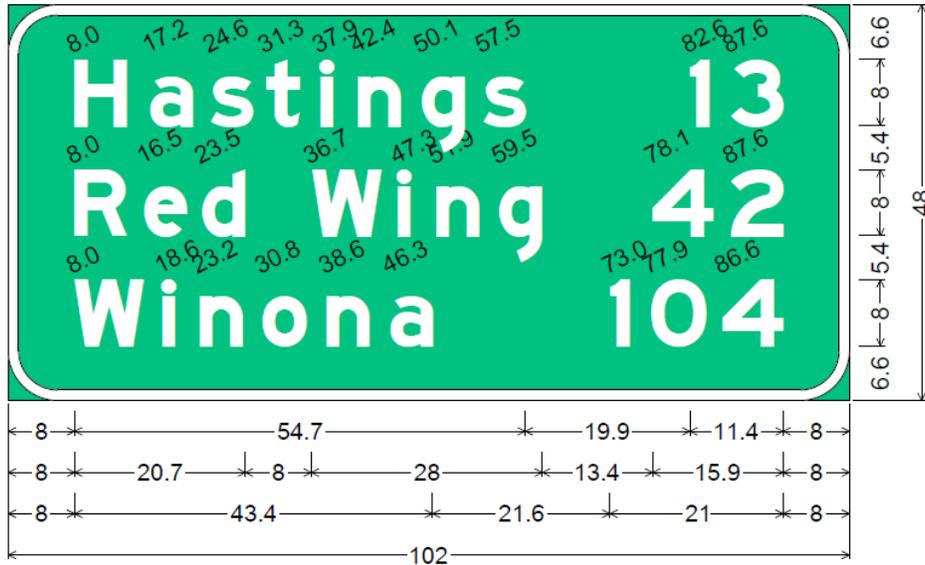
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color – white
2. Text tool –
 - Create individual text entries for cities and distances
 - Font - E modified
 - Size – 8-6
3. Install city names and distances into panel, one by one
4. Right mouse click on each item
 - Align Left (cities) and Align Right (distances)
5. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B
6. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D_1 , D_2 , and D_3

Typical Mistakes

- ✓ Cities and mileages not justified correctly
- ✓ D_2 and D_3 spaces do not meet minimum dimension requirements
- ✓ D_1 space + border is larger than A

Final Sign Panel



6.0" Radius, 1.3" Border, White on Green;
 "Hastings" E Mod; "13" E Mod; "Red Wing" E Mod; "42" E Mod;
 "Winona" E Mod; "104" E Mod;

4.10.1 Example #7, Distance Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: all text
- ✓ Font size (**Exhibit 3-4**) = 8-6

1. Assume border (**Exhibit 3-2**) = 1.25"

From top to bottom:

1.25" - top border

8" - text

8" - text

8" - text

1.25" - bottom border

total of 26.5" of space needed for components

2. Four spaces exist (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (8") = 4" - 6", use 5"

$4 * 5" = 20"$ of space required

3. $26.5" + 20" = 46.5"$

46.5" is not divisible by 6, round to closest, use 48" → valid panel size

4. Spacing adjustments

Rounded Panel Height (48") - Step 3 totals (46.5") = 1.5"

Therefore, we need to add 1.5" of spacing into the sign.

This can be done by adding 0.375" to each of the (B) spacing values.

Alternatively, one may choose to keep the measurements between text and from text to the panel edges at half-inch increments. This can be done by increasing the vertical spacing around the middle object to 5.5" and the spacing from text to the inside borders to 5.25". The vertical space between the border and text is not as critical as from text to text.

5. Final vertical component and object spacing summary:

Border	1.25"
(B) Space	5.375"
(A) Letter Height	8"
(E) Space	5.375"
(A) Letter Height	8"
(E) Space	5.375"
(A) Letter Height	8"
(E) Space	5.375"
Border	1.25"
TOTAL	48"

Horizontal Size of Panel and Spacing

Begin with between 75% and 100% of the font size as horizontal spacing between inside of border and text, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

Start with (D₁) spacing values of 7". Set the left object spacing for each of the mileages to a minimum of 1.5*(A), which is 12". We also need to check that the (D₃) spacing between the longest city name of Red Wing and the longest mileage of 104 is a minimum of 1.1*(A), or 8.8". To check this, find the difference between the sums of these legend line lengths, ignoring the space between the city name and mileage for now: [20.7" Red + 8" space + 28" Wing + 15.9" 42] – [43.4" Winona + 21" 104] = 8.2". This is less than the minimum requirement for the (D₃) spacing, so we need to increase it by 0.6" to hit the minimum.

Horizontal objects and spacings are now: 1.25" border + 7" (D₁) space + 20.7" Red + 8" space + 28" Wing + 12.6" (D₂) space + 15.9" 42 + 7" (D₁) space + 1.25" border = 101.7". This rounds the panel up to 102", automatically increasing the outer (D₁) spacings to approximately 7.15" each.

However, remember for this type of sign that we want the (D₁) space + border width to be approximately equal to the text height of 8". Currently, we have 7.15" (D₁) space + 1.25" border = 8.4". Therefore, we should remove 0.2 inches from each side by decreasing each of the (D₁) spacings from 7" to 6.8", and then reallocate this combined 0.8" into the middle of the panel to make (D₂) = 13.4".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Red	Text space	Wing	(D ₂) Space	42	(D ₁) Space	Border	TOTAL
1.25"	6.79"	20.7"	8"	28.01"	13.4"	15.81"	6.79"	1.25"	102"

(Sometimes the spacing values shown in SignCAD are not precise enough when rounded to the nearest tenth of an inch, and it can affect the panel. If your calculated spacing values are causing the panel to jump up to the next 6" increment, this may be a cause of it. Try changing the drawing dimensions' number of decimal places to 2 in order to find more precise values and recalculate. Otherwise, you can try reducing the spacing values by trial and error to arrive at the correct panel size.)

4.11 Example #8, Distance Sign (Freeway)

Purpose of Example:

- ✓ Illustrates a typical freeway distance sign, incorporating overlays, fractions and whole numbers.

Given Conditions:

- ✓ Freeway distance sign

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A = Letter height

B₁ = Distance from top border to first line text/overlay (**Exhibit 3-9**)

B₂ = Distance from first line text/overlay to second line text/overlay (**Exhibit 3-9**)

B₃ = Distance from second line text/overlay to third line text/overlay (**Exhibit 3-9**)

B₄ = Distance from bottom border to third line text/overlay (**Exhibit 3-9**)

D₁ = Horizontal spacing from inside border to text (13" for all freeway distance signs; D₁ + border = 15")

D₂ = Shortest same-line horizontal spacing from destination name to distance (ideally 24", +/- 3")

D₃ = Shortest different-line horizontal spacing from destination name to distance (minimum 18")

[D₃ is not applicable in this example problem]



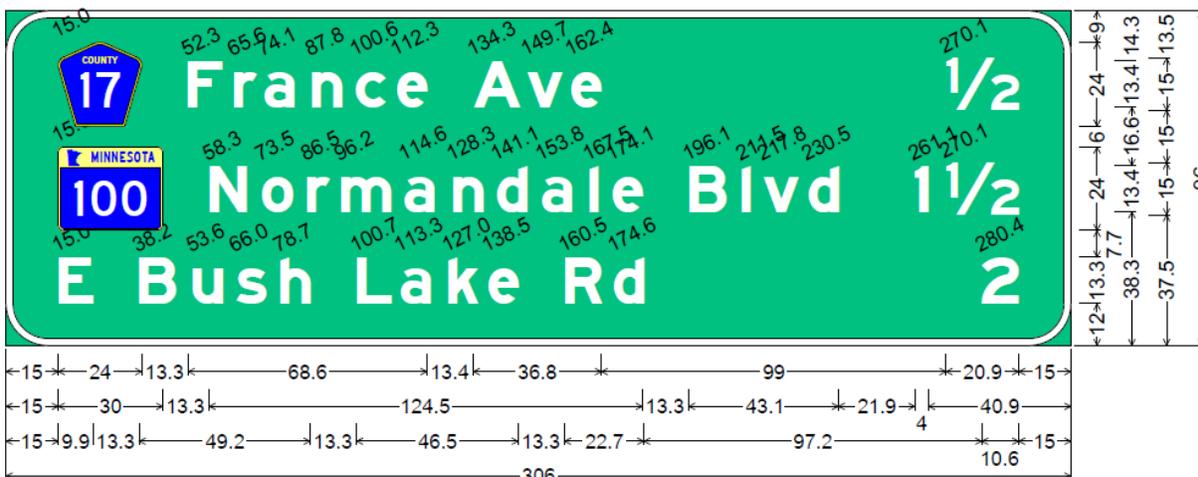
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color - white
2. Install sign components as individual entries (so that they can be aligned later), keep in mind the number preceding the fraction is 13.3" (**Exhibit 3-9**) and the fractions are 15".
3. Right mouse click on each item
 - Select Object Align Left (destinations) or Right (distances)
4. Adjust vertical spacing
5. Adjust horizontal spacing
 - Move excess space from edges by adjusting D_2 within its acceptable range of values

Typical Mistakes

- ✓ Not following the freeway distance sign layout combinations listed in **Exhibit 3-9**
- ✓ The font size for the 1 in the Normandale distance is the wrong size
- ✓ Spacing between 1 and $\frac{1}{2}$ for Normandale distance not chosen correctly (**Exhibit 3-12**)
- ✓ Not adjusting the D_2 spacing correctly, causing the $D_1 + \text{border}$ measurement to not equal 15"

Final Sign Panel



12.0" Radius, 2.0" Border, White on Green;
 "France Ave" E Mod; "1/2" E Mod; "Normandale Blvd" E Mod; "1" E Mod; "1/2" E Mod; "E Bush Lake Rd" E Mod;
 "2" E Mod;

4.11.1 Example #8, Distance Sign (Freeway) Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 2 object/text, 1 text
- ✓ Overlay (**Exhibit 3-5**) = 24 OL
- ✓ Font size (**Exhibit 3-5**) = 13.3-10
- ✓ Follow **Exhibit 3-9** in Section 3.5 for the vertical spacing requirements (this is a standard sign application), and **Exhibit 3-12** in Section 3.9 for fraction horizontal spacing requirement.

According to **Exhibit 3-9**, Combination #6, the vertical component and object spacing requirements are:

Border	2"
(B ₁) Space	7"
Overlay Height	24"
(B ₂) Space	6"
Overlay Height	24"
(B ₃) Space	7.67"
Letter Height	13.33"
(B ₄) Space	10"
Border	2"
TOTAL	96"

Horizontal Size of Panel and Spacing

The left and right (D₁) spaces will be set equally to 13". Any excess amounts of space in the (D₁) spaces needs to be transferred into the (D₂) space between the left and right legend columns. A minimum of 24" space is required between a destination and its corresponding mileage, while a minimum of 20" horizontal space is maintained between the longest destination line and the longest mileage.

2" border + 13" (D₁) space + 30" overlay + 13.33" space + 124.48" Normandale + 13.33" space + 43.02" Blvd + 24" (D₂) space + 3.96" 1 + 5" space + 20.90" ½ + 13" (D₁) space + 2" border = 308.02". Round down to a 306" panel by subtracting 2.1" (at least 2.02") from the D₂ spacing.

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Overlay	Space	Normandale	Text Space	Blvd	(D ₂) Space	1	Space	½	(D ₁) Space	Border	TOTAL
2"	13"	30"	13.33"	124.48"	13.33"	43.02"	21.98"	3.96"	5"	20.9"	13"	2"	306"

Key Placement Issues

- ✓ Mileage entered as separate objects so they can be justified
- ✓ Text is left justified and distances are right justified; overlays are middle justified on text
- ✓ Follow standard vertical spacing table and fraction font size table

4.12 Example #9, Directional Sign (Split Panel)

Purpose of Example:

- ✓ Illustrates use of tabular arrangement
- ✓ Illustrates vertical and horizontal spacing in this type of sign



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 55 mph
- ✓ Lane Configuration: Single Lane
- ✓ Intersections: At-Grade
- ✓ Sign Location: Overhead (Signal mast arm)

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Letter height for cardinal direction, first letter

A₂ = Letter height for cardinal direction, rest of word

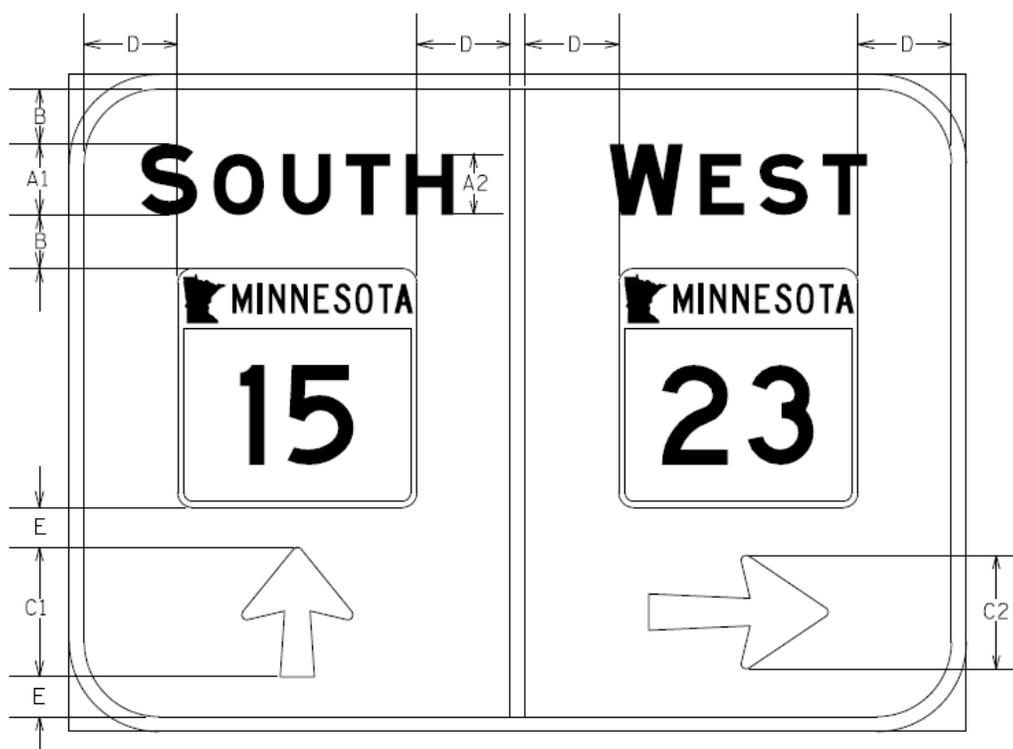
B = Vertical spacing from text to overlay, or from text to inside border ($\frac{1}{2}$ A to $\frac{3}{4}$ A)

C₁ = Vertical arrow height

C₂ = Horizontal arrow height

D = Horizontal spacing from overlay to borders (overlay text height = approx. 40% of overlay height)

E = Vertical spacing from vertical arrow to overlay, or from vertical arrow to inside border (less than B)



SignCAD Methods:

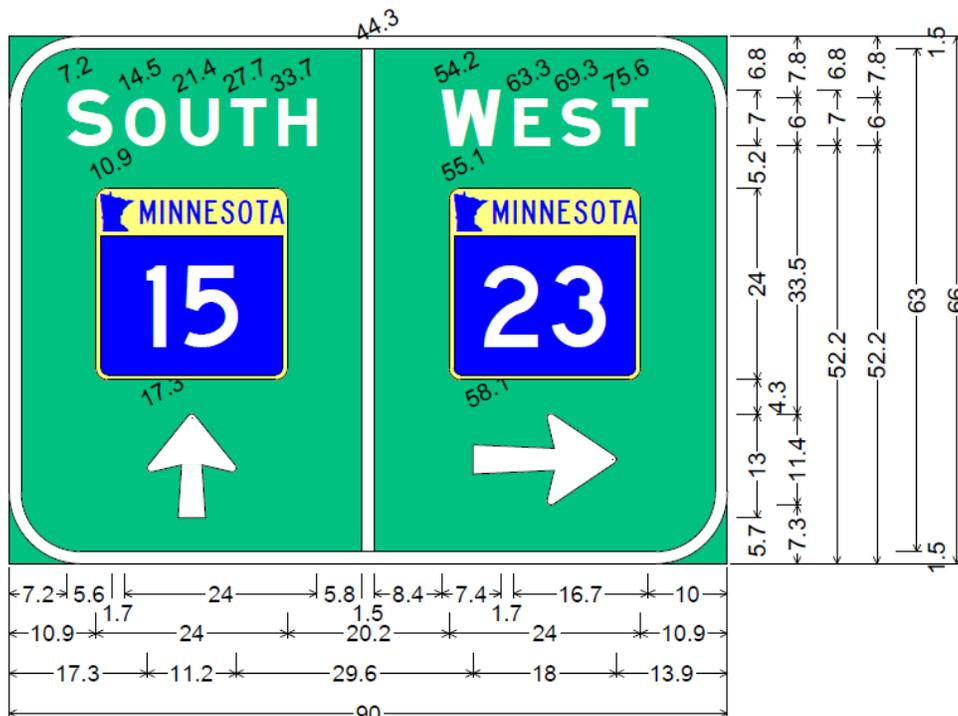
1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color - white
2. Create tabular arrangement - 2 Columns, 3 Rows
3. Install all components in arrangement
4. Move whole arrangement into panel
5. Double click or right click/edit on dashed lines created by arrangement
 - Minimum Space - Change all values to 0
 - Lines - Check Show Vertical Lines
6. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B and E
7. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D

All components should be aligned to the center of each column. Adjust horizontal spacing, aiming to have the overlay centered within each column. Each column's width on the sign panel will be determined by the overlay size. This is done easiest by zeroing out the horizontal spacing for the cardinal directions, and applying even spacing on each side of the overlays.

Typical Mistakes

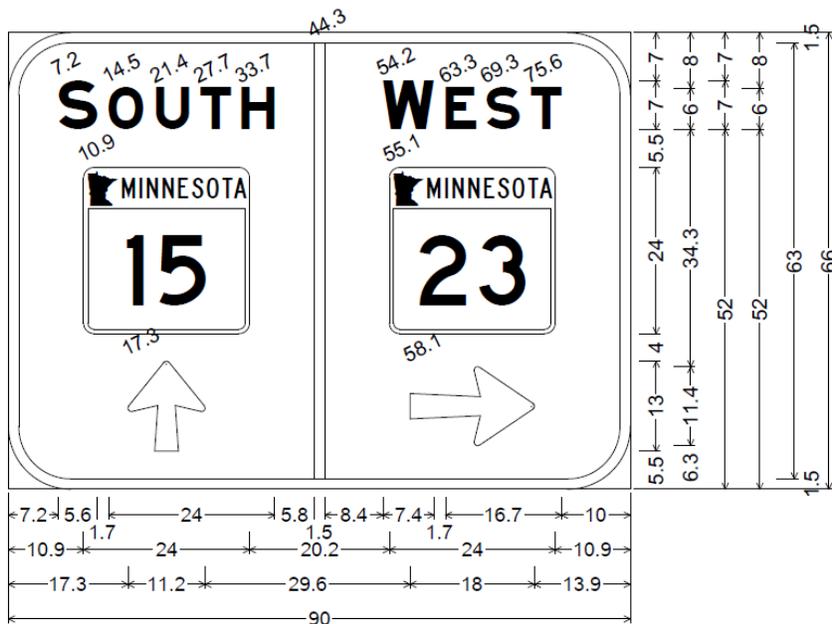
- ✓ Arrow size choice incorrect for layout
- ✓ Panel sections are different sizes (spacing based on cardinal text, not overlays)

Final Sign Panel



9.0" Radius, 1.5" Border, White on Green;
 "SOUTH" E Mod; "WEST" E Mod; Arrow 5 - 13.0" 90°;
 Arrow 14 - 18.0" 0°;

Alternative Panel Design



4.12.1 Example #9, Directional Sign (Split Panel) Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 1 text, 2 objects
- ✓ Overlay (**Exhibit 3-4**) = 24 OL, based on mast arm mounting
- ✓ Cardinal direction font height (**Exhibit 3-4**) = 7 first letter /6 other letters, based on mounting
- ✓ Arrows (**Exhibit 3-4 & Exhibit 3-10**) = 5-13 for vertical and 14-18 for horizontal, based on layout and mounting

1. Assume border = 1.5"

From top to bottom:

- 1.5" - top border
- 7" - text (first letter controls)
- 24" - overlay
- 13" - arrow (tallest arrow in row)
- 1.5" - bottom border

total of 47" of space needed for objects

2. Four spaces exist:

Two text spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (7"), between 3.5" and 5.25", use 4.5"

$2 * 4.5" = 9"$ of space required

Two vertical arrow spaces (E), less than (B), use 4"

$2 * 4" = 8"$ of space required

$9" + 8" = 17"$ of space required

3. $47" + 17" = 64"$

64" is not divisible by 6, round up to 66" → valid panel side

4. Spacing adjustments

Rounded Panel Height (66") - Step 3 totals (64") = 2"

Therefore, we need to add an additional 2" inches of spacing into the sign.

We can do this by adding 0.75" to each of the (B) spacings, bringing (B) to the maximum $\frac{3}{4}$ of font size, 5.25". Then split the remaining 0.5" among the two (E) spacing measurements.

5. Final vertical component and object spacing summary:

Border	1.5"
(B) Space	5.25"
(A ₁) Letter Height	7"
(B) Space	5.25"
Overlay Height	24"
(E) Space	4.25"
(C1) Arrow Height	13"
(E) Space	4.25"
Border	1.5"
TOTAL	66"

Horizontal Size of Panel and Spacing

Horizontal spacing for this sign is determined only by the overlays and border widths. There are four (D) spacings, two on each side of the two overlays. Each will be equally sized and equal to the text height used on the overlays, or approximately 40% of the overlay height.

To determine the spacing, add the widths of the objects along the middle row: 1.5" border)+ 10" (D) space + 24" overlay + 10" (D) space + 1.5" border + 10" (D) space + 24" overlay + 10" (D) space + 1.5" border = 92.5". Round this value down to 90" (a valid panel size) by removing 2.5" of space from the panel. Divide this amount equally into the four spacing (D) values to result in 9.375" of spacing on each side of the overlays.

Final horizontal component and object spacing summary (longest line):

Border	(D) Space	Overlay	(D) Space	Border	(D) Space	Overlay	(D) Space	Border	TOTAL
1.5"	9.375"	24"	9.375"	1.5"	9.375"	24"	9.375"	1.5"	90"

Key Placement Issues

- ✓ Use a 2 column and 3 row tabular arrangement to place objects in, and then place matrix on panel
- ✓ Equal spacing between overlays and borders

4.13 Example #10, Supplemental Sign (Split Panel)

Purpose of Example:

- ✓ Incorporating different colored panels into the same sign

Given Conditions:

- ✓ Posted speed limit: 40 mph
- ✓ Lane Configuration: Single Lane
- ✓ Intersections: At-Grade Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.



Return
to Index

Object and spacing values for this example:

A₁, A₂ = Letter height for proper names and distance numeral

A₃ = Letter height for distance word

B₁, B₂ = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

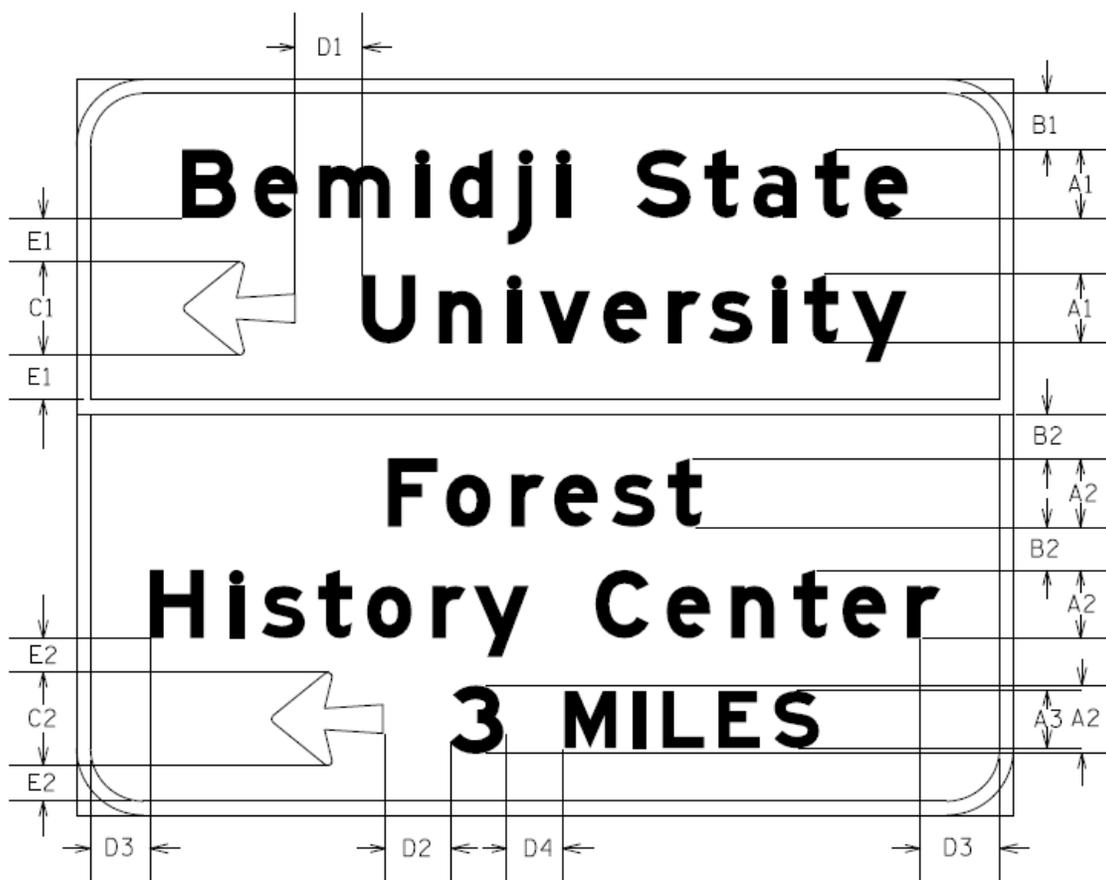
C₁, C₂ = Horizontal arrow height

D₁, D₂ = Horizontal spacing arrow to text (A₁, A₂)

D₃ = Horizontal spacing from inside border to text (approximately $\frac{3}{4} A$)

D₄ = Horizontal spacing between distance numeral and distance word (average of A₂ and A₃)

E₁, E₂ = Vertical spacing from arrow to text, or from arrow to inside border = less than B



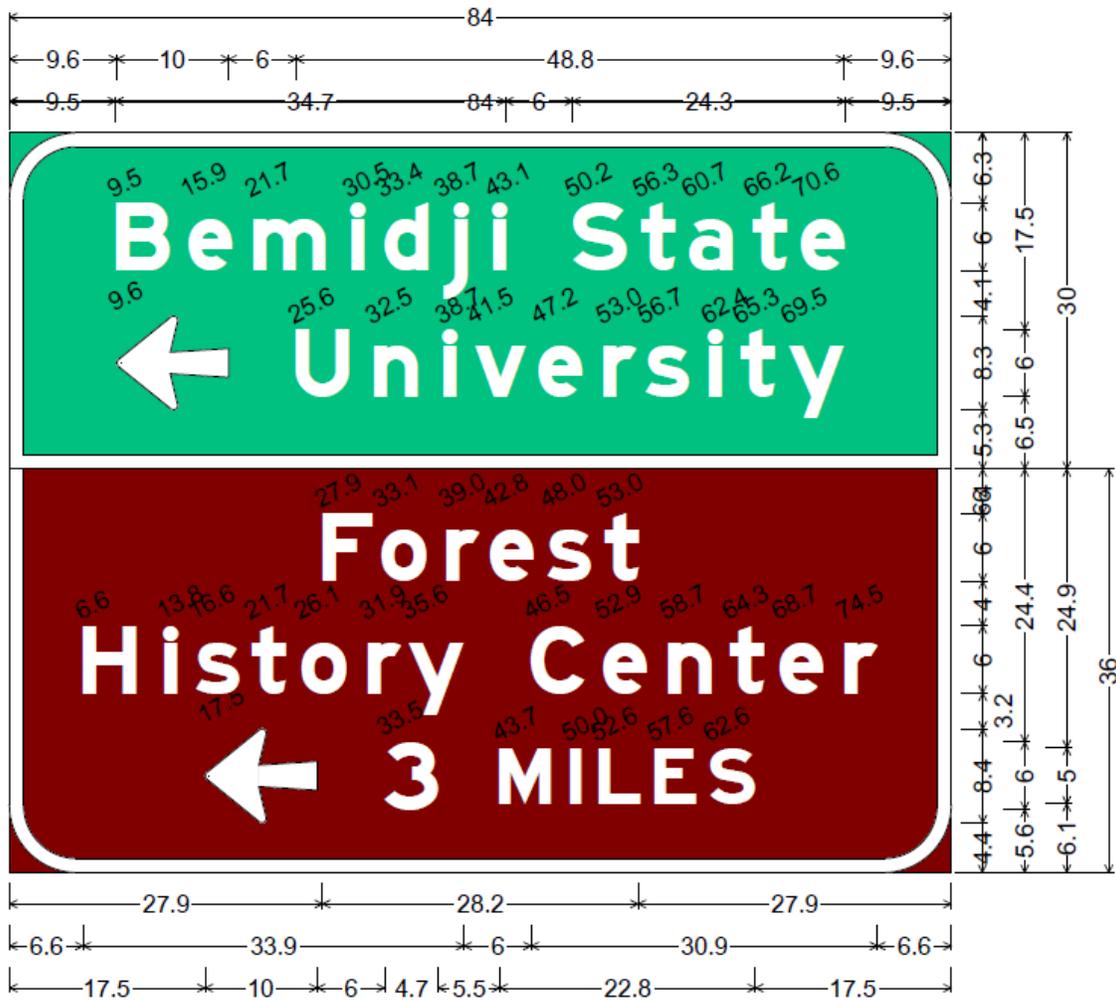
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color – green (college) and brown (history center), create one panel of each
 - Border color – white
2. Install components in the two panels
3. Double click on green panel
 - Border
 - Custom - Check Square Corner: Bottom Left, Bottom Right
4. Double click on brown panel
 - Border
 - Custom - Uncheck Display Border: Top
5. Place the panels next to each other, brown bottom to green top (this enables the multipanel functions)
6. Open each panel edit
 - General
 - Edit multipanel – Check Dimension as unit
 - Size
 - Enlarge to Fit when in Multipanel – Check Column width
7. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B_1 , B_2 , E_1 , and E_2
8. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D_1 , D_2 , and D_3

Typical Mistakes

- ✓ Not squaring the bottom corners of the top panel
- ✓ Not hiding the top border for the bottom panel
- ✓ The distance numeral and text are entered as the same text height, and the space between them (D_4) is incorrect

Final Sign Panel



EXAMPLE #10; 6.0" Radius, 1.3" Border, White on Green;
 "Bemidji State" E Mod; Arrow 3 - 10.0" 180°; "University" E Mod;
 6.0" Radius, 1.3" Border, White on Brown;
 "Forest" E Mod; "History Center" E Mod; Arrow 3 - 10.0" 180°; "3 MILES" E Mod;

Example #10, Supplemental Sign (Split Panel) Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 5 rows of components: 3 text, 2 object/text
- ✓ Font size (**Exhibit 3-4**) = 6-4.5, based on roadway, speed and number of lanes
- ✓ Arrow (**Exhibit 3-4 & Exhibit 3-10**) = 3-10 for horizontal arrows

Each panel needs to be designed separately:

Top (Green) Panel

Bottom (Brown) Panel

1. Assume border = 1.25"

1. Assume no top border

From top to bottom:

From top to bottom:

1.25" - border

6" - text

6" - text

6" - text

8.35" - arrow

8.35" - arrow

1.25" - border

1.25" - border

total of 16.85" for components

total of 21.6" for components

2. Three spaces exist:

2. Three spaces exist:

One text space (B_1) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size
(6") = 3"- 4.5", use 4.5"

Two text spaces (B_2) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size
(6") = 3"- 4.5", use 4.5"

1 (4.5") = 4.5" of space required

2 (4.5") = 9" of space required

Two arrow spaces (E_1) = less than (B)

Two arrow spaces (E_2) = less than (B)

Use (E) = 4"

Use (E) = 4"

2 * 4" = 8" of space required

2 * 4" = 8" of space required

4.5" + 8" = 12.5" of space required

9" + 8" = 17" of space required

3. $16.85" + 12.5" = 29.35"$

3. $21.6" + 17" = 38.6"$

29.35" is not divisible by 6, round to closest, use 30" → valid panel size

38.6" is not divisible by 6, round to closest, use 36" → valid panel size

4. Spacing adjustments

Rounded Panel Height (30") - Step 3 totals (29.35") = 0.65"

Therefore, add 0.65" inches of spacing. Add 0.5" to (B₁) and 0.075" to each (E₁) measurement.

4. Spacing adjustments

Rounded Panel Height (36") - Step 3 totals (38.6") = -2.6"

Therefore, subtract 2.6" inches of spacing from the sign. Accomplish this by subtracting 0.5" from each (B₂) measurement, and by removing 0.8" from each of the (E₂) measurements.

5. Final vertical component and object spacing summary:

Top (Green) Panel

Bottom (Brown) Panel

Border	1.25"
(B ₁) Space	5"
(A ₁) Letter Height	6"
(E ₁) Space	4.075"
(C ₁) Arrow Height	8.35"
(E ₁) Space	4.075"
Border	1.25"
SUBTOTAL	30"

No Border	0"
(B ₂) Space	4"
(A ₁) Letter Height	6"
(B ₂) Space	4"
Letter Height	6"
(E ₂) Space	3.2"
(C ₂) Arrow Height	8.35"
(E ₂) Space	3.2"
Border	1.25"
SUBTOTAL	36"

Attach the sign panels to reach a combined panel height of 66"

Horizontal Size of Panel and Spacing

Use ½ to ¾ font size as horizontal spacing between inside of border and text, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The History Center line is the longest component. 1.25" border + 4" (D₃) space + 33.9" History + 6" space + 30.9" Center + 4" (D₃) space + 1.25" border → 81.3", use 84". This will automatically increase the outer spaces by 1.35" each.

Horizontal spacing from the arrows to the text should be text size (6"). Spacing between distance numeral and distance word is the average of the two text sizes.

Final horizontal component and object spacing summary (longest line):

Border	(D ₃) Space	History	Text Space	Center	(D ₃) Space	Border	TOTAL
1.25"	5.35"	33.9"	6"	30.9"	5.35"	1.25"	84"

Key Placement Issues

- ✓ Create two panels and design their vertical spacing separately instead of together as one sign.
- ✓ Make sure that the green bottom corners are squared, and the top of the brown panel has no border displayed.
- ✓ Join the two signs and under Edit Multipanel, check Dimension as Unit.

4.14 Example #11, Junction Sign

Purpose of Example:

- ✓ *This is a standardized format. Use SignCAD guide sign templates and customize rather than designing the panel from scratch.*



Return
to Index

Given Conditions:

- ✓ Posted speed limit: 55 mph
- ✓ Lane Configuration: Single Lane
- ✓ Intersections: At-Grade Only
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A = Letter height

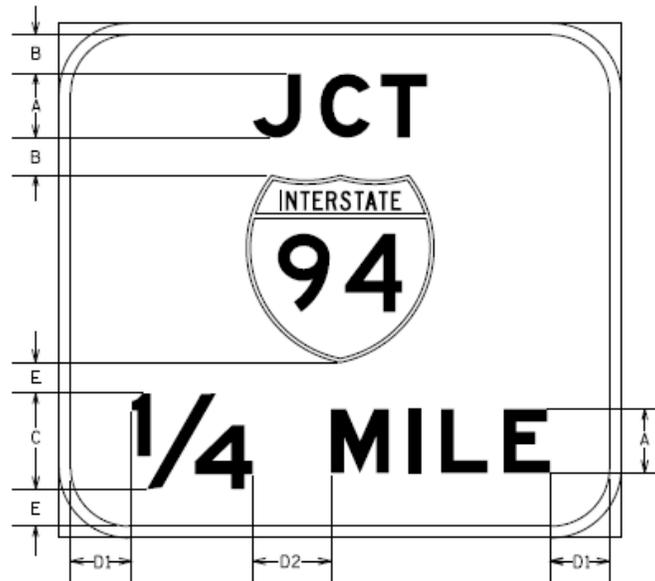
B = Vertical spacing from text to overlay, or text to inside border ($\frac{1}{2} A$ to $\frac{3}{4} A$)

C = Distance fraction height (1.5 A)

D_1 = Horizontal spacing from inside border to legend ($\frac{1}{2} A$ to $\frac{3}{4} A$)

D_2 = Horizontal spacing from distance fraction to distance word (average of A and C)

E = Vertical spacing from fraction to overlay, or from fraction to inside border (less than B)



SignCAD Methods:

1. Panel tool -

Sign type - guide

Panel color – green

Border color – white

2. Install components (JCT text and overlay)

3. Install distance fraction and distance word

Create the distance fraction by typing a space, then typing the distance, and then typing another space afterward.

After the fraction appears in the correct format, delete the spaces on each side of it.

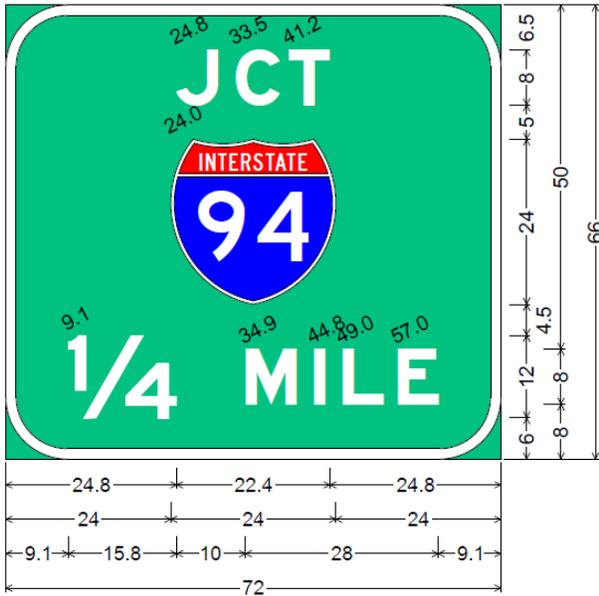
Change the text size for the “MILE” word and insert it after the distance fraction. It should not be included as part of the same text object as the distance fraction.

Modify object spacing so that the distance between the fraction and distance is the average of the two different text sizes.

Typical Mistakes

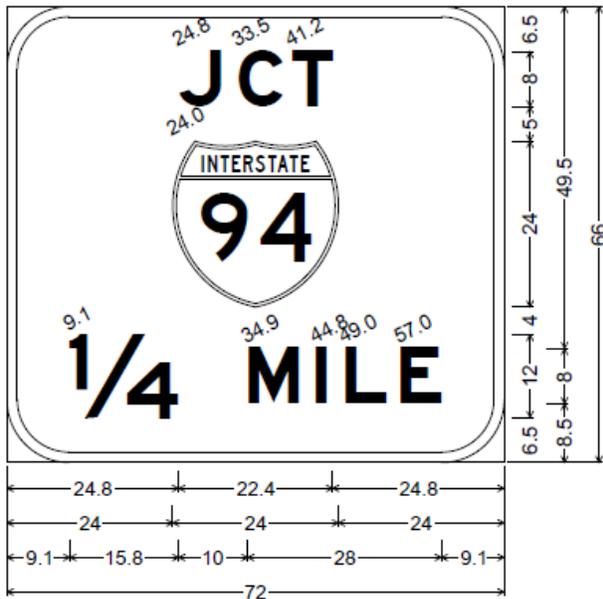
- ✓ Incorrect fraction design

Final Sign Panel



EXAMPLE #11;
 9.0" Radius, 1.5" Border, White on Green;
 "JCT" E Mod; "1/4 MILE" E Mod;

Alternative Panel Design



4.14.1 Example #11, Junction Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of objects (1 text, 1 overlay, 1 object/text)
- ✓ Font size (**Exhibit 3-4**) = 8, based on roadway, speed and number of lanes
- ✓ Overlay (**Exhibit 3-4**) = 24, based on roadway, speed and number of lanes

1. Assume border = 1.5"

From top to bottom:

1.5" - top border

8" - text

24" - overlay

12" - distance fraction

1.5" - bottom border

total of 47" of space needed for components

2. Four spaces exist:

Two text spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (8"), between 4" and 6", use 5"

$$2 * 5" = 10" \text{ of space required}$$

Two fraction spaces (E), less than (B), use 4"

$$2 * 4" = 8" \text{ of space required}$$

$$10" + 8" = 18" \text{ of space required}$$

3. $47" + 18" = 65"$

65" is not divisible by 6, round to closest, use 66" → valid panel size

4. Spacing adjustments

Rounded Panel Height (66") - Step 3 totals (65") = 1"

Therefore, we need to add an additional 1" of spacing into the sign.

We can do this by adding 0.5" to each of the (E) spacings.

Alternatively, one may choose to add the whole 1" to the bottom (E) space, further separating the line from the bottom border.

5. Final vertical component and object spacing summary:

Border	1.5"
(B) Space	5"
(A) Letter Height	8"
(B) Space	5"
Overlay Height	24"
(E) Space	4.5"
(C) Fraction Height	12"
(E) Space	4.5"
Border	1.5"
TOTAL	66"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use between ½ and ¾ of the font size as horizontal spacing between inside of border and text, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The ¼ MILE is the longest object and determines the width of the sign. 1.5" border + 7" (D₁) space + 15.8" ¼ + 10" (D₂) space + 28" MILE + 7" (D₁) space + 1.5" border → 70.8", round up to 72". SignCAD automatically will round up to 72" by increasing each (D₁) space to 7.6".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	¼	(D ₂) Space	MILE	(D ₁) Space	Border	TOTAL
1.5"	7.6"	15.8"	10"	28"	7.6"	1.5"	72"

Key Placement Issues

- ✓ Spaces used on each side of 1/4 to create correct fraction design
- ✓ Fraction is coded with a font size of 12"

4.15 Example #12, Exit Direction Sign

Purpose of Example:

- ✓ Freeway example
- ✓ Diagonal arrow



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 60 mph
- ✓ Lane Configuration; Divided Multilane
- ✓ Intersections: Grade Separated
- ✓ Sign Location: Overhead

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = City name letter height

A₂ = Cardinal direction letter height, first letter

A₃ = Cardinal direction letter height, rest of word

B = Vertical spacing from text to border, text to overlay, or from overlay to inside border ($\frac{1}{2} A_1$ to $\frac{3}{4} A_1$)

C = Horizontal width of diagonal arrow

D₁ = Horizontal spacing from inside border to text, or from text to diagonal arrow (approximately $\frac{3}{4} A_1$)

D₂ = Horizontal spacing from overlay to cardinal direction (A₃)

D₃ = Horizontal spacing from inside border to diagonal arrow (approximately $\frac{3}{4} A_1$, but typically = 12")



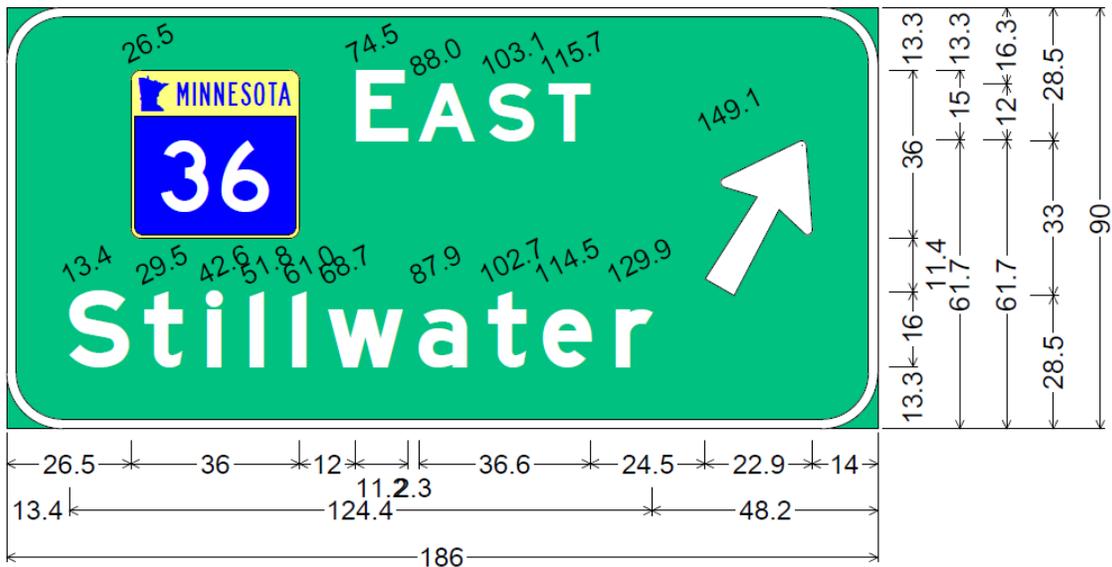
SignCAD Methods:

1. Panel tool –
 - Sign type – guide
 - Panel color – green
 - Border color - white
2. Text tool –
 - Font – E modified
 - Size – 15 E modified for EAST first letter, 12 other letters; 16-12 E modified for Stillwater
 - Proper name – Upper-lower case
3. Arrow tool –
 - Angle – 60 degrees
 - Arrowhead – 17 (17-36 arrow)
4. Install components into panel one at a time with the arrow last
5. Right justify arrow
6. Top align EAST – Right/click, object align top
7. Baseline align EAST – Right/click, text align baseline
8. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B
9. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D_1 , D_2 , and D_3

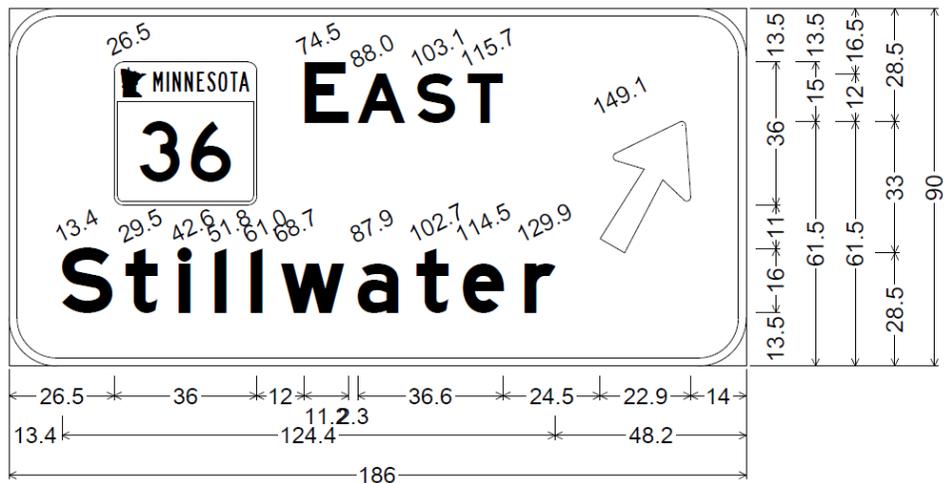
Typical Mistakes

- ✓ Arrow angle incorrect
- ✓ Cardinal direction not top aligned on overlay
- ✓ Cardinal direction not text-aligned baseline

Final Sign Panel



Alternative Panel Design



4.15.1 Example #12, Exit Direction Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 2 rows of components: 1 object/text , 1 text
- ✓ Overlay (**Exhibit 3-5**) = 36, based on freeway and overhead position
- ✓ Font size (**Exhibit 3-5**) = 16-12, based on freeway and overhead position
- ✓ Cardinal Direction Font Size (**Exhibit 3-5**) = 15 first letter / 12 other letters
- ✓ Arrow (**Exhibit 3-5**) = 17-36, based on roadway and sign type

1. Assume border = 2"

From top to bottom:

2" - top border

36" - overlay

16" - legend

2" - bottom border

total of 56" of space needed for objects

2. Three spaces exist @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (16") = 8" to 12", use 11"

$3 * 11 = 33"$ of space required

3. $56" + 33" = 89"$

89" is not divisible by 6, round to closest, use 90" → valid panel size

4. Spacing adjustments

Rounded Panel Height (90") - Step 3 totals (89") = 1"

Therefore, we need to add 1" of spacing into the sign.

This should be done by adding 0.33" to each of the (B) spacing values.

Alternatively, one may choose to add 0.5" to each top and bottom (B) spacing values.

5. Final vertical component and object spacing summary:

Border	2"
(B) Space	11.33"
Overlay Height	36"
(B) Space	11.33"
(A ₁) Letter Height	16"
(B) Space	11.33"
Border	2"
TOTAL	90"

Horizontal Size of Panel and Spacing

Once the vertical spacing is determined the horizontal spacing is based on the longest object. The arrow is spaced 12" from inside the right border. Use approximately between ½ and ¾ of the font size (16") as horizontal spacing on either side of the city name, remember that panels are sized in 6" increments.

Stillwater and the arrow are the longest objects across the panel. 2" border)+ 10" (D₁) space + 124.4" Stillwater + 10" (D₁) space + 22.9" arrow + 12" (D₃) space + 2" border → 183.3", round up to 186". Add an extra 1.35" into each (D₁) space to get 11.35".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Stillwater	(D ₁) Space	(C) Arrow	(D ₃) Space	Border	TOTAL
2"	11.35"	124.4"	11.35"	22.9"	12"	2"	186"

Key Placement Issues

- ✓ Sequence of installing components: Arrow installed last
- ✓ Fixing arrow position to right side
- ✓ EAST is top and baseline aligned

4.16 Example #13, Exit Direction Sign w/ Exit Only Panel

Purpose of Example:

- ✓ Freeway design
- ✓ Exit only
- ✓ Multipanel



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit = 60 mph
- ✓ Lane Configuration = Divided Multilane
- ✓ Intersections: Grade Separated Interchange
- ✓ Sign Location: Overhead

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Street name letter height

A₂ = EXIT ONLY letter height

B₁ = Vertical spacing from overlay to text, or from overlay to inside border ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

B₂ = Vertical spacing from text to text, or from text to inside border ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

C = Arrow height

D₁ = Horizontal spacing from inside border to text (approximately $\frac{3}{4}$ A₁)

D₂ = Horizontal spacing from arrow to text (A₂)

D₃ = Horizontal spacing from inside border to text

E = Vertical spacing from arrow to inside border



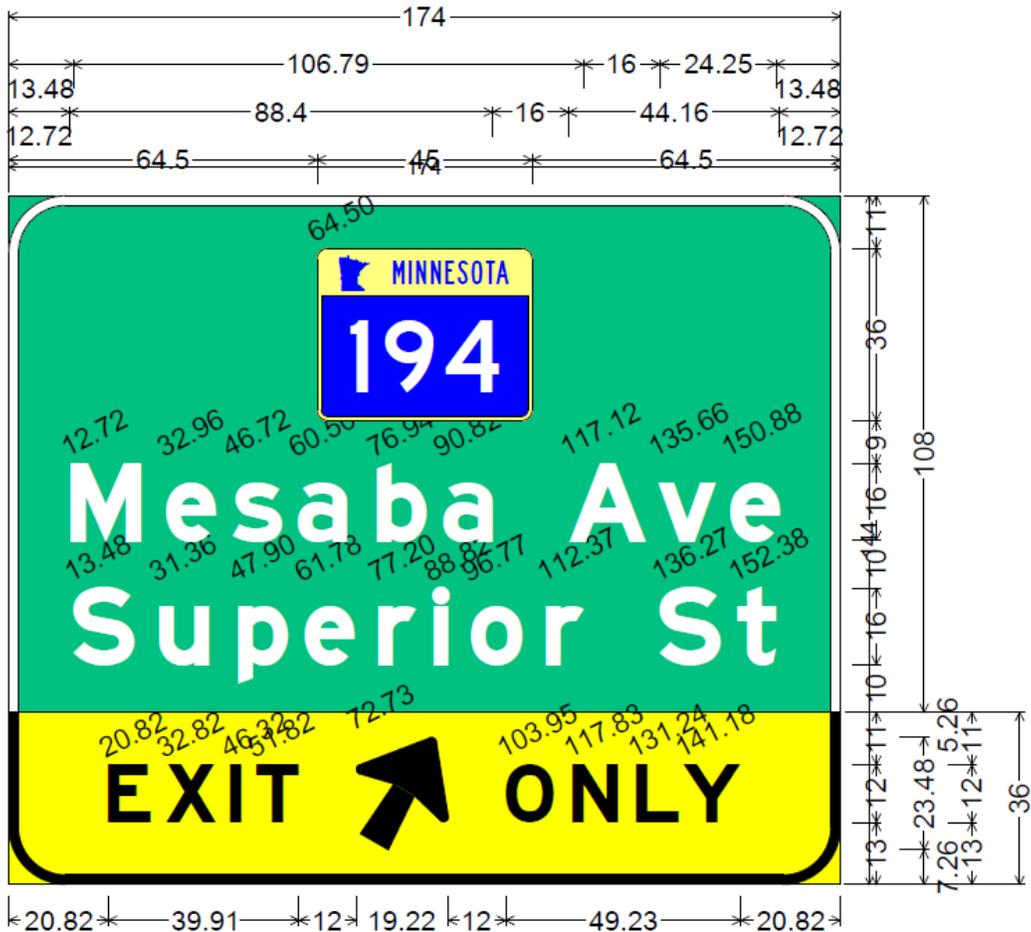
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color – green (guide section) and yellow (exit only section), create one panel of each
 - Border color – white (for the green panel) and black (for the yellow panel)
2. Install components in the two panels
3. Double click on green panel
 - Border
 - Custom - Check Square Corner: Bottom Left, Bottom Right
 - Custom – Uncheck Display Border: Bottom
4. Double click on yellow panel
 - Border
 - Custom - Uncheck Display Border: Top
5. Place the panels next to each other, yellow bottom to green top (this enables the multipanel functions)
6. Open each panel edit
 - General
 - Edit multipanel – Check Dimension as unit
 - Size
 - Enlarge to Fit when in Multipanel – Check Column width
9. Adjust vertical spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for B_1 , B_2 , and E
10. Adjust horizontal spacing
 - Right mouse click on object to be spaced - select object spacing (left click)
 - Enter calculated values for D_1 and D_2 ; D_3 should be automatic with centering of line

Typical Mistakes

- ✓ Panel calculations done as one panel instead of two separate panels

Final Sign Panel



20.82 39.91 12 19.22 12 49.23 20.82
 12.00" Radius, 2.00" Border, White on Green;
 "Mesaba Ave" E Mod; "Superior St" E Mod;
 12.00" Radius, 2.00" Border, Black on Yellow;
 "EXIT" E Mod: Arrow 8 - 25.00" 60°: "ONLY" E Mod:

4.16.1 Example #13, Exit Direction Sign w/ Exit Only Panel Calculations

Given:

- ✓ 4 rows of components: 1 object, 2 text, 1 object/text
- ✓ Font size (**Exhibit 3-5**) = 16-12, based on roadway, speed and number of lanes
- ✓ Arrow (**Exhibit 3-5**) = 3-10 for horizontal arrows
- ✓ EXIT ONLY panel height = 36"

Each panel needs to be designed separately:

Top (Green) Panel	Bottom (Yellow) Panel
<p>1. Assume no bottom border</p> <p style="padding-left: 40px;">From top to bottom:</p> <p style="padding-left: 80px;">2" - border</p> <p style="padding-left: 80px;">36" - overlay</p> <p style="padding-left: 80px;">16" - text</p> <p style="padding-left: 80px;">16" - text</p> <p style="padding-left: 40px;">total of 70" for components</p>	<p>1. Assume no top border</p> <p style="padding-left: 40px;">From top to bottom:</p> <p style="padding-left: 80px;">23.48" - diagonal arrow</p> <p style="padding-left: 80px;">2" - bottom border</p> <p style="padding-left: 40px;">total of 25.48" for components</p>
<p>2. Four spaces exist:</p> <p style="padding-left: 40px;">Two overlay spaces (B_1) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (16") = 8" to 12", use 10"</p> <p style="padding-left: 80px;">$2 * 10" = 20"$ of space required</p> <p style="padding-left: 40px;">Two text spaces (B_2) = @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (16") = 8" to 12", use 10"</p> <p style="padding-left: 80px;">$2 * 10" = 20"$ of space required</p> <p style="padding-left: 40px;">$20" + 20" = 40"$ of space required</p>	<p>2. Two spaces exist:</p> <p style="padding-left: 40px;">Two arrow spaces (E) =</p> <p style="padding-left: 80px;">Use (E) = 6"</p> <p style="padding-left: 40px;">$2 * 6" = 12"$ of space required</p>
<p>3. $70" + 40" = 110"$</p> <p style="padding-left: 40px;">110" is not divisible by 6, round to closest, use 108" → valid panel size</p>	<p>3. $25.48" + 12" = 37.48"$</p> <p style="padding-left: 40px;">37.48" is not divisible by 6, round to closest, use 36" → valid panel size</p>

4. Spacing adjustments

Rounded Panel Height (108") - Step 3 totals (110") = -2.0"

Therefore, subtract 2" of spacing from the sign by removing 1" from each (B₁) measurement. (Space around text is more important than space around overlays for legibility reasons, so (B₂) should remain the same.)

5. Final vertical spacing summary:

Top (Green) Panel

Border	2"
(B ₁) Space	9"
Overlay Height	36"
(B ₁) Space	9"
(A) Letter Height	16"
(B ₂) Space	10"
(A) Letter Height	16"
(B ₂) Space	10"
No Border	0"

4. Spacing adjustments

Rounded Panel Height (36") - Step 3 totals (37.4") = -1.48"

Therefore, subtract 1.48" inches of spacing from the sign. Accomplish this by subtracting 0.74" from each (E) measurement.

(SignCAD's default object spacing of 4" around the arrow will actually achieve the correct panel height in this case.)

5. Final vertical spacing summary:

Bottom (Yellow) Panel

SUBTOTAL	108"
No Border	0"
(E) Space	5.26"
(C) Arrow Height	23.48"
(E) Space	5.26"
Border	2"
SUBTOTAL	36"

Attach the sign panels to reach a combined panel height of 144".

Horizontal Size of Panel and Spacing

Use approximately between ½ and ¾ font size as horizontal spacing between inside of border and text, remember that panels are sized in 6” increments. Additionally, be sure to check panel size against U-Post Spacing charts to verify desirable installation on a new or existing structure.

The Mesaba Ave line is the longest component; horizontal spacing on either side of this should be used to determine panel width. 2” border + 10” (D₁) space + 88.4” Mesaba + 16” space + 44.2” Ave + 10” (D₁) space + 2” border → 172.6”, round up to 174”. The panel will automatically round up to this size and increase the outer spaces by 0.7” each.

The width of the EXIT ONLY panel will match that of the top panel once attached. Set the (D₂) spacing values equal to the (A₂) text height, (12”). By default, the text and arrow will be centered on the panel, allowing the horizontal spacing from the text to inside border (D₃) to be automatically set.

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Mesaba	Text Space	Ave	(D ₁)	Border	TOTAL
2”	10.7”	88.4”	16”	44.2”	10.7”	2”	174”

Key Placement Issues

Create two panels and design their vertical spacing separately instead of together as one sign.

4.17 Example #14, Freeway Junction (Advance Guide) Sign

Purpose of Example:

- ✓ Selection of freeway sign components
- ✓ Placement and spacing of overlays
- ✓ Placement of fractions
- ✓ Horizontal and vertical spacing of fractions



Return
to Index

Given Conditions:

- ✓ Posted speed limit: 65 mph
- ✓ Lane Configuration: Divided Multilane
- ✓ Intersections: Grade Separated Interchanges
- ✓ Sign Location: Ground
- ✓ Roadway Classification: Interstate

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Destination letter height

A₂ = Distance word letter height

B = Vertical spacing from text/overlay to text, or from text/overlay to inside border ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

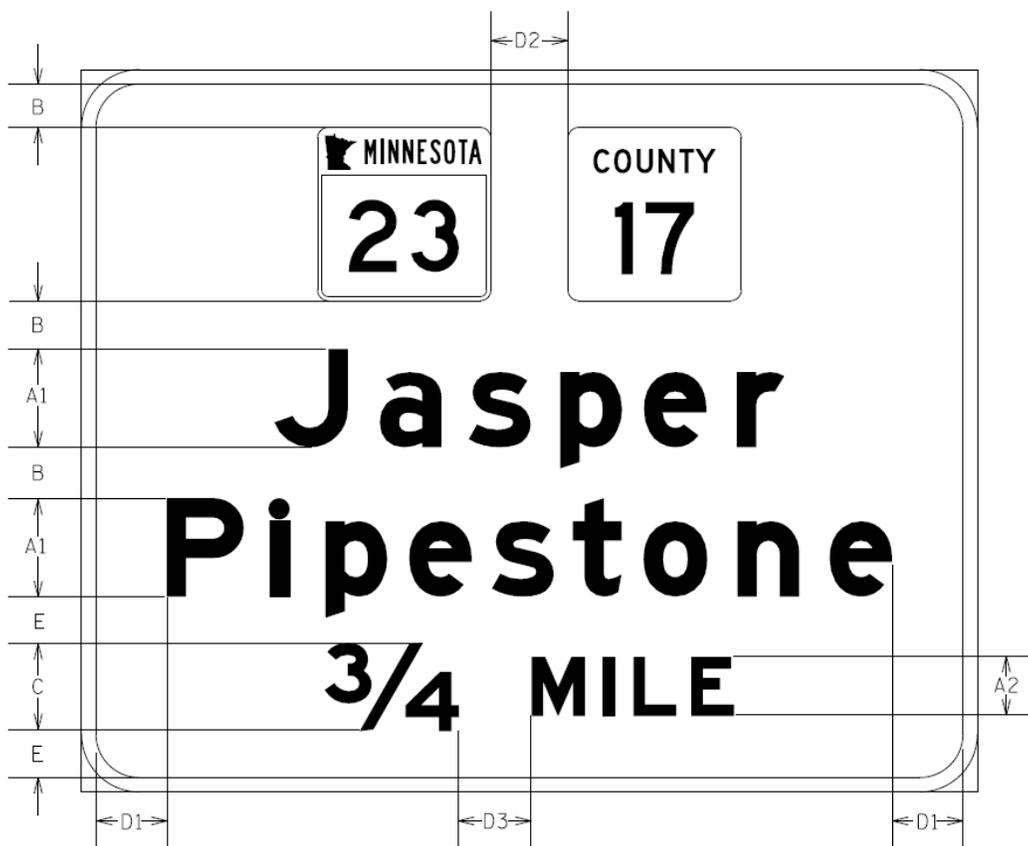
C = Distance fraction height

D₁ = Horizontal spacing from inside border to text ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

D₂ = Horizontal spacing from overlay to overlay (approximately $\frac{3}{4}$ A₁)

D₃ = Horizontal spacing from distance fraction to distance word (average of A₂ & C)

E = Vertical spacing from object to inside border (less than B)



SignCAD Methods:

1. Panel tool -

Sign type - guide

Panel color - green

Border color - white

2. Install legend and object components into panel one at a time

Create the distance fraction by typing a space, then typing the distance, and then typing another space afterward.

After the fraction appears in the correct format, delete the spaces on each side of it.

Change the text size for the "MILE" word and insert it after the distance fraction. It should not be included as part of the same text object as the distance fraction.

Modify object spacing so that the distance between the fraction and distance is the average of the two different text sizes.

3. Adjust vertical spacing

Object spacing for the fraction will control over the MILE text because it is taller

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for B and E

4. Adjust horizontal spacing

Spacing near the fraction and overlays will likely need to be adjusted from the default

Right mouse click on object to be spaced - select object spacing (left click)

Enter calculated values for D_1 , D_2 , and D_3



Return to
Index

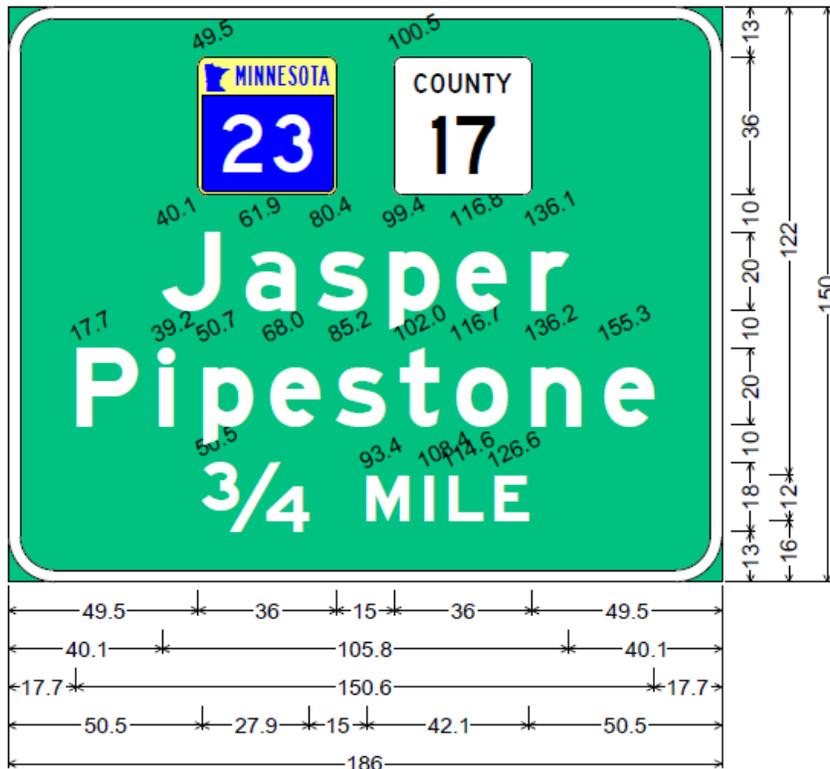
Typical Mistakes

- ✓ Fraction not formatted correctly, is wrong size, or spacing between it and MILE is incorrect
- ✓ MILE is incorrectly placed with the same font size as the distance numeral/fraction.

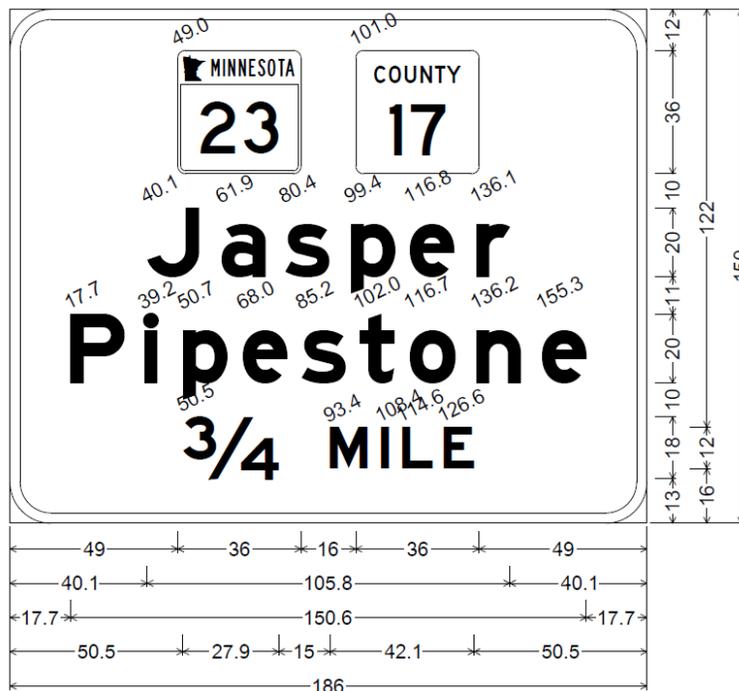
Key Placement Issues

- ✓ $\frac{3}{4}$ and MILE are both horizontally and vertically centered on their line.

Final Sign Panel



Alternative Panel Design



4.17.1 Example #14, Freeway Junction (Advance Guide) Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 4 rows of components: 1 object, 2 text, 1 object/text
- ✓ Overlay size = 36"
- ✓ Destination font size (**Exhibit 3-5**) = 20-15, based on ground mount, Interstate classification
- ✓ Distance (fraction) font size (**Exhibit 3-5**) = 18 based on ground mount, Interstate classification
- ✓ Distance (word) font size (**Exhibit 3-5**) = 12 based on ground mount, Interstate classification

1. Assume border = 3" (**Exhibit 3-2**)

From top to bottom:

3" – top border

36" – overlays

20" – first line of text

20" – second line of text

18" – distance fraction

3" – bottom border

total of 100" needed for components

2. Five spaces exist:

Three text/marker spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (20"), between 10" and 15", use 10"

$3 * 10" = 30"$ of space required

Two fraction spaces (E), less than (B) = 9"

$2 * 9" = 18"$ of space required

$30" + 18" = 48"$

3. $100" + 48" = 148"$

148" is between 144" and 150" (valid panel sizes), round up to 150"

4. Spacing adjustments

Rounded Panel Height (150") - Step 3 totals (148") = 2"

Therefore, we need to add an additional 2" inches of spacing into the sign.

There are several ways to accomplish this. For this example, the chosen solution is to add the extra 2" by splitting them evenly among the two (E) measurements. This will make each of the (B) and (E) measurements equivalent.

An alternative design involves making the (B) space above the overlay smaller by 1", and relocating this toward the center of the sign, further separating the two city names.

5. Final vertical component and object spacing summary:

Border	3"
(B) Space	10"
Overlay Height	36"
(B) Space	10"
(A ₁) Letter Height	20"
(B) Space	10"
(A ₁) Letter Height	20"
(E) Space	10"
(C) Fraction Height	18"
(E) Space	10"
Border	3"
TOTAL	150"

Horizontal Size of Panel and Spacing

Use between ½ and ¾ of the font size as horizontal spacing between inside of border and legend/objects. Remember that panels are sized in 6" increments.

The second text line (Pipestone) is the longest; horizontal spacing defaults to 20" (font size). 3" border + 14" (D₁) space + 150.6" Pipestone + 14" (D₁) space + 3" border → 184.6". Round up to the closest 6" increment, which is 186". SignCAD will automatically round the panel and force the D₁ spaces to 14.7".

Spacing between the fraction (3/4) and the text (MILE) should be the average of the two font sizes (18" and 12", respectively). This leads to a spacing of 15". Spacing between the overlays should be approximately ¾ font size, or 15".

Final horizontal component and object spacing summary (longest line):

Border	(D ₁) Space	Pipestone	(D ₁) Space	Border	TOTAL
3"	14.7"	150.6"	14.7"	3"	186"

4.18 Example #15, Overhead Advance Guide Sign w/ Exit Only Panel

Purpose of Example:

- ✓ Positioning of down arrows for multiple lanes
- ✓ Multipanel design
- ✓ Accounting for maximum allowable panel height on Type OH signs



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 60 mph
- ✓ Lane Configuration: Divided Multilane
- ✓ Intersections: Grade Separated
- ✓ Sign Location: Overhead
- ✓ Maximum allowable panel height = 13 feet (156 inches)
- ✓ Down arrows shall be positioned so that their points are within 18 inches of the center of the lane. (Perfect positioning between two arrows is 144" on center, though this is not possible in all cases.)

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Street name letter height

A₂ = Cardinal direction letter height, first letter

A₃ = Cardinal direction letter height, rest of word

A₄ = Distance word letter height

A₅ = EXIT ONLY letter height

B₁ = Vertical spacing from overlay to text, or from overlay to border ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

B₂ = Vertical spacing from text to text, or from text to border ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

C₁ = Distance fraction height

C₂ = Arrow height

D₁ = Horizontal spacing from inside border to text ($\frac{1}{2}$ A₁ to $\frac{3}{4}$ A₁)

D₂ = Horizontal spacing from overlay to cardinal direction (A₃)

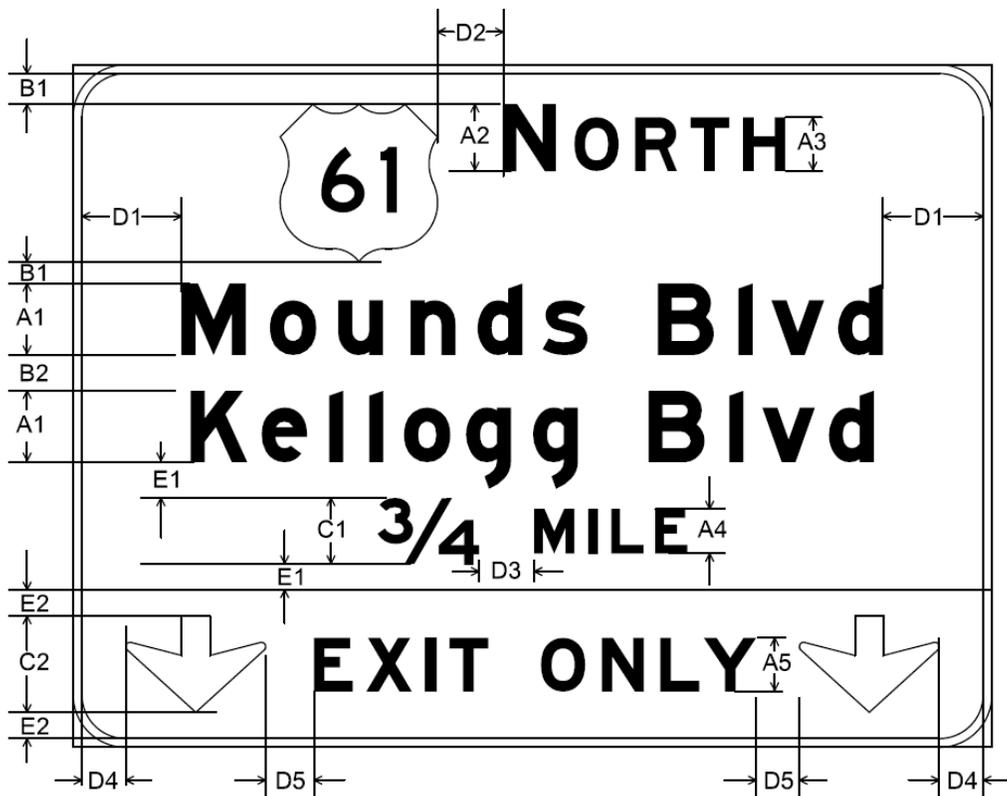
D₃ = Horizontal spacing from distance fraction to distance word (average of C₁ and A₄)

D₄ = Horizontal spacing from down arrows to inside border (10" minimum)

D₅ = Horizontal spacing between down arrows to EXIT ONLY word ($\frac{3}{4}$ A₅ minimum)

E₁ = Vertical spacing from fraction to text, or fraction to edge of border (less than B₂)

E₂ = Vertical spacing from arrow to edge of yellow panel/border (6" minimum)



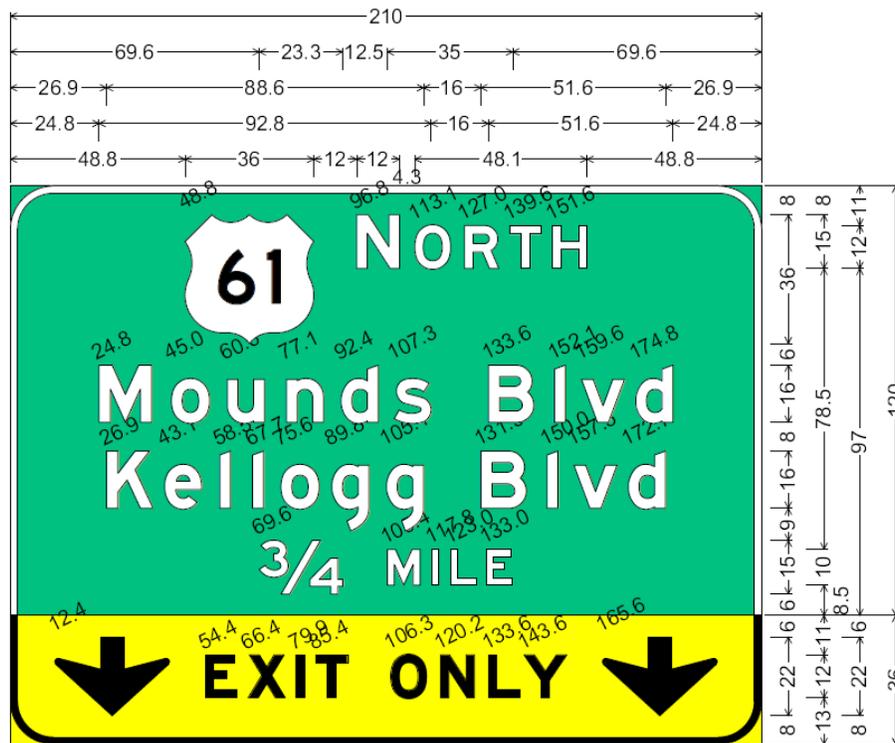
SignCAD Methods:

1. Panel tool -
 - Sign type - guide
 - Panel color – green (guide section) and yellow (exit only section), create one panel of each
 - Border color – white (for the green panel) and black (for the yellow panel)
2. Install components in the two panels
3. Create distance fraction as done in previous examples
4. Double click on green panel
 - Border
 - Custom - Check Square Corner: Bottom Left, Bottom Right
 - Custom – Uncheck Display Border: Bottom
5. Double click on yellow panel
 - Border
 - Custom - Uncheck Display Border: Top
6. Place the panels next to each other, yellow bottom to green top (this enables the multipanel functions)
7. Open each panel edit
 - General
 - Edit multipanel – Check Dimension as unit
 - Size
 - Enlarge to Fit when in Multipanel – Check Column width
8. Adjust vertical spacing
9. Adjust horizontal spacing

Typical Mistakes

- ✓ Cardinal direction is not top justified
- ✓ Panel calculations done as one panel instead of two separate panels
- ✓ Panel is designed taller than 156” which is the maximum sign panel height for Type OH signs

Final Sign Panel



12.4 32 10 39.9 12 49.3 10 32 12.4
 12.0" Radius, 2.0" Border, White on Green;
 "NORTH" E Mod; "Mounds Blvd" E Mod; "Kellogg Blvd" E Mod; "3/4" E Mod;
 "MILE" E Mod;
 12.0" Radius, 2.0" Border, Black on Yellow;
 Down Arrow 22.0" 270°; "EXIT ONLY" E Mod; Down Arrow 22.0" 270°;

Alternative Panel Design



12.0" Radius, 2.0" Border, White on Green;

4.18.1 Example #15, Overhead Advance Guide Sign w/ Exit Only Panel Calculations

Given:

- ✓ 5 rows of components: 3 object/text, 2 text
- ✓ City name font size (**Exhibit 3-5**) = 16-12
- ✓ Cardinal direction font size (**Exhibit 3-5**) = 15-12
- ✓ Distance message font size (**Exhibit 3-5**) = 15 for distance fraction, 10 for distance word
- ✓ Arrow (**Exhibit 3-5**) = 22-32 for down arrows
- ✓ Max panel height is 156". EXIT ONLY (yellow) portion is 36" → guide panel (green) max = 120"

Each panel needs to be designed separately:

Top (Green) Panel

Bottom (Yellow) Panel

1. Assume no bottom border

1. Assume no top border

From top to bottom:

From top to bottom:

2" - border

22" - down arrow

36" - overlay

2" - bottom border

16" - text

16" - text

15" - fraction

total of 85" for components

total of 24" for components

2. Five spaces exist:

2. Two spaces exist:

Two overlay spaces (B_1) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (15") = 7.5" - 11.25", use 8"

Two arrow spaces (E_2) total = space necessary to make EXIT ONLY panel height equal to 36"

2 (8") = 16" of space required

36" panel - 24" components = 12" space.

One text space (B_2) = @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (16") = 8" to 12", use 8"

12" / 2 spaces = 6" for (E_2)

1 * 8" = 8" of space required

Two fraction spaces (E_1), less than (B) = 7"

2 * 7" = 14" of space required

16" + 8" + 14 = 38" of total space required

2 * 6" = 12" of space total

3. 85" + 38" = 123"

123" is larger than the maximum 120" for this part of the sign so we must remove 3" of spacing from what we would typically use for designing signs.

- 3. $24" + 12" = 36"$
 → valid EXIT ONLY panel size

4. Spacing adjustments

We should give more space than typical to the top (E₁) space, since the low hanging "g" in the word Kellogg takes up extra room.

Take 2" away from each (B₁) spacing around the route marker. Take another 1" from the bottom (E₁) space.

This has removed 5" space from the sign but we only needed to remove 3". Add the extra remaining 2" of space to the top (E₁) to get better spacing between the "g" and the distance message.

4. Spacing adjustments

No spacing adjustments necessary

5. Final vertical component and object spacing summary:

Top (Green) Panel

Border	2"
(B ₁) Space	6"
Overlay Height	36"
(B ₁) Space	6"
(A ₁) Letter Height	16"
(B ₂) Space	8"
(A ₁) Letter Height	16"
(E ₁) Space	9"
(C ₁) Fraction Height	15"
(E ₁) Space	6"
No Border	0"
SUBTOTAL	120"

5. Final vertical component and object spacing summary:

Bottom (Yellow) Panel

No Border	0"
(E ₂) Space	6"
(C ₂) Arrow Height	22"
(E ₂) Space	6"
Border	2"
SUBTOTAL	36"

Attach the sign panels to reach a combined panel height of 156".

Horizontal Size of Panel and Spacing

The (D₁) spacing is not affected by object spacing in this example because the longest line of components on the sign is in the EXIT ONLY panel. Therefore, it is just centered horizontally on the green panel.

The (D₂) spacing between the route marker and the cardinal direction should be 12”.

The (D₃) spacing between the distance fraction (¾) and the distance word (MILE) is the average of the two component heights. Since the fraction height is 15” and the distance word is 10”, the average = (15+10)/2 = 12.5”.

The longest line of components is the one containing the EXIT ONLY message and therefore it controls the width of the panel. 2” border + 10” (D₄) space + 32” down arrow + 10” (D₅) space + 39.9” EXIT + 12” default text space + 49.3” ONLY + 10” (D₅) space + 32” down arrow + 10” (D₄) space + 2” border → 209.2”, round to 210”. The panel will automatically round up to this size and increase the (D₄) spaces by 0.4” each.

The width of the top green panel will match that of the EXIT ONLY panel once attached, as long as the top panel is set to “Enlarge to Fit When In Multipanel”.

Final horizontal component and object spacing summary (longest line):

Border	(D ₄) Space	Arrow	(D ₅) Space	EXIT	Text Space	ONLY	(D ₅) Space	Arrow	(D ₄) Space	Border	TOTAL
2”	10.4”	32”	10”	39.9”	12”	49.3”	10”	32”	10.4”	2”	210”

Key Placement Issues

Create two panels and design their vertical spacing separately instead of together as one sign.

4.19 Example #16, Advance Entrance Direction Sign for Interchange Crossroad

Purpose of Example:

- ✓ Advanced horizontal spacing methods
- ✓ Use of rectangle, line, and tabular arrangement tools
- ✓ Centering a vertical line below a route marker overlay



Return
to Index

Given Conditions:

- ✓ Posted Speed Limit: 50 mph
- ✓ Lane Configuration: Undivided Multilane
- ✓ Intersections: At-Grade
- ✓ Sign Location: Ground

Example Task:

- ✓ Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

Object and spacing values for this example:

A₁ = Cardinal direction letter height, first letter

A₂ = Cardinal direction letter height, rest of word

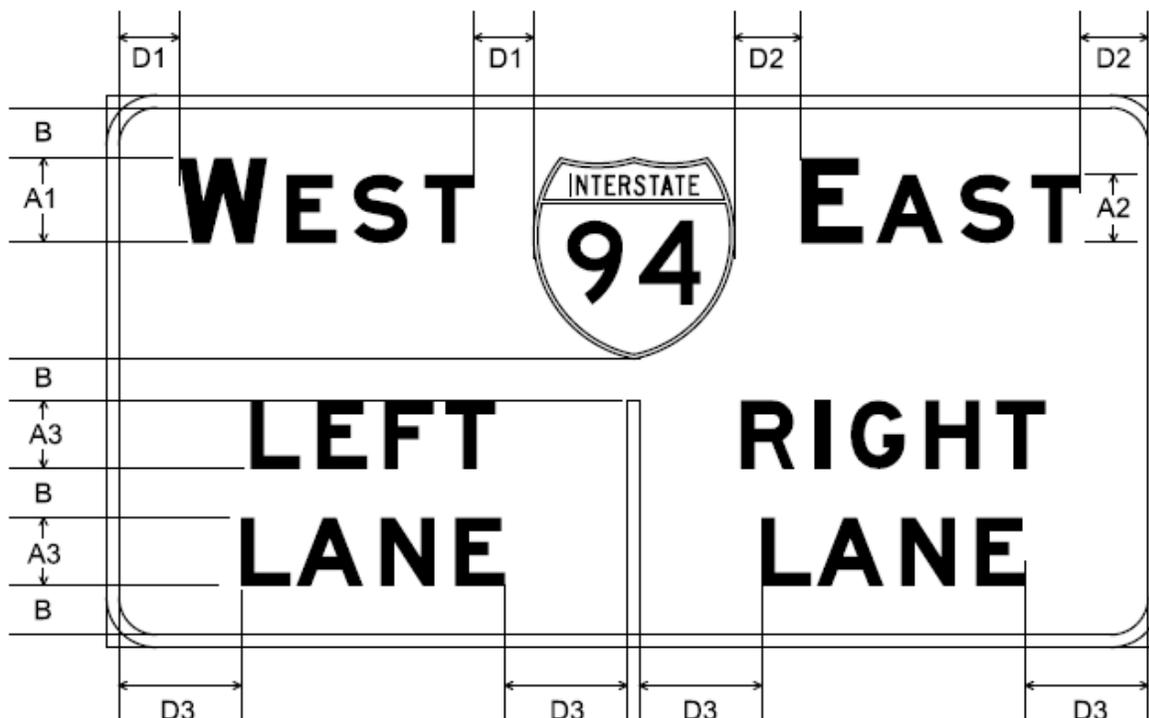
A₃ = Letter height for action word

B = Vertical spacing between inside borders, overlays, and text components ($\frac{1}{2} A_{2(3)}$ to $\frac{3}{4} A_{2(3)}$)

D₁ = Horizontal spacing on each side of the left side cardinal direction ($\frac{3}{4} A_2$ to A_2)

D₂ = Horizontal spacing on each side of the right side cardinal direction ($\frac{3}{4} A_2$ to A_2)

D₃ = Horizontal spacing on each side of the "LANE" action words.



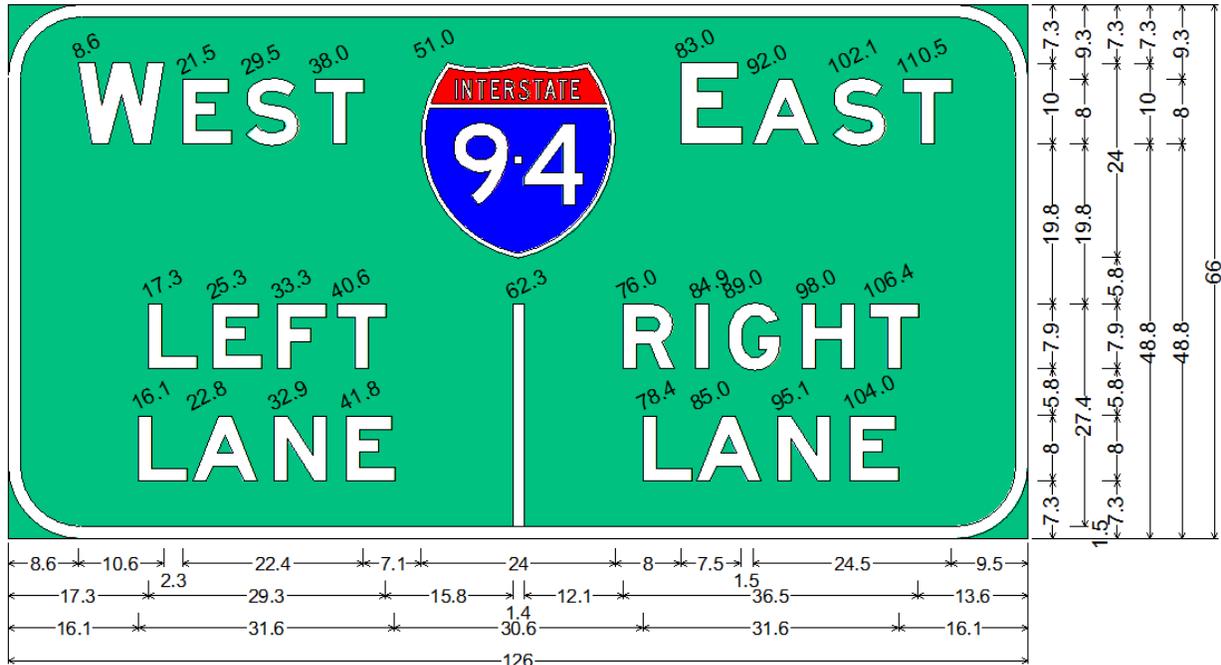
Also note that:

- The I-94 Route Marker Overlay should be centered on the panel.
- The vertical Line should be centered on the panel, directly below the overlay.

SignCAD Methods:

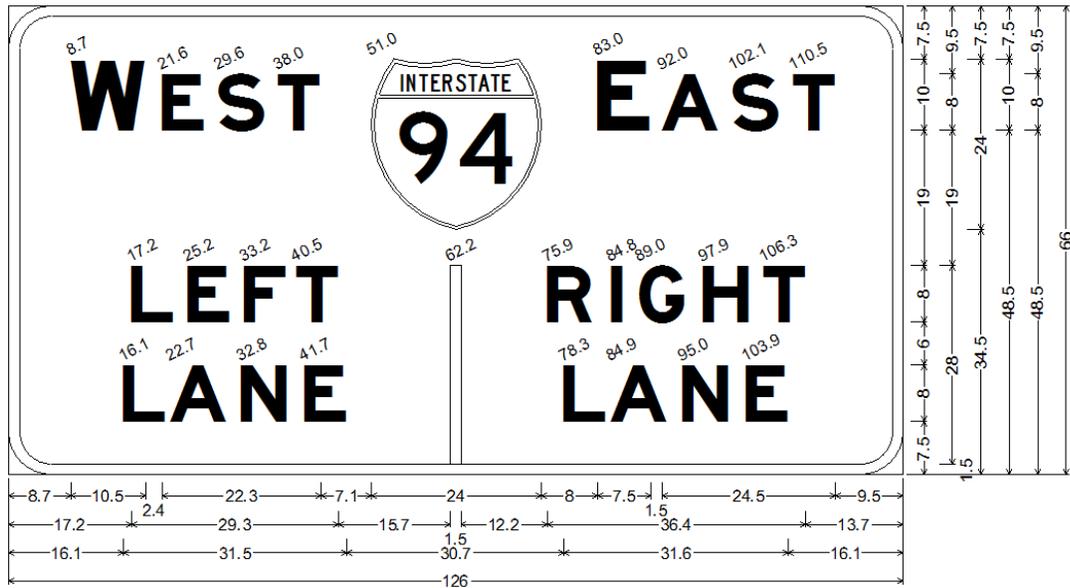
1. Panel tool -
 - Sign type - guide
 - Panel color - green
 - Border color – white
2. Create all of the panel components outside of the panel: I-94 overlay, WEST, EAST, LEFT, LANE, RIGHT, LANE.
3. Create an arrangement for the top portion of the sign by selecting the Arrange Tool.
 - Click on the screen and then choose “Row”.
 - Install the WEST, I-94 overlay, and EAST components into the row arrangement.
 - Right click on the arrangement and set Object Align to “Top”.
4. Drag the top portion’s row arrangement into the panel.
5. Create the bottom portion of the sign panel by selecting the Rectangle Tool, and create a default rectangle on the screen outside of the green sign panel.
 - In this specific order, install the LEFT legend into the upper left corner of the arrangement, the LANE legend into the bottom left corner of the arrangement, the RIGHT legend into the top right corner, and the other LANE legend into the bottom right corner of the arrangement.
 - Use the Vertical Line Tool to place a line between the LEFT LANE and RIGHT LANE sections.
 - Select the Arrange Tool and create a 1 x 1 Tabular Arrangement. Right click on this arrangement and select “Edit Data”. Select the “Minimum Space” tab. Change the left and right spacing values to zero while leaving the top and bottom values alone. Now select the “Minimum Size” tab. Set the column width to 1”. Click “OK”.
 - Select the tabular arrangement and duplicate it by going to the Edit Menu and selecting “Duplicate” or hit CTRL+Q to create a second 1x1 tabular arrangement of the same size. These tabular arrangements will be used as space placeholders in the panel.
 - Drag one tab arrangement to the left of LEFT LANE, and one to the right of RIGHT LANE.
6. Now drag the rectangle containing the LEFT LANE, RIGHT LANE, and tabular arrangements into the bottom portion of the panel. Select the white rectangle and delete it. This will remove the rectangle but put the components in their correct placements on the panel.
7. Select the LEFT and RIGHT legend components and set their top object spacing to zero. This will make the vertical line flush with the top of the text components.
8. Adjust vertical spacing by entering calculated B values.
9. Adjust horizontal spacing by entering calculated D_1 , D_2 , D_3 values. During calculation of the D_3 values, remember that there are hidden 1” wide tabular arrangements included on the left side of the LEFT legend and on the right side of the RIGHT legend that you will need to account for.

Final Sign Panel



9.0" Radius, 1.5" Border, White on Green;
 "WEST" E Mod; Interstate 94 M1-1; "EAST" E Mod; "LEFT" E Mod; "LANE" E Mod; "RIGHT" E Mod;
 "LANE" E Mod;

Alternative Panel Design



6.0" Radius, 1.5" Border, White on Green;
 "WEST" E Mod; Interstate 94 M1-1; "EAST" E Mod; "LEFT" E Mod; "RIGHT" E Mod; "LANE" E Mod;
 "LANE" E Mod;

4.19.1 Example #16, Adv. Entrance Direction Sign for Interchange Crossroad Sign Calculations

Vertical Size of Panel and Line Spacing

Given:

- ✓ 3 rows of components: 1 object, 2 text,
- ✓ Overlay (**Exhibit 3-4**) = 24, based on roadway, speed and number of lanes
- ✓ Cardinal Direction Font size (**Exhibit 3-4**) = 10-8, based on roadway, speed and number of lanes
- ✓ Action Word Font Size (**Exhibit 3-4**) = 8, based on roadway, speed and number of lanes

1. Assume border = 1.5" (**Exhibit 3-2**)

From top to bottom:

1.5" – top border

24" – overlay

8" – first line of text

8" – second line of text

1.5" – bottom border

total of 43" needed for components

2. Four spaces exist:

Four object/text spaces (B) @ $\frac{1}{2}$ to $\frac{3}{4}$ of the (A₂) and (A₃) font size of 8", between 4" and 6", use 5"

4 * 5" = 20" of space required

3. 43" + 20" = 63"

63" is between 60" and 66" (valid panel sizes). Could round down to 60" or round up to 66". However, if you round down to 60", keep in mind that then the vertical spacing above the cardinal direction would look scrunched due to the (A₁) font size being larger than the normally controlling (A₂) font size. Therefore in this case, round the panel up to 66".

4. Spacing adjustments

Rounded Panel Height (66") - Step 3 totals (63") = 3"

Therefore, we need to add an additional 3" inches of spacing into the sign.

There are several ways to accomplish this. For this example, the chosen solution is to add the extra 3" by splitting it evenly among the four (B) measurements. This will make increase each of the (B) measurements to 5.75".

An alternative design could be to increase the top (B) space and bottom two (B) spaces to 6" and then leave the (B) space between the overlay and the vertical line at 5". This could be done because the vertical line is not a readable word, and therefore having comparably less spacing near it would be sufficient.

5. Final vertical component and object spacing summary:

Border	1.5"
(B) Space	5.75"
Overlay Height	24"
(B) Space	5.75"
(A ₃) Letter Height	8"
(B) Space	5.75"
(A ₃) Letter Height	8"
(B) Space	5.75"
Border	1.5"
TOTAL	66"

Horizontal Size of Panel and Spacing

In order to determine horizontal spacing and placement of components such that the overlay and vertical line are centered on the panel, we need to first determine how wide the sign will be. The longest line of components will be along the top line of the panel. The (D₁) spaces on either side of WEST and the (D₂) spacing values on either side of EAST should be between ¾ and up to full text size of (A₂), therefore between 6" and 8". Assume 7" spaces for now just to determine size of the panel. The spacing and components are as follows: 1.5" border + 7" (D₁) space + 35.25" WEST + 7" (D₁) space + 24" overlay + 7" (D₁) space + 33.42" EAST + 7" (D₁) space + 1.5" border → 123.67". Round this up to 126" which is a valid panel size.

Now that we know the panel will be 126" wide, we can figure out how to center the overlay shield. The center of the overlay should be at exactly half the panel width, which is 63". Since the overlay is 24" wide, half of it is 12", so then we know that the left edge of the overlay should be at the 51" mark. This is observed by looking at the "object lefts" dimensions shown on the sign panel.

To place the left edge of the overlay shield at the 51" mark, add up the components on the left side of the panel: 1.5" border + 35.25" WEST + 12" half of overlay = 48.75" of components. Since the halfway point of the panel is 63", subtract the component width from it: 63" – 48.75" = 14.25" of spaces needed. Since there are two (D₁) spaces, divide this by two to get (D₁) = 7.125".

Next, find the finalized two (D₂) spaces in a similar way by solving the next 63" half of the panel. The components are: 12" half of overlay + 33.42" EAST + 1.5" border = 46.92". 63" – 46.92" = 16.08" of space. Divide by two to find (D₂) = 8.04".

Enter these (D₁) and (D₂) object spaces on each side of the cardinal directions and then the route marker overlay will be centered on the panel at 51" exactly.

To get the vertical line centered beneath the overlay and on the panel, we will need four equal (D_3) spaces on each side of the panel's LANE legend. Note that the LANE words are equally sized and dimensioned, so it will be easier to determine their spacing values, rather than the LEFT or RIGHT words which are different lengths. Therefore, set the horizontal object spacing values to zero for both the LEFT and RIGHT words.

Solve for the (D_3) value by adding up the components across the panel: 1.5" border + 31.57" LANE + 1.5" vertical line + 31.57" LANE + 1.5" border = 67.64". Subtract this from the panel width: 126" – 67.64" = 58.36" of space. There are four (D_3) spaces, so divide by four: 58.36"/4 = 14.59". Therefore, (D_3) is 14.59".

Before entering these (D_3) values as object spacing for each LANE word, remember to account for the hidden 1" wide tabular arrangements that were placed in the panel. They act as an additional object width. Therefore, adjust the spacing on the left side of the left LANE word and the right LANE word. For example, enter 13.59" as the left object spacing of the left LANE word and 14.59" on its right object spacing.

Now do this for the right LANE word, entering 14.59" for the left (D_3) space and the right 13.59" for the right (D_3) space to account for the 1" tabular arrangement. You will notice that unfortunately this right object spacing value is too large because it increases the panel size to 132". In this example, there is a hidden program spacing value which is automatic and cannot be accounted for with the way this type of panel is designed.

As sometimes happens in SignCAD with special designs, you will just have to play with the object spacing values to attain your goals for the panel. Keep decreasing the right side (D_3) object spacing value until the panel comes back down to 126" wide. Keep adjusting as necessary to make sure that the actual (D_3) dimensions shown on each side of both LANE words is equal. Ensure that the overlay and vertical line remain centered on the panel. The final value for right object spacing will be 12.6" after all adjustments in this case.

Final horizontal component and object spacing summary (top line):

Border	(D_1) Space	WEST	(D_1) Space	Overlay	(D_2) Space	EAST	(D_2) Space	Border	TOTAL
1.5"	7.125"	35.25"	7.125"	24"	8.04"	33.42"	8.04"	1.5"	126"

Final horizontal component and object spacing summary (bottom line):

Border	(D_3) Space		LANE	(D_3) Space	Vertical Line	(D_3) Space	LANE	(D_3) Space			Border	TOTAL
	Tab Object	Object Space						Object Space	Hidden Program Spacing	Tab Object		
1.5"	1"	13.59"	31.57"	14.59"	1.5"	14.59"	31.57"	12.6"	0.99"	1"	1.5"	126"

5. APPENDIX

5.1 Font Spacing Charts

LETTER & NUMERAL WIDTHS and SPACE between letters and numerals

SERIES E(M)

To determine the proper SPACE between letters or numerals obtain the code number from table 1 or 2 and enter table 6 for that code number to the desired letter or numeral height.

TABLE 1
LETTER TO LETTER CODE NUMBER

Preceding Letter	Following Letter			
	B D E F H I K L M N P R U	C G O Q S X Z	A J T V W Y	
A	2	2	4	
B	1	2	2	
C	2	2	3	
D	1	2	2	
E	2	2	3	
F	2	2	3	
G	1	2	2	
H	1	1	2	
I	1	1	2	
J	1	1	2	
K	2	2	3	
L	2	2	4	
M	1	1	2	
N	1	1	2	
O	1	2	2	
P	1	2	2	
Q	1	2	2	
R	1	2	2	
S	1	2	2	
T	2	2	4	
U	1	1	2	
V	2	2	4	
W	2	2	4	
X	2	2	3	
Y	2	2	4	
Z	2	2	3	

TABLE 4
WIDTH OF LETTER in inches

Letter Height	Letter Height				
	8	10.67	13.33	16	20
A	8.00	10.67	13.33	16.00	20.00
B	6.38	8.50	10.62	12.75	15.94
C	6.38	8.50	10.62	12.75	15.94
D	6.38	8.50	10.62	12.75	15.94
E	5.94	7.92	9.90	11.88	14.85
F	5.94	7.92	9.90	11.88	14.85
G	6.38	8.50	10.62	12.75	15.94
H	6.38	8.50	10.62	12.75	15.94
I	1.60	2.13	2.67	3.20	4.00
J	6.06	8.09	10.10	12.13	15.16
K	6.50	8.67	10.83	13.00	16.25
L	5.94	7.92	9.90	11.88	14.85
M	7.38	9.84	12.29	14.75	18.44
N	6.38	8.50	10.62	12.75	15.94
O	6.69	8.92	11.15	13.38	16.73
P	6.38	8.50	10.62	12.75	15.94
Q	6.69	8.92	11.15	13.38	16.73
R	6.38	8.50	10.62	12.75	15.94
S	6.38	8.50	10.62	12.75	15.94
T	5.94	7.92	9.90	11.88	14.85
U	6.38	8.50	10.62	12.75	15.94
V	7.32	9.76	12.19	14.63	18.29
W	8.44	11.26	14.06	16.88	21.10
X	6.94	9.26	11.56	13.88	17.35
Y	8.00	10.67	13.33	16.00	20.00
Z	6.38	8.50	10.62	12.75	15.94

TABLE 2
NUMERAL TO NUMERAL CODE NUMBER

Preceding Letter	Following Numeral		
	15	236 890	47
1	1	1	2
2	1	2	2
3	1	2	2
4	2	2	4
5	1	2	2
6	1	2	2
7	2	2	4
8	1	2	2
9	1	2	2
0	1	2	2

TABLE 5
WIDTH OF NUMERAL in inches

Numeral Height	Numeral Height				
	8	10.67	13.33	16	20
1	2.38	3.17	3.96	4.75	5.94
2	6.38	8.50	10.62	12.75	15.94
3	6.38	8.50	10.62	12.75	15.94
4	7.38	9.84	12.29	14.75	18.44
5	6.38	8.50	10.62	12.75	15.94
6	6.38	8.50	10.62	12.75	15.94
7	6.38	8.50	10.62	12.75	15.94
8	6.38	8.50	10.62	12.75	15.94
9	6.38	8.50	10.62	12.75	15.94
0	6.63	8.84	11.04	13.25	16.66

TABLE 3
WIDTH OF STROKE

Letter or Numeral Height	Stroke Width in Inches
8	1.60
10.67	2.13
13.33	2.67
16	3.20
20	4.00

TABLE 6
SPACE in inches measured horizontally from the extreme right edge of the preceding letter (or numeral) to the extreme left edge of the following letter (or numeral).

CODE NUMBER	8	10.67	13.33	16	20
1	2.56	3.43	4.28	5.13	6.41
2	2.06	2.75	3.44	4.13	5.16
3	1.38	1.84	2.29	2.75	3.44
4	.69	.93	1.15	1.38	1.73

**LETTER WIDTHS FOR LOWER CASE
E MODIFIED SERIES**

LOWER CASE E MODIFIED					
WIDTH OF LETTER					
in inches					
	Letter Height				
	8-6	10.67-8	13.33-10	16-12	20-15
a	5.15	6.87	8.58	10.30	12.88
b	5.20	6.94	8.66	10.40	13.00
c	5.15	6.87	8.58	10.30	12.88
d	5.20	6.94	8.66	10.40	13.00
e	5.20	6.94	8.66	10.40	13.00
f	3.31	4.42	5.52	6.62	8.28
g	5.20	6.94	8.66	10.40	13.00
h	5.20	6.94	8.66	10.40	13.00
i	1.52	2.03	2.53	3.04	3.80
j	2.87	3.83	4.78	5.74	7.17
k	5.15	6.87	8.58	10.30	12.88
l	1.52	2.03	2.53	3.04	3.80
m	8.59	11.46	14.31	17.18	21.48
n	5.20	6.94	8.66	10.40	13.00
o	5.35	7.13	8.91	10.70	13.37
p	5.20	6.94	8.66	10.40	13.00
q	5.20	6.94	8.66	10.40	13.00
r	3.95	5.27	6.58	7.90	9.88
s	5.15	6.87	8.58	10.30	12.88
t	4.07	5.43	6.78	8.14	10.17
u	5.20	6.94	8.66	10.40	13.00
v	6.04	8.06	10.07	12.09	15.11
w	8.00	10.67	13.33	16.00	20.00
x	6.29	8.39	10.48	12.58	15.72
y	6.55	8.74	10.92	13.11	16.38
z	5.34	7.13	8.90	10.69	13.36

**SERIES E MODIFIED LOWER CASE SPACING
8-6, 10.67-8, 13.33-10**

FOLLOWING LETTER

Each spacing is the distance measured from the extreme right edge of the preceding letter to the extreme left edge of the following letter.

PRECEDING LETTER	acdegoq		bhiklmnp ru		fw		j		st		vy		x		z												
	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10	8-6	10.67-13.33-8 10											
AWX	1.86	2.48	3.10	2.12	2.83	3.54	1.74	2.32	2.90	1.18	1.57	1.96	1.51	2.01	2.51	1.27	1.69	2.11	1.51	2.01	2.51	1.51	2.01	2.51	1.92	2.56	3.20
B	2.25	3.00	3.75	2.87	3.82	4.77	2.12	2.83	3.54	1.51	2.01	2.51	2.07	2.76	3.45	1.74	2.32	2.90	1.74	2.32	2.90	1.74	2.32	2.90	2.33	3.11	3.89
CEG	2.12	2.83	3.54	2.63	3.50	4.37	1.92	2.56	3.20	1.39	1.85	2.31	1.86	2.48	3.10	1.86	2.48	3.10	1.86	2.48	3.10	2.01	2.68	3.35	2.18	2.91	3.64
DOOR	2.07	2.76	3.45	2.69	3.58	4.47	2.01	2.68	3.35	1.33	1.77	2.21	1.86	2.48	3.10	1.86	2.48	3.10	1.86	2.48	3.10	2.01	2.68	3.35	2.12	2.83	3.54
F	1.01	1.34	1.67	2.01	2.68	3.35	1.27	1.69	2.11	1.01	1.34	1.67	1.13	1.50	1.87	1.13	1.50	1.87	1.13	1.50	1.87	1.18	1.57	1.96	1.51	2.01	2.51
HIMN	2.75	3.66	4.57	3.25	4.33	5.41	2.63	3.50	4.37	2.12	2.83	3.54	2.57	3.42	4.27	2.57	3.42	4.27	2.57	3.42	4.27	2.69	3.58	4.47	2.81	3.74	4.67
JU	2.69	3.58	4.47	2.87	3.82	4.77	2.63	3.42	4.27	2.07	2.76	3.45	2.39	3.19	3.99	2.39	3.19	3.99	2.39	3.19	3.99	2.51	3.35	4.19	2.75	3.66	4.57
KL	1.62	2.16	2.70	2.39	3.19	3.99	1.51	2.01	2.51	.95	1.26	1.57	1.45	1.93	2.41	1.45	1.93	2.41	1.45	1.93	2.41	1.57	2.09	2.61	1.74	2.32	2.90
P	1.92	2.56	3.20	2.24	2.99	3.74	1.80	2.40	3.00	1.01	1.34	1.67	1.62	2.16	2.70	1.62	2.16	2.70	1.62	2.16	2.70	1.74	2.32	2.90	1.86	2.48	3.10
S	1.86	2.48	3.10	2.57	3.42	4.27	1.74	2.32	2.90	1.28	1.70	2.12	1.68	2.24	2.80	1.68	2.24	2.80	1.68	2.24	2.80	1.80	2.40	3.00	1.92	2.56	3.20
T	1.51	2.01	2.51	2.39	3.19	3.99	1.39	1.85	2.31	1.13	1.50	1.87	1.51	2.01	2.51	1.51	2.01	2.51	1.51	2.01	2.51	1.62	2.16	2.70	1.74	2.32	2.90
V	1.39	1.85	2.31	2.24	2.99	3.74	1.51	2.01	2.51	1.18	1.57	1.96	1.68	2.24	2.80	1.68	2.24	2.80	1.68	2.24	2.80	1.80	2.40	3.00	1.92	2.56	3.20
Y	1.01	1.34	1.67	2.01	2.68	3.35	1.27	1.69	2.11	.86	1.14	1.42	.95	1.26	1.57	.95	1.26	1.57	.95	1.26	1.57	1.13	1.50	1.87	1.62	2.16	2.70
Z	2.51	3.35	4.19	2.99	3.98	4.97	2.45	3.27	4.09	1.74	2.32	2.90	2.39	3.19	3.99	2.39	3.19	3.99	2.39	3.19	3.99	2.51	3.35	4.19	2.63	3.50	4.37
adhijlmnqu	2.45	3.27	4.09	3.07	4.09	5.11	2.33	3.11	3.89	1.74	2.32	2.90	2.24	2.99	3.74	2.24	2.99	3.74	2.24	2.99	3.74	2.39	3.19	3.99	2.51	3.35	4.19
bfkops	1.74	2.32	2.90	2.45	3.27	4.09	1.62	2.16	2.70	1.07	1.42	1.77	1.57	2.09	2.61	1.57	2.09	2.61	1.57	2.09	2.61	1.68	2.24	2.80	1.80	2.40	3.00
ce	1.86	2.48	3.10	2.51	3.35	4.19	1.74	2.32	2.90	1.18	1.57	1.96	1.68	2.24	2.80	1.68	2.24	2.80	1.68	2.24	2.80	1.80	2.40	3.00	1.92	2.56	3.20
r	1.18	1.57	1.96	1.86	2.48	3.10	1.13	1.50	1.87	.50	.67	.84	1.01	1.34	1.67	1.01	1.34	1.67	1.01	1.34	1.67	1.13	1.50	1.87	1.27	1.69	2.11
tz	1.80	2.40	3.00	2.51	3.35	4.19	1.68	2.24	2.80	1.13	1.50	1.87	1.62	2.16	2.70	1.62	2.16	2.70	1.62	2.16	2.70	1.74	2.32	2.90	1.86	2.48	3.10
vy	1.57	2.09	2.61	2.24	2.99	3.74	1.45	1.93	2.41	.86	1.14	1.42	1.39	1.85	2.31	1.39	1.85	2.31	1.39	1.85	2.31	1.51	2.01	2.51	1.62	2.16	2.70
w	1.63	2.17	2.71	2.24	2.99	3.74	1.51	2.01	2.51	.95	1.26	1.57	1.45	1.93	2.41	1.45	1.93	2.41	1.45	1.93	2.41	1.57	2.09	2.61	1.68	2.24	2.80
x	1.68	2.24	2.80	2.33	3.11	3.89	1.57	2.09	2.61	1.01	1.34	1.67	1.51	2.01	2.51	1.51	2.01	2.51	1.51	2.01	2.51	1.62	2.16	2.70	1.74	2.32	2.90

**SERIES E MODIFIED LOWER CASE SPACING
16-12, 20-15**
FOLLOWING LETTER

Each spacing is the distance measured from the extreme right edge of the preceding letter to the extreme left edge of the following letter.

PRECEDING LETTER	acdegoq		bhiklmnp ru		fw		j		st		vy		x		z	
	16-12	20-15	16-12	20-15	16-12	20-15	16-12	20-15	16-12	20-15	16-12	20-15	16-12	20-15	16-12	20-15
AWX	3.72	4.65	4.25	5.31	3.48	4.35	2.36	2.94	3.02	3.77	2.54	3.17	3.02	3.77	3.84	4.80
B	4.50	5.63	5.73	7.16	4.25	5.31	3.02	3.77	4.14	5.18	3.48	4.35	3.48	4.35	4.67	5.83
CEG	4.25	5.31	5.25	6.56	3.84	4.80	2.78	3.47	3.72	4.65	3.72	4.65	4.02	5.03	4.37	5.46
DOOR	4.14	5.18	5.37	6.71	4.02	5.03	2.66	3.32	3.72	4.65	3.72	4.65	4.02	5.03	4.25	5.31
F	2.01	2.51	4.02	5.03	2.54	3.17	2.01	2.51	2.25	2.81	2.25	2.81	2.36	2.94	3.02	3.77
HIMN	5.49	6.86	6.50	8.12	5.25	6.56	4.25	5.31	5.13	6.41	5.13	6.41	5.37	6.71	5.61	7.01
JU	5.37	6.71	5.73	7.16	5.13	6.41	4.14	5.18	4.79	5.98	4.79	5.98	5.03	6.28	5.49	6.86
KL	3.24	4.05	4.79	5.98	3.02	3.77	1.89	2.36	2.90	3.62	2.90	3.62	3.14	3.92	3.48	4.35
P	3.84	4.80	4.49	5.61	3.60	4.50	2.01	2.51	3.24	4.05	3.24	4.05	3.48	4.35	3.72	4.65
S	3.72	4.65	5.13	6.41	3.48	4.35	2.55	3.19	3.36	4.20	3.36	4.20	3.60	4.50	3.84	4.80
T	3.02	3.77	4.79	5.98	2.78	3.47	2.25	2.81	3.02	3.77	3.02	3.77	3.24	4.05	3.48	4.35
V	2.78	3.47	4.49	5.61	3.02	3.77	2.36	2.94	3.36	4.20	3.36	4.20	3.60	4.50	3.84	4.80
Y	2.01	2.51	4.02	5.03	2.54	3.17	1.71	2.14	1.89	2.36	1.89	2.36	2.25	2.81	3.24	4.05
Z	5.03	6.28	5.97	7.46	4.91	6.13	3.48	4.35	4.79	5.98	4.79	5.98	5.03	6.28	5.25	6.56
adhijlmnqu	4.91	6.13	6.14	7.67	4.67	5.83	3.48	4.35	4.49	5.61	4.49	5.61	4.79	5.98	5.03	6.28
bfkops	3.48	4.35	4.91	6.13	3.24	4.05	2.13	2.66	3.14	3.92	3.14	3.92	3.36	4.20	3.60	4.50
ce	3.72	4.65	5.03	6.28	3.48	4.35	2.36	2.94	3.36	4.20	3.36	4.20	3.60	4.50	3.84	4.80
r	2.36	2.94	3.72	4.65	2.25	2.81	1.01	1.26	2.01	2.51	2.01	2.51	2.25	2.81	2.54	3.17
tz	3.60	4.50	5.03	6.28	3.36	4.20	2.25	2.81	3.24	4.05	3.24	4.05	3.48	4.35	3.72	4.65
vy	3.14	3.92	4.49	5.61	2.90	3.62	1.71	2.14	2.78	3.47	2.78	3.47	3.02	3.77	3.24	4.05
w	3.26	4.07	4.49	5.61	3.02	3.77	1.89	2.36	2.90	3.62	2.90	3.62	3.14	3.92	3.36	4.20
x	3.36	4.20	4.67	5.83	3.14	3.92	2.01	2.51	3.02	3.77	3.02	3.77	3.24	4.05	3.48	4.35

5.2 Glossary of Sign Terms

Cone of Vision - A fan-shaped field of view extending in front of a vehicle operator.

Conventional Road (Single Lane) - A two-lane, two-way section of highway.

Conventional Road (Multilane) - An undivided or divided roadway with more than one lane in each direction of travel and having a posted speed less than 55 mph.

Demountable Legend - Non-adhesive backed character affixed to the sign face material by fasteners, usually pop-rivets.

Expressway - A high speed, divided, multi-lane highway which is generally an arterial road with a posted speed of 55 mph and greater. Most intersections are at grade, although grade separated interchanges may exist.

Highway - a general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Legend - The message on the face of a sign panel. It includes all alpha-numeric text, arrows, route markers, and special symbols. Legends are made of retroreflective materials except where opaque black paints are prescribed for text on certain signs.

Legend - Direct Applied - Adhesive-backed pressure sensitive characters.

Logo - A single or multicolored symbolic design unique to a product, a business or a service facility; a national, regional or local commercially recognized pictorial reference to a specific product, service or business used as a means of identification of a company's products, services or business.

Overlay - A thin, flat aluminum sheet with sign face material applied, which is bolted or pop-riveted to a sign panel.

Primary Guide Signs (Freeways only) - These signs consist of advance junction signing, exit directional signs, exit gore signs and destination signs. On interstate freeways, exit numbers are included. Distance signs are also primary guide signs.

Sheeting - Encapsulated Lens Retroreflective - A material utilizing retroreflective spherical lens elements adhered to a synthetic resin and covered by a smooth plastic surface (commonly referred to as "High Intensity").

Sheeting - Enclosed Lens Retroreflective - A material utilizing retroreflective spherical lens elements embedded within a smooth plastic film (commonly referred to as "Engineering Grade"). MnDOT no longer uses this material.

Sheeting - Pressure Sensitive - Reflective or non-reflective sheeting which has an adhesive backing that permits application of the sheeting to the substrate by pressure, and requires no heat, solvent, or other preparation for adhesion to smooth, clean surfaces.

Sheeting - Wide Angle Prismatic Retroreflective for Visual Impact Performance (VIP) - A material utilizing prismatic lenses formed in a transparent, synthetic resin, sealed and backed with a pressure sensitive adhesive and blue poly liner. This sheeting material has optimum performance over a broad range of observation angles.

Sign Base Material or Sign Blank (Substrate) - Sheet aluminum joined by backup splice plates, or extruded sections bolted together to form a flat surface.

Sign Face Material - Reflectorized or non-reflectorized sheeting material applied to the sign substrate.

Supplemental Guide Signs - Guide signs which further orient the driver to geographical identification and secondary destinations. Destinations include cities, motorist services, and state parks.

5.3 Index

A

Abbreviations 3-1, 3-20
Advance Guide..... 2-10, 3-22
 Appendix 1-1, 3-10
 Arrows 3-1, 3-15

B

Background..... 1-1
 Background Information 1-1
 Basic Considerations 2-4
 Basic Guide Sign Design Examples 4-2
 Borders 3-1

C

Colors 3-1, 3-3
 Conventional Highway Guide Sign..... 2-8

D

Department Classification 2-5
 Destination..... 2-8, 4-89
Directional..... 2-9, 2-11, 4-46, 4-50
 Disclaimer..... 1-1
 Distance 2-2, 2-4, 2-8, 2-10, 3-11, 3-14, 4-37, 4-40, 4-42, 4-44, 5-5

E

Example #1 4-4, 4-93, 4-106
 Example #10..... 4-33
 Example #12..... 4-37
 Example #13..... 4-35, 4-40
 Example #14..... 4-42
 Example #15..... 4-44
 Example #16..... 4-46
 Example #17..... 4-50
 Example #18..... 4-52
 Example #19..... 4-56
 Example #2..... 4-7
 Example #20..... 4-71
 Example #21..... 4-74
 Example #22..... 4-16, 4-76
 Example #23..... 4-20, 4-80
 Example #24..... 4-82, 4-95, 4-102
 Example #25..... 4-86, 4-99
 Example #3..... 4-9
 Example #4..... 4-13

Example #5 4-89
 Example #6 4-22
 Example #7 4-26
 Example #8 4-28
 Example #9 4-31
Exit Directional Guide..... 2-11
Exit Panel..... 2-11

F

Font Size 3-1, 3-5, 4-2, 4-80
 Font Style 3-1, 3-4
 Fractions..... 3-1, 3-19
 Freeway... 2-10, 3-11, 3-22, 3-23, 4-22, 4-42, 4-71, 4-76, 4-82, 4-86, 4-89
 Freeway Guide Sign..... 2-10
 Functional Classification 2-4

G

Guide Sign Basics..... 4-2

H

Historical Perspectives..... 2-1

I

Introduction..... 1-1

J

Junction..... 2-8, 4-71, 4-74

L

Legend/Layout Justifications 3-20

M

Margins 3-1
 Mn/DOT 1-1, 2-4, 2-5, 2-8, 2-9, 2-10, 3-5
 Mn/DOT Specific Guidance 2-4

N

Non-Freeway 4-22, 4-42, 4-71, 4-89

P

Panel size 3-1

R

Radii 3-1, 3-2
References 1-1, 5-8
Route Markers and Sizes 3-14

S

Sign Components 1-1
Sign Post Spacing Chart 3-26
SignCAD 1-1, 4-5, 4-11, 4-18, 4-24, 4-29, 4-34, 4-38, 4-43, 4-48, 4-54, 4-72, 4-78, 4-84, 4-91, 4-97, 4-104, 5-8

Supplemental 2-4, 2-9, 2-10, 2-11, 4-4, 4-7, 4-9, 4-13, 4-22, 4-26, 4-93, 5-5

Supplemental and Motorist Services Signs 2-10
Supplemental Guide 2-11, 4-7, 4-9, 4-13, 4-26, 5-5

T

Typical Freeway Signs 3-22

U

U-Post and Post Spacing 3-24

V

Vertical Lines 3-1, 3-12, 4-48

5.4 References

Manual of Uniform Traffic Control Devices 2011, Federal Highway Administration, Washington, DC, 2011.

Minnesota Manual of Uniform Traffic Control Devices, Minnesota Department of Transportation, 2015.

Minnesota Standard Signs Manual, Minnesota Department of Transportation

Minnesota Traffic Engineering Manual, Minnesota Department of Transportation.

SignCAD® Users Guide, SignCAD® Systems, Inc., Minnetonka, MN

Standard Highway Signs, US Department of Transportation, FHWA, Washington, DC 1979

Traffic Control Devices Handbook, Federal Highway Administration, Washington, DC, 2001.

Traffic Control Devices: Historical Aspects Thereof by Gordon M. Sessions, Institute of Traffic Engineers, Washington, D.C, 1971

Traffic Signing Handbook, Institute of Transportation Engineers, Washington, DC, 1997

CHAPTER 6. SUPPLEMENTAL INFORMATION

6.A Course Information

Dates: November 1-2, 2017

Location: MnDOT Training and Conference Center, 1900 West County Road I, Shoreview, MN 55126

Purpose: This 2-day course is designed for MnDOT, county, city, and consultant engineering personnel who need to acquire guide sign design skills. Participants will acquire the basic design skills needed in order to design traffic guide signs using the SignCAD® software.

SignCAD® will be used to demonstrate basic sign design elements for as many traffic guide sign examples as time permits. All Participants will receive a MnDOT Traffic Guide Sign manual, but will NOT receive a copy of the SignCAD® software.

6.A.1 Workshop Presenter

John Albeck, P.E., PTOE
Senior Transportation Engineer
Albeck Gerken, Inc.
(813) 319-3790
jalbeck@albeckgerken.com

6.A.2 MnDOT Technical Experts

Heather Lott, P.E.
State Signing Engineer
MnDOT OTST
(651) 234-7371
heather.lott@state.mn.us

Rick Sunstrom
Central Office Signing
MnDOT OTST
(651) 234-7381
rick.sunstrom@state.mn.us

Brian Barrett
Central Office Signing
MnDOT OTST
(651) 234-7374
brian.barrett@state.mn.us

Eric Peterson
North Area Signing Engineer
MnDOT Metro
(651) 234-7830
Eric.peterson@state.mn.us

6.A.3 Course Hours

Each participant will receive 15.0 Professional Development Hours (PDH's) for this course which shall be noted on their training certificate.

6.A.4 Guide Sign Design Course Agenda
Day 1: November 1, 2017 (8:00 AM to 4:00 PM)

Topic	Comments
Registration & Introduction	
Basic Information	
Sign Components	Panel Size, Radii, Borders, Margins
Sign Components continued	Colors, Font Styles and Font Sizes
	Horizontal Spacing
	Vertical Spacing for Freeway Distance Signs
	Horizontal and Vertical Lines
	Route Markers and Sizes
	Arrows, Fractions and Abbreviations
	Legend/Layout Justifications
	Typical Freeway Signs
	U-Post and Post Spacing
	Supplemental Guide Sign (Non-freeway)
	Supplemental Guide Sign (Freeway)
Split Panel Destination Sign	
SignCAD Demonstration	
Overview of Design Process	
Example Problem # 1	Supplemental Sign
Example Problem # 2	Destination Sign
Example Problem # 3	Freeway Junction (Advance Guide) Sign
Adjourn	

6.A.5 Day 2: November 2, 2017 (8:00 AM to 4:00 PM)

Topic	Comments
Day 1 Recap	
Example Problem # 4	Supplemental Sign (Freeway)
Example Problem # 5	Directional Sign
Example Problem # 6	Exit Panel (E1-SP)
Example Problem # 7	Distance Sign
Example Problem # 8	Distance Sign (Freeway)
Example Problem # 10	Directional Sign (Split Panel)
Example Problem # 11	Supplemental Sign (Split Panel)
Example Problem #12	Junction Sign
Example Problem #13	Exit Direction Sign
Example Problem #14	Exit Direction Sign w/ Exit Only Panel
Example Problem #15	Freeway Junction (Advance Guide) Sign
Example Problem #16	Overhead Advance Guide Sign w/ Exit Only Panel

6.B SignCAD® Program

6.B.1 To Login for Course Computer

To login to the course computer (non-MnDOT staff), use the following:

- ✓ LoginID: ahtc1
- ✓ Password: ahtc1ahtc1

6.B.2 To create signs from scratch:

The following paraphrased outline is a suggested order of steps (from SignCAD 8.48 Help Files, Copyright ©1994-2015, SignCAD Systems, Inc):

1. Analyze the sign to determine how it is laid out in rows and columns. (See the arrange topic in the User Guide.) You can 'nest' rows of objects within columns, and columns within rows to create complex signs easily.
2. Determine how objects are to be aligned to one another: top, middle or bottom, or left, center or right. Each row and column has its own alignment, unaffected by the alignment of column and row groups within it. You can align the entire grouping on the panel so that you can set exact spacing from the edges.
3. Set preferences: Font, font size, fill colors, spacing. You can also change these at any time.
4. Use the panel tool to place a panel onto the workspace. The panel will recognize objects as they are placed onto it and resize itself and its border to accommodate each new object.
5. Use the toolbar to place objects one by one, onto the panel, adding to existing rows or columns and creating whole new rows and columns.
6. If the panel is complex, use the arrange tool to create simple column or row arrangements of objects.
7. If you want objects to be aligned both vertically and horizontally, create a tabular arrangement.
8. Move objects and arrangements onto the panel.
9. If not already on, turn on dimension display. SignCAD effortlessly dimensions all objects for you.
10. Select the Arrange Tool to show alignments and spacing information.
11. Adjust alignments and spacing, and modify objects or edit text, if necessary.
12. Determine which objects (usually only one or two) that control heights of rows or widths of columns.
13. Save and print the sign, or export DXF or HPGL

6.B.3 Key Strokes Used in SignCAD®

Key Stroke	Result
Space x/y Space	Fraction (spaces may be deleted later)
Ctrl while dragging mouse over sign panel	will highlight panel and allow moving it
Ctrl + A	will size sign to fill workspace on monitor
F2	will reduce viewing size of sign
F3	will allow magnification
Ctrl + S	text size
Ctrl + F	text font
Ctrl + Q	Duplicates highlighted item
Ctrl + Z	undo

6.C Green Signs North, South, East, West

[Selected text from Tiffany A. Kautz, PE, South Signing Engineer, MnDOT Metro District]

Guidance on how to create Cardinal with the new bigger first letter in SignCAD®.

- ✓ Click on the Text tool 
- ✓ Before typing your first letter, use the shortcut key control: [Ctrl]+[S]. This opens the Text Size box. Choose the text size of your first letter. Type your first letter.
 - 7" first letter for 6" cardinal,
 - 10" first letter for 8" cardinal,
 - 12" first letter for 10" cardinal,
 - 15" first letter for 12" cardinal,
 - 18" first letter for 15" cardinal.
- ✓ Before typing the remaining letter, use the [Ctrl]+[S] shortcut again. Change the text size. Type the remaining letters. SignCAD® will automatically install the necessary space between the first letter and the remaining letters.
- ✓ In order to get all of the letter to align at the bottom, right click on the text. Choose Text Align>Baseline.

6.D Select Manual Exhibits

Exhibit 3-1 Standard Corner Radii, Margin, and Border for Non-Guide Signs

Length of Shortest Side	Radius	Margin	Border
Under 24"	1.5"	.38"	.38"
24"	1.5"	.38"	.63"
30"	1.88"	.5"	.75"
36"	2.25"	.63"	.88"
42"	2.25"	.63"	.88"
48" – 60"	3"	.75"	1.25"

Exhibit 3-2 Guide Sign Border and Radii

Length of Shortest Side	Border Width	Border Radius
≤ 36"	1"	3"
42" – 60"	1.25"	6"
66" – 84"	1.5"	9"
≥ 90"	2"	12"

Exhibit 3-4 Guidelines for Guide Sign (Non-Freeway) Font Size

Guidelines for Conventional Road and Expressway Guide Sign Font Size						
Sign Type		Conventional Roads			Expressway*	
		<45mph	45-60 mph	45-60 mph	60	65 mph
		Single Lane and Multilane	Single Lane	Multilane	Divided Multilane	Divided Multilane
Destination	City/Street Name	6-4.5	8-6	10.7-8	10.7-8	13.3-10
	Arrow Size	3 or 13 head	5 or 14 head	6 or 15 head	6 or 15 head	7 or 16 head
	Numerals	6	8	10.7	10.7	13.3
Distance	Cardinal Direction					
	First Letter	6	6	7	7	12
	Rest of word	5	5	6	6	10
	Route Marker					
	2 Digit	18 x 18	18 x 18	24 x 24	24 x 24	24 x 24
	3 Digit	22.5 x 18	22.5 x 18	30 x 24	30 x 24	30 x 24
	City/Street Name	6-4.5	6-4.5	8-6	8-6	10.7-8
	Numerals	6	6	8	8	10.7
Junction	Fraction Numerals	4	4	6	6	8
	JCT	8	8	8	8	10
	Cardinal Direction					
	First Letter	7	7	10	10	10
	Rest of word	6	6	8	8	8
	Route Marker	24	24	24	24	24
	Word	8	8	8	8	10
	Numerals	12	12	12	12	15
Directional	Fraction Numerals	8	8	8	8	10
	Cardinal Direction					
	First Letter	7	7	10	10	10
	Rest of word	6	6	8	8	8
	Route Marker					
	2 Digit	18 x 18	24 x 24	24 x 24	24 x 24	24 x 24
	3 Digit	22.5 x 18	30 x 24	30 x 24	30 x 24	30 x 24
	City/Street Name	6-4.5	8-6	10.7-8	10.7-8	10.7-8
Supplemental	Arrow Size					
	with City/Street Name	3 or 13 head	5 or 14 head	6 or 15 head	6 or 15 head	6 or 15 head
	without City/Street Name	3 or 13 head	5 or 14 head	5 or 14 head	5 or 14 head	5 or 14 head
	Generic	6	6	8	8	8
Non Standard Overhead Signs	Proper Name	6-4.5	6-4.5	8-6	8-6	10.7-8
	Action Message	5	5	6	6	8
	Arrow Size	3 or 13 head	3 or 13 head	5 or 14 head	5 or 14 head	6 or 15 head
	Cardinal Direction					
Non Standard Overhead Signs	First Letter	7	7	10		
	Rest of word	6	6	8		
	Route Marker					
	2 Digit	24 x 24	24 x 24	24 x 24		
	3 Digit	30 x 24	30 x 24	30 x 24		
	City/Street Name	8-6	8-6	10.7-8		
Arrow Size	5 or 14 head	5 or 14 head	5 or 14 head			

* Ground Mounted signs for Expressways interchanges use Table 4, US & MN Highways column. All overhead signs use Table 4 Overhead Mounted Signs column.

NOTES:

- Letter fonts are E Modified unless otherwise noted.
- In urban areas there may be limited horizontal space in which to place a sign. It is then permissible to reduce the size of the letters of a sign by one step. Modified cardinal directions may be used on mast arm signs if load restrictions exist.
- These minimum and recommended sizes are shown in inches.
- For signing on freeway and expressway ramps use the sizes shown under the speed 45-60 mph, single lane heading.
- When a sign includes both destination and supplemental information, and letter sizes stipulated above are different for each, upsize the supplemental legend to the destination legend size.

Exhibit 3-5 Guidelines for Guide Sign (Freeway) Font Size

Guidelines for Freeway Guide Sign Font Size					
Sign Type		Overhead Mounted Signs	Ground Mounted Signs		
			Interstates	US & MN Highways	
Guide Advance Guide Exit Direction Overhead Guide Signs	Cardinal Direction				
	First Letter	15	15	15	
	Rest of word	12	12	12	
	Aux/Alt Route Legend	12	12	12	
	Route Marker				
	2 Digit	36 x 36	36 x 36	36 x 36	
	3 Digit	45 x 36	45 x 36	45 x 36	
	City/Street Name	16-12	20-15	16-12	
	Arrow Size	17-36	17-36	17-36	
	EXIT ONLY	12	N/A	N/A	
	Diagonal Upward Pointing Arrow	8-25			
	Down Arrow	22-32			
	Distance	Numeral	15	18	15
		Fraction Numerals	10	12	10
		Word	10	12	10
Distance	Cardinal Direction				
	First Letter	12	12	12	
	Rest of word	10	10	10	
	Route Marker				
	2 Digit	24 x 24	24 x 24	24 x 24	
	3 Digit	30 x 24	30 x 24	30 x 24	
	City/Street Name	13.3-10	13.3-10	13.3-10	
	Numerals	13.3	13.3	13.3	
	Fraction Numerals	10	10	10	
Supplemental	Generic	12	12	12	
	Proper Name	13.3-10	13.3-10	13.3-10	
	Action Message	10	10	10	
	Word	10	10	10	
	Numeral	15	15	15	
Exit Panel	Word	10	10	10	
	Numeral	15	15	15	
	Letter	15	15	15	

Notes:

*For further guidelines see MnMUTCD, Section 2-E

Exhibit 3-9 Combinations for Freeway Distance Signs

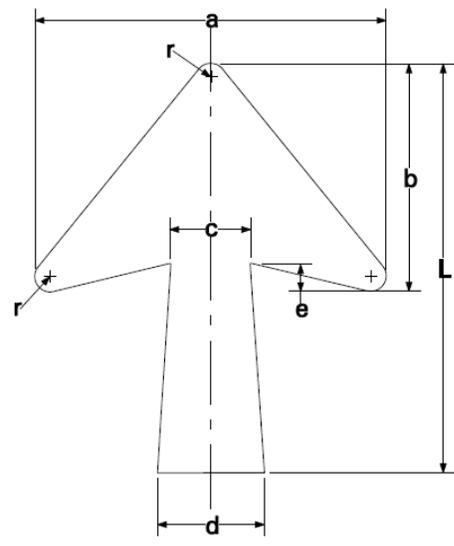
Combination	1	2	3	4	4	4	5	5	5	6	6	6	7	7
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Space	7	10	9	7.5	10	10.4	6.5	9	9	7	9	7.4	7	8.5
Component	24	13.3	15	24	13.3	13.3	24	15	15	24	13.3	24	24	15
Space	6	10	8.5	7	7.6	10.4	6	7	9	6	8.2	8	6	7.5
Component	24	13.3	15	13.3	24	13.3	15	24	15	24	24	13.3	24	24
Space	6	10	8.5	10.4	7.6	7	9.5	7	7	7.7	6	8	7.5	6
Component	24	13.3	15	13.3	13.3	24	15	15	24	13.3	24	24	15	24
Space	7	10	9	10.4	10	7.5	10	9	7	10	7.5	7.3	8.5	7
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Panel height	102"	84"	84"	90"	90"	90"	90"	90"	90"	96"	96"	96"	96"	96"

Combination	7	8	8	8	8	8	8	9	9	9	10	10	10	
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	
Space	7	7	9	10	7	9.6	10	9.6	9.5	9.6	9	9.2	9.2	
Component	24	24	15	13.3	24	13.3	15	13.3	15	13.3	15	13.3	15	
Space	7.5	7	7	9.6	7	7	9.6	9.6	9.6	9.6	9.2	9.2	9.2	
Component	15	13.3	24	15	15	24	13.3	13.3	13.3	15	15	15	13.3	
Space	7.5	9.7	7	7	9	7	7	9.6	9.6	9.5	9.2	9.2	9.2	
Component	24	15	13.3	24	13.3	15	24	15	13.3	13.3	13.3	15	15	
Space	7	10	10.6	7	10.6	10	7	9.5	9.6	9.6	9.2	9	9	
Border	2	2	2	2	2	2	2	2	2	2	2	2	2	
Panel height	96"	90"	90"	90"	90"	90"	90"	84"	84"	84"	84"	84"	84"	

Notes:

1. All dimensions are in inches.
2. All signs will have 2" borders.
3. All signs of this category have three lines of legend.
4. Components of three different heights may be used: Route markers (24"), standard fonts (13.33"), and fractions (15"). This results in 10 combinations. When taking into account the order from top to bottom of the line possibilities, this is expanded to 27.

Exhibit 3-10 Straight Arrows



NOTES:
 1. Arrow Code: First number specifies the head to be used. Second number specifies the length L. Thus, a 5-13 arrow has head #5 and length 13".
 2. For each legend size there is a corresponding short shaft and long shaft arrow.

OVERHEAD SIGNS ONLY

Arrow	Letter and Overlay Size	Dimensions in Inches					
		f	g	h	i	L	r
16"	13.33-10", 10" & less	24.0	12.0	4.88	2.25	16.5	.75
22"	16-12", 12" & greater	32.0	16.0	6.5	3.0	22.0	1.00

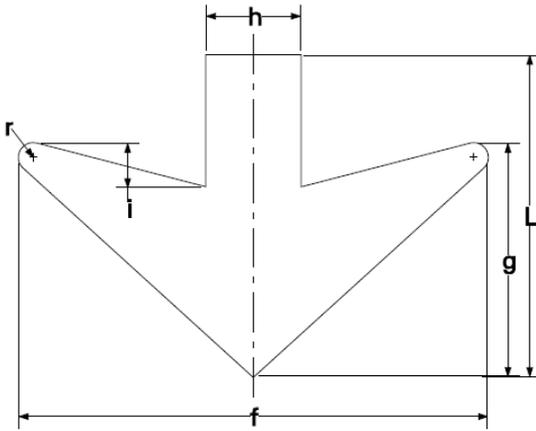


TABLE 1 - SHORT SHAFT ARROWS

Head	Matching Letter Size	Standard Length L	Dimensions in Inches					
			a	b	c	d	e	r
1	4", 4.3"	6"	5.58	3.63	1.28	1.72	.47	.26
2	5"	8"	7.06	4.60	1.61	2.18	.56	.32
3	6", 6-4.5"	10"	8.35	5.44	1.91	2.58	.67	.38
4			9.75	6.35	2.23	3.02	.78	.44
5	8", 8-6"	13"	11.16	7.27	2.55	3.44	.89	.51
6	10", 10.67-8"	17"	15.09	9.83	3.45	4.65	1.21	.69
7	10", 12", 13.33-10"	20"	17.72	11.54	4.05	5.47	1.42	.81
8	16-12"	25"	21.88	14.25	5.00	6.75	1.75	1.00

TABLE 2 - LONG SHAFT ARROWS

Head	Matching Letter Size	Standard Length L	Dimensions in Inches					
			a	b	c	d	e	r
11	4", 4.3"	9"	5.70	4.36	1.38	1.83	.45	.26
12	5"	12"	7.18	5.48	1.74	2.30	.56	.32
13	6", 6-4.5"	14"	8.56	6.54	2.07	2.74	.67	.38
14	8", 8-6"	18"	11.41	8.72	2.76	3.66	.90	.51
15	10", 10.67-8"	24"	15.14	11.56	3.66	4.85	1.19	.68
16	10", 12", 13.33-10"	29"	18.24	13.93	4.41	5.84	1.43	.82
17	16-12", 20-15"	36"	22.25	17.00	5.38	7.13	1.75	1.00
17		42"	22.25	17.00	5.38	8.39	1.75	1.00
18		36"	26.18	20.00	6.33	7.13	2.06	1.18
18		42"	26.18	20.00	6.33	8.39	2.06	1.18

ARROW SELECTION:
 Adjacent to one line of legend - use Table 1 for vertical, horizontal, or diagonal arrow.
 Adjacent to two or more lines of legend - use Table 2 for vertical or diagonal arrow; Table 1 for horizontal arrow.
 Beneath one or more lines of legend - use Table 2 for horizontal or diagonal arrow ≤ 45°; Table 1 for vertical or diagonal arrow > 45°.
ALL FREEWAY SIGNS & EXPRESSWAY INTERCHANGE SIGNS - use Table 2.

ARROW SIZE:
 Arrow head numbers determine which straight arrow corresponds with which advance turn, double head, and double head 90° arrows and legend.
 For example, a 5-13 arrow and a 5-24 double head arrow (both have #5 heads) would be appropriate arrows to use with an 8-6" legend.

APPROVED 9/1/73	DATE OF REV. 1/1/03	STRAIGHT ARROWS Table 6: Arrow Selection and Sizes		PAGE NUMBER 102
---------------------------	-------------------------------	--	---	---------------------------

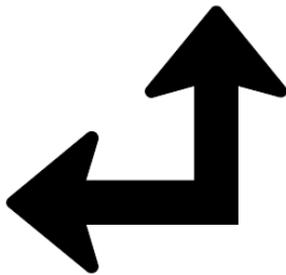
Exhibit 3-11 Double Head and Degree Arrows

DOUBLE HEAD ARROWS



Arrow Designation	1 Head	3 Head	5 Head	6 Head	7 Head
Height	5.58	8.35	11.16	15.09	17.72
L - Minimum	12	18	24	30	36

DOUBLE HEAD 90 DEGREE ARROWS



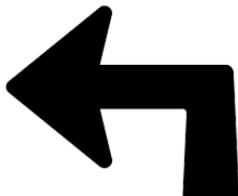
Arrow Designation	1-11	3-16	5-22	6-29
Height	10.5	15.75	21	28
Length	11	16.5	22	29.5

45 DEGREE ADVANCE TURN ARROWS



Arrow Designation	6 X 8	9 X 12	12 X 16	15 X 20	17 X 24
Arrow head	1	3	5	6	7
Height	8	12	16	20	24
Length	6	9	12	15	17

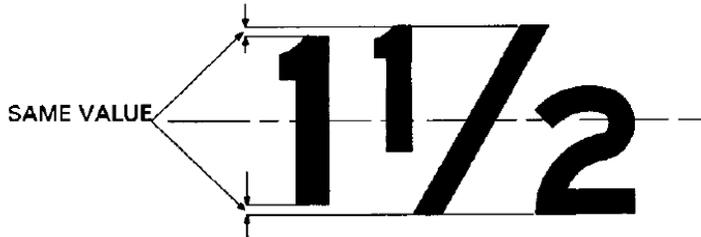
90 DEGREE ADVANCE TURN ARROWS



Arrow Designation	8 X 6.5	12 X 10	16 X 13	18 X 16	22 X 18	25 X 21
Arrow head	1	3	5	14	6	7
Height	6.5	10	13	16	18	21
Length	8	12	16	18	22	25

3.9 Fractions

A fraction is always 1.5 times the height of the numerals used in it. When using a whole number with a fraction see **Exhibit 3-12** below for the correct numeral height. Alignment is shown below. Note that the fraction is centered vertically on the numeral.



If a fraction is used on a line with additional legend (as in "1/2 MILE ON RIGHT") the fraction numerals should be the same height as the legend letter height, as shown below.

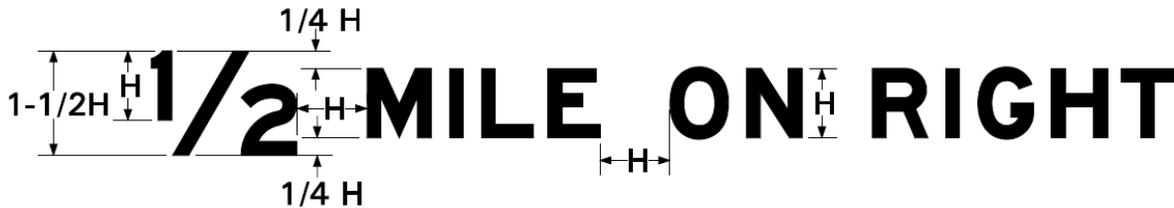


Exhibit 3-12 Fraction Font Sizes

Fraction Height	Preceding Whole Number Height	Numeral Height in Fraction	Space From Whole Number 1 to Fraction	Space From Whole Numbers 2 - 9 to Fraction
6"	6"	4"	2.5"	2"
9"	8"	6"	3"	2.5"
12"	10.67"*	8"	4.5"	4"
12"	12"	8"	5"	4"
15"	13.33"*	10"	5"	4"
15"	15"	10"	6"	5"
18"	18"	12"	7"	6"

*On distance signs

Exhibit 3-13 U-Post Structure Chart for Ground Mounted Signs

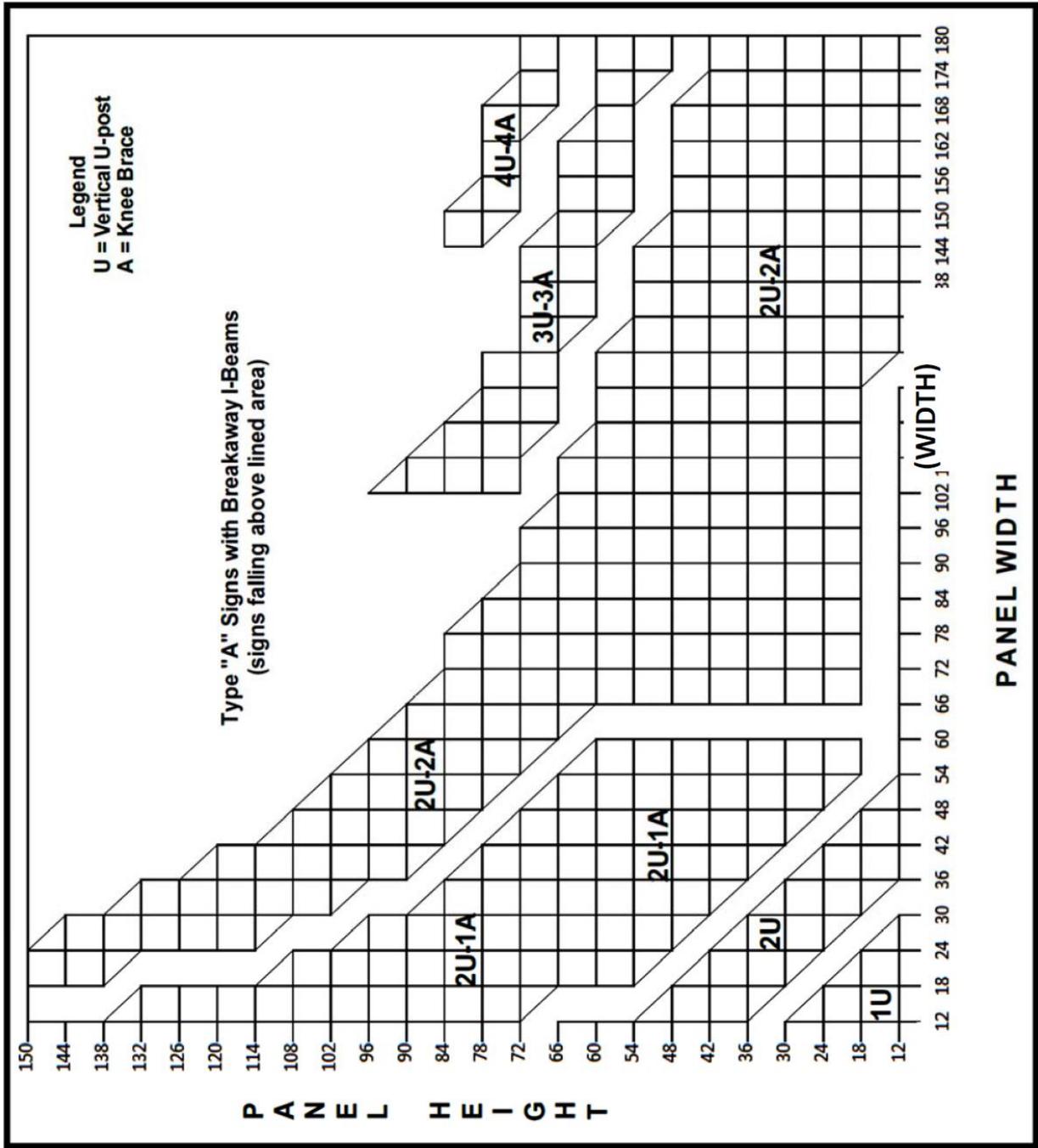


Exhibit 3-14 Sign Post Spacing Chart (Source: Traffic Engineering Manual)

PANEL WIDTH (inches)	POST SPACING		
	2 POSTS (inches)	3 POSTS (inches)	4 POSTS (inches)
36	24	---	---
42	30	---	---
48	30	---	---
54	30	---	---
60	36	---	---
66	42	---	---
72	42	---	---
78	54	---	---
84	54	---	---
90	54	---	---
96	54	---	---
102	60	45	---
108	66	45	---
114	66	45	---
120	72	45	---
126	78	45	---
132	78	45	---
138	78	48	---
144	90	51	45
150	90	54	45
156	90	54	45
162	96	57	48
168	96	60	48
174	102	63	54
180	108	63	54

Use this chart if punch codes cannot be found in the Standard Signs and Markings Manual.

Exhibit 3-15 Sign Post Spacing Chart for Exit Panels

Panel Length (inches)	Post Spacing (inches)		
	2 Posts	3 Posts	4 Posts
48	30		
54	30		
60	36		
66	36		
72	42		
78	48		
84	48		
90	54		
96	54		
102		36	
108		36	
114		42	
120		42	
126		48	
132		48	
138		54	
144			42
150			42
156			42
162			42
168			48
174			48
180			

6.E Standard Signs Manual Handout

The following pages are portion of the Standard Signs Manual D Series (Group 1, 2 and 3) and E Series (all groups). The Standard Signs Manual can be downloaded from:

www.dot.state.mn.us/trafficeng/publ/index.html

Standard Signs Manual

NEW, CHANGED, OR DELETED 1/2017

"R" SERIES: REGULATORY

Group 1 - Right of Way

R1-1.....	STOP
R1-2.....	YIELD
R1-2aP.....	TO ONCOMING TRAFFIC (Use with R1-2)
R1-3P.....	ALL WAY
R1-5b.....	STOP HERE FOR (Ped Symbol)
R1-5c.....	STOP HERE FOR PEDESTRIANS
R1-6a.....	In Street and Post Mounted Pedestrian Crossing Sign
R1-6c.....	In Street and Post Mounted Schoolchildren Crossing Sign
R1-9b.....	STATE LAW - STOP FOR PEDESTRIANS IN CROSSWALK
R1-X1.....	STOP FOR PEDESTRIAN IN CROSSWALK
R1-X3.....	TAKE TURNS

Group 2 - Speed

R2-1.....	SPEED LIMIT ____
R2-3P.....	NIGHT (Speed Limit)
R2-4b.....	SPEED LIMIT ____ MINIMUM ____
R2-4P.....	MINIMUM SPEED (Limit)
R2-6bP.....	\$300 FINE
R2-12.....	END WORK ZONE SPEED LIMIT
R2-X5.....	BRIDGE SPEED LIMIT ____

Group 3 - Turning Movement

R3-1.....	No Right Turn (Symbol)
R3-2.....	No Left Turn (Symbol)
R3-3.....	NO TURNS
R3-4.....	No U Turn (Symbol)
R3-4a.....	No U Turn (Symbol)
R3-5 (R or L).....	Mandatory Lane Use Turn Arrow
R3-5a.....	Mandatory Lane Use Through Arrow
R3-6 (R or L).....	Optional Lane Use Arrows
R3-7.....	Mandatory Turn Signs
R3-8 (1 of 3).....	Lane Use Control Signs
R3-8 (2 of 3).....	Lane Use Control Signs
R3-8 (3 of 3).....	Lane-Use Control Sign Format
R3-8 Supplement.....	Lane Use Control Sign Arrows
R3-9a.....	Two-Way Left Turn ONLY (Overhead Mounting)
R3-9b.....	CENTER LANE ONLY Two-Way Left Turn
R3-9cP and R3-9dP.....	BEGIN, END (Plaques)
R3-17.....	BIKE LANE (with Symbol)
R3-17aP and R3-17bP.....	AHEAD, ENDS (Plaques)
R3-18.....	U-Turn and Left Turn Prohibition (Symbol)
R3-27.....	No Straight Thru (Symbol)
R3-33.....	RIGHT LANE MUST EXIT
R3-X3.....	HOV RAMP

HANDOUT

HANDOUT

Group 4 - Alignment

- R4-1..... DO NOT PASS
- R4-2..... PASS WITH CARE
- R4-3..... SLOWER TRAFFIC KEEP RIGHT
- R4-3a..... SLOWER TRAFFIC MOVE RIGHT
- R4-4..... BEGIN RIGHT TURN LANE YIELD TO BIKES
- R4-5..... TRUCKS USE RIGHT LANE
- R4-6..... TRUCK LANE ___ FEET
- R4-7..... Keep Right (Symbol)
- R4-7c..... Keep Right - Narrow (Symbol)
- R4-8..... Keep Left (Symbol)
- R4-8c..... Keep Left - Narrow (Symbol)
- R4-17a..... NO DRIVING ON SHOULDER
- R4-18a..... NO PASSING ON SHOULDER
- R4-X1..... THRU TRAFFIC KEEP RIGHT
- R4-X4..... TRUCK STOPPING LANE
- R4-X5..... STATE LAW
- R4-X6..... PASSING LANE ___ MILE(S) AHEAD
- R4-X7..... SHOULDER - AUTHORIZED BUSES ONLY
- R4-X7P..... END, BEGIN (Plaques) (Use With R4-X7)
- R4-X8..... BYPASS LANE
- R4-X8a..... BYPASS AND TURN LANE

Group 5 - Exclusion

- R5-1..... DO NOT ENTER
- R5-1a..... WRONG WAY
- R5-2..... No Trucks (Symbol)
- R5-3..... NO MOTOR VEHICLES
- R5-6..... No Bicycles (Symbol)
- R5-10d..... PEDESTRIANS BICYCLES MOTORIZED BICYCLES NON-MOTORIZED TRAFFIC PROHIBITED
- R5-X1..... No Snowmobiles (Symbol)
- R5-X2..... STATE PROPERTY KEEP OFF (OUT)
- R5-X3..... MnDOT Prohibition Sign
- R5-X4..... NO THRU TRAFFIC

Group 6 - One Way

- R6-1..... ONE WAY (Arrow)
- R6-2 (R or L)..... ONE WAY (with Arrow)
- R6-3 and R6-3a..... DIVIDED HIGHWAY (with Symbol)
- R6-4..... Roundabout Directional (Symbol)
- R6-4a..... Roundabout Directional (Symbol)
- R6-4b..... Roundabout Directional (Symbol)
- R6-6..... BEGIN ONE WAY
- R6-7..... END ONE WAY

Group 7 - Parking and Stopping - Urban

- R7-8bP..... VAN ACCESSIBLE (Plaque)
- R7-8m..... Disabled Parking (with Symbol)
- R7-108..... Permissive Parking
- R7-X2..... NO TRUCK PARKING

HANDOUT

HANDOUT

HANDOUT

HANDOUT

Group 8 - Parking and Stopping - Rural and Urban

- R8-3..... No Parking (Symbol)
- R8-3mP No Parking Plaques
- R8-4..... EMERGENCY PARKING ONLY
- R8-7..... EMERGENCY STOPPING ONLY
- R8-8..... DO NOT STOP ON TRACKS
- R8-41..... Park and Ride Parking Prohibition

Group 9 - Pedestrian and Bicycle

- R9-3..... No Pedestrian Crossing (Symbol)
- R9-5..... Bikes USE PED SIGNAL (with Symbol)
- R9-6..... Bikes YIELD TO PEDS (with Symbol)
- R9-7 (R or L)..... KEEP LEFT-RIGHT (with Pedestrian and Bike Symbols)
- R9-9..... SIDEWALK CLOSED
- R9-9a..... TRAIL CLOSED
- R9-10..... SIDEWALK CLOSED USE OTHER SIDE
- R9-11 (R or L)..... SIDEWALK CLOSED AHEAD CROSS HERE
- R9-11a (R or L)..... SIDEWALK CLOSED CROSS HERE
- R9-11b (R or L)..... SIDEWALK CLOSED USE OTHER SIDE OF STREET
- R9-X1 Bikes USE SHOULDER (with Symbol)
- R9-X2 Bikes MUST USE BIKEWAY (with Symbol)

Group 10 - Traffic Signal

- R10-3..... PUSH BUTTON FOR Walk (with Symbol)
- R10-3b..... PUSH BUTTON TO CROSS
- R10-3d..... PUSH BUTTON TO CROSS
- R10-3e..... PUSH BUTTON TO CROSS
- R10-6 (R or L)..... STOP (WAIT) HERE ON RED (with Arrow)
- R10-7..... DO NOT BLOCK INTERSECTION
- R10-7a..... DO NOT BLOCK CROSSWALK
- R10-10 (R or L)..... LEFT (RIGHT) TURN SIGNAL
- R10-11b..... NO TURN ON RED
- R10-12..... LEFT TURN YIELD ON GREEN
- R10-15a (R or L)..... TURNING VEHICLES STOP FOR Pedestrians (with Symbols)
- R10-16..... U-TURN YIELD TO RIGHT TURN
- R10-X4 RAMP METERING BEGINS ____
- R10-X6 1 CAR ON GREEN
- R10-X7 FORM 2 LANES WHEN METERED
- R10-X12 LEFT TURN YIELD ON FLASHING YELLOW ARROW
- R10-X13 U-TURN YIELD ON FLASHING YELLOW ARROW

Group 11 - Closures

- R11-1 KEEP OFF MEDIAN
- R11-2 ROAD (STREET) (RAMP) CLOSED
- R11-2a..... BRIDGE CLOSED (OUT)
- R11-3a..... ROAD CLOSED ____ MILES AHEAD LOCAL TRAFFIC ONLY
- R11-3b..... BRIDGE OUT ____ MILES AHEAD LOCAL TRAFFIC ONLY
- R11-3c..... BRIDGE CLOSED ____ MILES AHEAD LOCAL TRAFFIC ONLY
- R11-4 ROAD CLOSED TO THRU TRAFFIC
- R11-X1..... ROAD CLOSED WHEN FLASHING

HANDOUT

HANDOUT

HANDOUT

HANDOUT

Group 12 - Weight Limit

- R12-1a..... BRIDGE WEIGHT LIMIT ___ TONS
- R12-2..... AXLE WEIGHT LIMIT ___ TONS
- R12-5..... WEIGHT LIMIT (with Symbols)
- R12-5a..... WEIGH LIMIT - (Special with Symbol)
- R12-5 SUPPLEMENT..... BRIDGE WEIGHT LIMIT ___ MILES (with Symbols/Plaques)
- R12-X2..... RESTRICTED BRIDGE ___ MILES AHEAD WEIGHT LIMIT ___ TONS
- R12-X2a..... RESTRICTED BRIDGE ___ MILES AHEAD PERMIT WEIGHT LIMIT 45 TONS
- R12-X3..... TRUCKS MUST NOT MEET ON BRIDGE
- R12-X3a..... VEHICLES MUST NOT MEET ON BRIDGE
- R12-X4..... RESTRICTED BRIDGE ___ MILES AHEAD WEIGHT LIMIT ___ TONS CLEARANCE ___ FT ___ IN
- R12-X4a..... RESTRICTED BRIDGE ___ MILES AHEAD CLEARANCE ___ FT ___ IN
- R12-X5..... VEHICLES OVER ___ TONS AXLE WT USE TRUCK DETOUR
- R12-X11..... PERMIT WEIGHT LIMIT 45T (with Symbol)

Group 13 - Weigh Station

- R13-X1..... WEIGH STATION

Group 14 - Truck Route

- R14-1..... TRUCK ROUTE

Group 15 - Railroad

- R15-3P..... EXEMPT
- R15-7 and R15-7a..... Light Rail DIVIDED HIGHWAY (Symbol)

Group 16 - Miscellaneous

- R16-4..... FENDER BENDER MOVE VEHICLES FROM TRAVEL LANES
- R16-X1..... STATE LAW STOP FOR SCHOOL BUS WHEN RED LIGHTS FLASHING
- R16-X2..... STATE LAW TRUCKS AND VEHICLES WITH TRAILERS MUST MAINTAIN
500 FOOT INTERVAL
- R16-X3..... UP TO \$1000 FINE FOR LITTERING HIGHWAYS
- R16-X4..... Freeway Entrance Ramp Informational Sign
- R16-X6..... SIGNAL YOUR TURN
- R16-X7 (R or L)..... RIGHT (LEFT) LANE MUST EXIT
- ~~R16-X8..... REST STOP 6 HR LIMIT NO CAMPING~~
- R16-X9..... STATE LAW UNLAWFUL TO PASS ON SHOULDER
- R16-X10..... NO FISHING FROM BRIDGE
- R16-X11..... STATE LAW SEAT BELT USE REQUIRED (with Symbol)
- R16-X12..... Seat Belt FASTENED? (with Symbol)
- R16-X13..... VEHICLE NOISE LAWS ENFORCED
- R16-X15..... STATE LAW MOVE OVER FOR STOPPED EMERGENCY AND
MAINTENANCE VEHICLES
- R16-X16..... DO NOT CROSS SOLID DOUBLE WHITE LINE
- R16-X33..... CHECK YOUR TURN SIGNAL

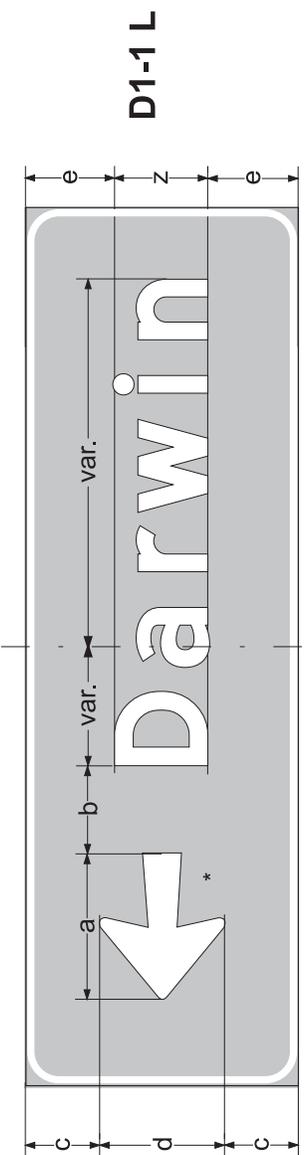
HANDOUT

HANDOUT

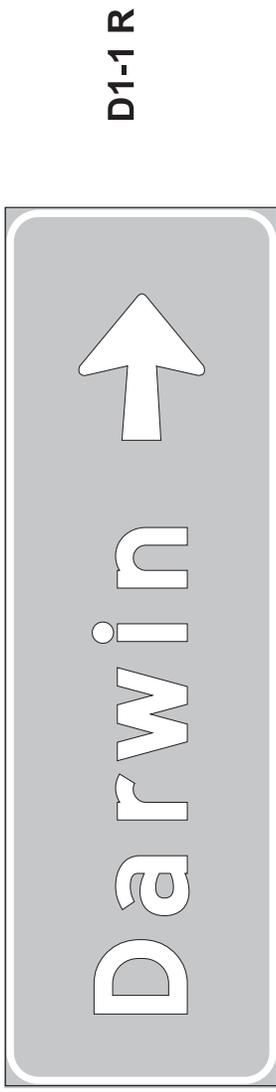
HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 24	Var. X 30
RADIUS	3	3
MARGIN		
BORDER	1	1
a	13	17
b	8	10.7
c	6.4	7.4
d	11.2	15.1
e	8	9.6
f		
g		
h		
i	*USE	* USE
j	5-13 ARROW	6-17 ARROW
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD



D1-1 L



D1-1 R

Destination, One-Line

APPROVED	DATE OF REV.	SIGN NUMBER
5/1/13		D1-1 (R or L)

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. For arrow dimensions, see page 102, Sign Details.
4. Sign to be designated right (R) or left (L).

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 24	Var. X 30
RADIUS	3	3
MARGIN		
BORDER	1	1
a	13	17
b	8	10.7
c	10	13.3
d	6.4	7.4
e	11.2	15.1
f	8	9.6
g		
h		
i	*USE	* USE
j	5-13 ARROW	6-17 ARROW
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD

D1-1a L

D1-1a R

Destination and Distance, One-Line

APPROVED	DATE OF REV.	SIGN NUMBER
5/1/13		D1-1a (R or L)

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. For arrow dimensions, see page 102, Sign Details.
4. Sign to be designated right (R) or left (L).

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 42	Var. X 54
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	13	17
b	8	10.7
c	5.2	6.3
d	11.2	15.1
e	4	5
f	1.25	1.25
g	5.6	7.2
h	6.8	8.5
i		
j		
k	*USE	*USE
l	5-13 ARROW	6-17 ARROW
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD

Destination, Two-Line	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		D1-2

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.

HANDOUT

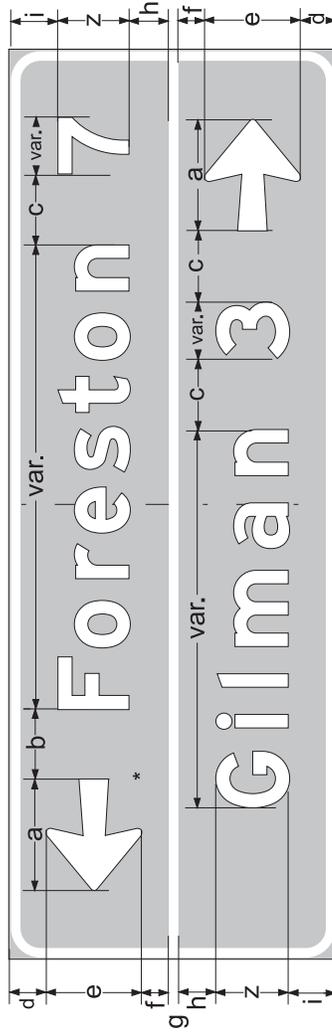
HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 42	Var. X 54
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	13	17
b	8	10.7
c	10	13.3
d	5.2	6.3
e	11.2	15.1
f	4	5
g	1.25	1.25
h	5.6	7.2
i	6.8	8.5
j		
k	*USE	*USE
l	5-13 ARROW	6-17 ARROW
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.



		Destination and Distance, Two-Line	
		APPROVED 5/1/13	DATE OF REV.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 42
RADIUS	6
MARGIN	
BORDER	1.25
a	17.2
b	7
c	8
d	13
e	2.8
f	16
g	1.6
h	1.25
i	5.6
j	6.8
k	4
l	11.2
m	5.2
n	
o	
p	*USE
q	5-13 ARROW
r	
s	
t	
u	
v	
w	
x	
y	
z	8-6 EMOD

Circular Intersection, Destination, Two-Line	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		D1-2d

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. For arrow dimensions, see page 102, Sign Details.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 60	Var. X 72
RADIUS	6	9
MARGIN		
BORDER	1.25	1.5
a	11.2	15
b	8.9	11.7
c	13	17
d	8	10.7
e	4	4
f	13	17
g	2.7	2.5
h	1.25	1.5
i	3.6	3.5
j	11.2	15.1
k	5.1	5.7
l	6.4	7.2
m	6.4	7.2
n	5.2	5.7
o	4.8	5
p		
q		
r		
s	*USE	*USE
t	5-13 ARROW	6-17 ARROW
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD

Destination, Three-Line	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		D1-3

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 60	Var. X 72
RADIUS	6	9
MARGIN		
BORDER	1.25	1.5
a	11.2	15
b	8.9	11.7
c	13	17
d	8	10.7
e	3.9	4
f	13	17
g	2.7	2.5
h	1.25	1.5
i	3.6	3.5
j	11.2	15.1
k	3.6	3.5
l	5.2	5.7
m	6.4	7.2
n	5.2	5.7
o	5.2	5.7
p	4.8	5
q	10	13.3
r		
s	*USE	*USE
t	5-13 ARROW	6-17 ARROW
u		
v		
w		
x		
y		
z	8-6 EMOD	10.7-8 EMOD

Destination and Distance, Three-Line	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		D1-3a

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 60
RADIUS	6
MARGIN	
BORDER	1.25
a	11.2
b	10
c	17.2
d	7
e	3.8
f	13
g	2.5
h	1.25
i	1.5
j	16
k	1.5
l	5
m	6.2
n	5.5
o	3.4
p	4.7
q	8
r	
s	*USE
t	5-13 ARROW
u	
v	
w	
x	
y	
z	8-6 EMOD

Circular Intersection, Destination, Three-Line

SIGN NUMBER
D1-3d

APPROVED 5/1/13 **DATE OF REV.**

SIGN NUMBER D1-3d

NOTES:

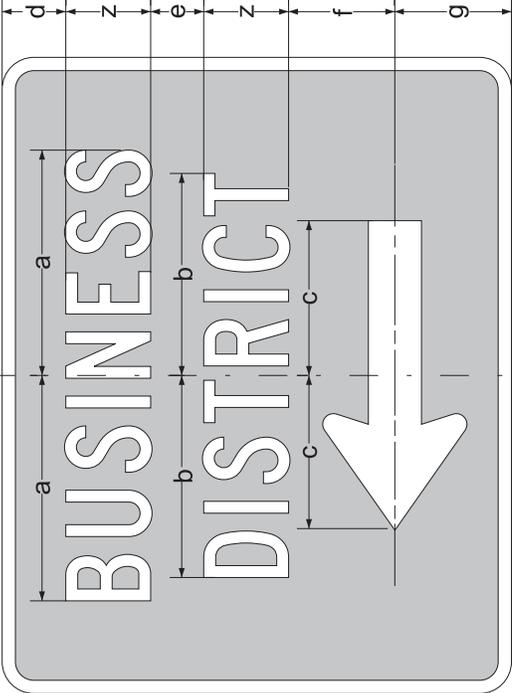
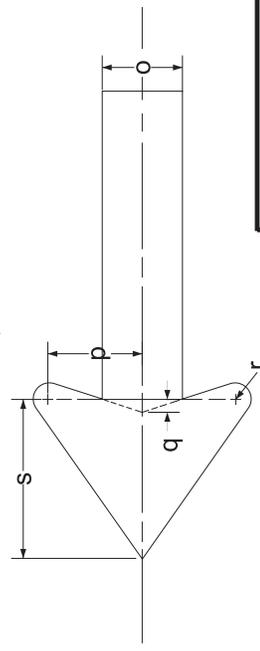
1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. For arrow dimensions, see page 102, Sign Details.

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	30 X 24	42 X 36	54 X 48
RADIUS	1.5	2.25	6
MARGIN			
BORDER	.63	.75	1.25
a	10.6	16	21.3
b	9.5	14.3	19.1
c	7.3	10	14.5
d	3	4.5	6
e	2.5	4	5
f	5	7.5	9.8
g	5.5	8	11.2
h			
i			
j			
k			
l			
m			
n			
o	2.5	3.5	5
p	2.9	4	5.8
q	.4	.5	.8
r	.5	.75	1
s	5	6.9	10
t			
u			
v			
w			
x			
y			
z	4C	6C	8C



BUSINESS DISTRICT (with Arrow)	DATE OF REV. 8/1/09	SIGN NUMBER D1-X1 (R or L)
APPROVED 1/1/73		

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. Arrow to be designated right (R) or left (L).

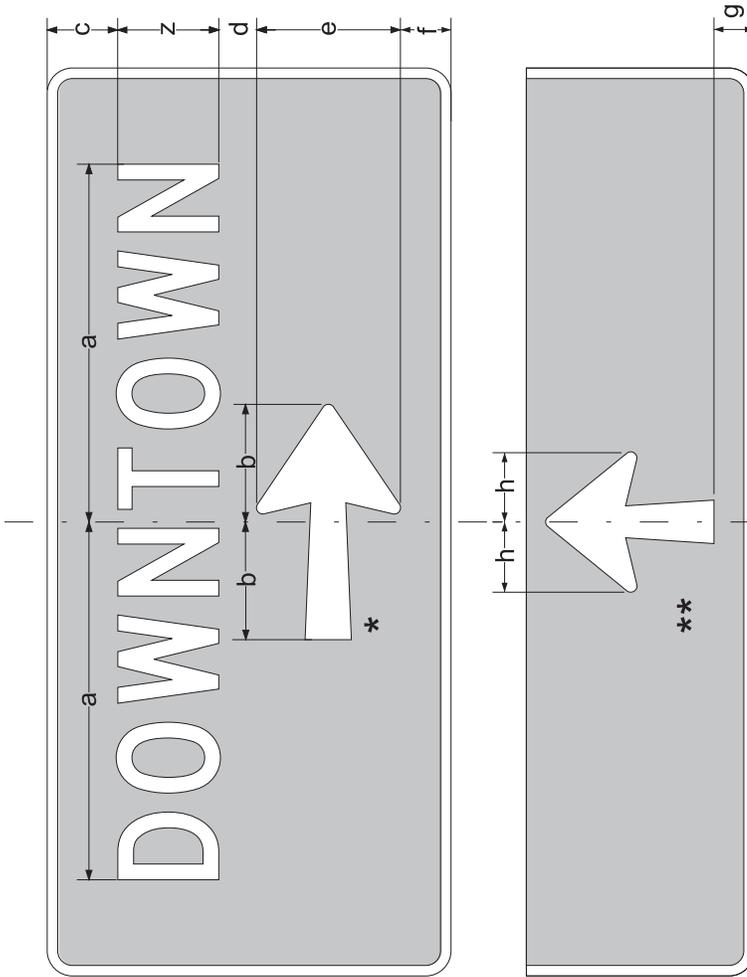
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	30 X 18	54 X 24	66 X 36
RADIUS	1.5	1.5	3
MARGIN			
BORDER	.5	.63	1
a	12	21.3	28.4
b	4.5	7	9
c	3.6	3.8	7
d	2.1	2.5	4.3
e	5.7	8.6	11.4
f	2.6	3.1	5.3
g	2.4	2.4	4.5
h	2.8	4.2	5.6
i			
j	*USE	*USE	*USE
k	11-9 ARROW	13-14 ARROW	14-18 ARROW
l			
m	**USE	**USE	**USE
n	1-6 ARROW	3-10 ARROW	5-13 ARROW
o			
p			
q			
r			
s			
t			
u			
v			
w			
x			
y			
z	4C	6D	8D



	DOWNTOWN (with Arrow)	
	APPROVED 1/1/09	DATE OF REV.

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.
 4. Arrow to be designated left (L), right (R), or through (T).

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	30 X 24	42 X 36	66 X 48
RADIUS	1.5	2.25	6
MARGIN			
BORDER	.63	.75	1.25
a	11	16.5	26.7
b	5.6	8.4	13.8
c	7.3	10	13
d	3	4.5	6
e	2.5	4	5.3
f	5	7.5	10
g	5.5	8	10.7
h			
i			
j			
k			
l			
m	9.5	13.5	18
n	7.3	10	13
o	2.5	3.5	4.7
p	2.9	4	5.3
q	.4	.5	.7
r	.5	.75	1
s	5	6.9	9.2
t			
u			
v			
w			
x			
y			
z	4C	6C	8D

The diagram shows a rectangular sign with rounded corners. The text 'FRONTAGE ROAD' is written in large, white, sans-serif capital letters on a green background. Below the text is a white arrow pointing to the right. Dimensions are labeled with letters a through z. Callouts indicate the 'CENTERLINE OF DOUBLE HEADED ARROW' and 'CENTERLINE OF SINGLE HEADED ARROW'.

	FRONTAGE ROAD (with Arrow)	
	APPROVED 1/1/73	DATE OF REV. 11/7/97
SIGN NUMBER D1-X2		(R, L, or DH)

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. Arrow to be designated left (L), right (R), or doubleheaded (DH).

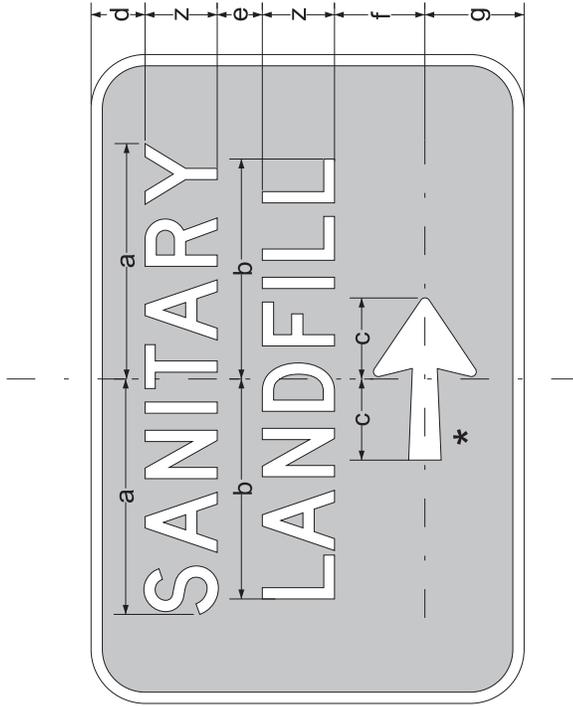
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	36 X 24	54 X 36	66 X 48**
RADIUS	1.5	2.25	6
MARGIN			
BORDER	.63	1	1.25
a	13.1	19.6	26.1
b	12.2	18.3	24.4
c	4.5	7	9
d	3	5	6.3
e	2.5	4	5
f	5	7	9.7
g	5.5	8	11
h			
i			
j			
k			
l			
m	*USE	*USE	*USE
n	11-9 ARROW	13-14 ARROW	14-18 ARROW
o			
p			
q			
r			
s			
t			
u			
v			
w			
x			
y			
z	4D	6D	8D



	SANITARY LANDFILL (with Arrow)	
	APPROVED 1/1/73	DATE OF REV. 1/1/11

- NOTES:
- All dimensions are in inches.
 - Color - White legend and border on green background, fully reflectorized.
 - For arrow dimensions, see page 102, Sign Details, Standard Signs Manual.
- ** The 66 X 48 size sign may have square corners.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	48 X 12	60 X 18
RADIUS	1.5	1.5
MARGIN		
BORDER	.38	.5
a	4	4
b	28	37
c	4	5
d	8	10
e	3	5
f	6	9
g		
h		
i		
j		
k		
l	*USE	*USE
m	2-8 ARROW	3-10 ARROW
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	6C	8C

AIRPORT (with Arrow)	APPROVED 1/1/73	DATE OF REV.	SIGN NUMBER D1-X4 (R or L)
---------------------------------	--------------------	--------------	--

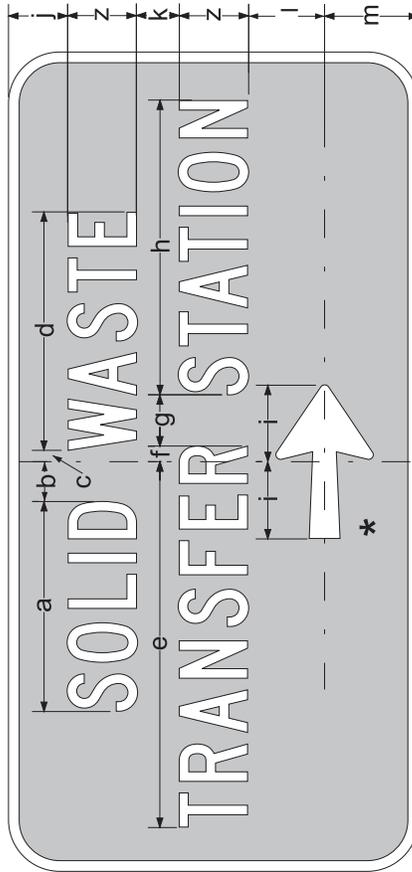
NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. Reverse legend for left directional guidance.

HANDOUT

HANDOUT

HANDOUT

HANDOUT



SIZE DIMENSION	48 X 24	72 X 36	96 X 48**
RADIUS	1.5	2.25	6
MARGIN			
BORDER	.63	1	1.25
a	12.3	18.4	24.6
b	2.3	3.2	4.6
c	.7	.8	1.4
d	13.9	20.9	27.9
e	21.3	31.7	42.6
f	1	1.8	2
g	3	4	6
h	17.3	25.8	34.5
i	4.5	7	9
j	3.5	5	6.6
k	2.5	4	5.4
l	4.5	7	9.4
m	5.5	8	10.6
n			
o	*USE	*USE	*USE
p	11-9 ARROW	13-14 ARROW	14-18 ARROW
q			
r			
s			
t			
u			
v			
w			
x			
y			
z	4C	6C	8C

- NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. Arrow direction to be specified.
 ** The 96 X 48 size sign may have square corners.

	SOLID WASTE TRANSFER STATION (with Arrow)	
	APPROVED 3/15/88	DATE OF REV. 1/1/11

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	54 X 24	78 X 36	108 X 48**
RADIUS	1.5	2.25	6
MARGIN			
BORDER	.63	1	1.25
a	4	5	8
b	18.4	27.5	36.7
c	15.9	22.8	31.7
d	11.8	17.7	23.7
e	11.9	17.8	23.7
f	8	12	15.9
g	7.9	11.9	15.9
h	4.5	7	9
i	3.5	5	6.7
j	18	27	36
k	2.5	4	5.3
l	3.3	5	6.5
m	2.7	4	5.3
n	4.7	7	9.5
o	5.3	8	10.7
p			
q	*USE	*USE	*USE
r	11-9 ARROW	13-14 ARROW	14-18 ARROW
s			
t			
u			
v			
w			
x			
y			
z	4C	6C	8C

The diagram shows a rectangular sign with rounded corners. On the left side, there is a white recycling symbol (three chasing arrows forming a triangle) on a green background. To the right of the symbol, the words "RECYCLING" and "CENTER" are stacked vertically in white, bold, sans-serif capital letters. A white arrow points to the right from the bottom right of the text area. Dimensions are indicated by lines and letters: 'a' through 'z' define the sign's geometry and text placement. 'a' is the left margin, 'b' is the symbol width, 'c' is the total width, 'd' is the text width, 'e' is the text height, 'f' is the letter height, 'g' is the letter width, 'h' is the arrow height, 'i' is the arrow width, 'j' is the sign height, 'k' is the bottom margin, 'l' is the arrow height, 'm' is the arrow width, 'n' is the arrow height, 'o' is the arrow width, 'p' is the arrow height, 'q' is the arrow width, 'r' is the arrow height, 's' is the arrow width, 't' is the arrow height, 'u' is the arrow width, 'v' is the arrow height, 'w' is the arrow width, 'x' is the arrow height, 'y' is the arrow width, and 'z' is the arrow height.

RECYCLING CENTER (with Arrow and Symbol)	APPROVED	9/1/90	SIGN NUMBER	D1-X6 (R or L)
	DATE OF REV.	1/1/11		

NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.
 4. For left directional arrow move symbol to right side of panel and words and arrow to left.
 ** The 108 X 48 size sign may have square corners.

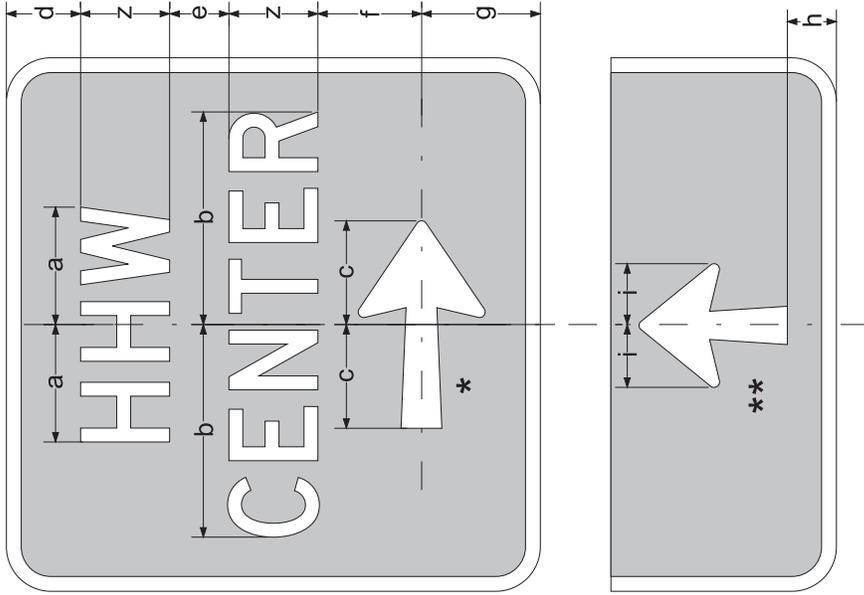
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	24 X 24	36 X 36	48 X 48***	60 X 60***
RADIUS	1.5	2.25	6	6
MARGIN				
BORDER	.63	1	1.25	1.25
a	5.3	7.9	10.6	13.2
b	9.6	14.3	19.1	23.9
c	4.5	7	9	12
d	3.2	5	6.3	7.8
e	2.5	4	5	6.5
f	4.8	7	9.7	12.2
g	5.5	8	11	13.5
h	2.4	3	4.5	5
i	2.8	4.2	5.6	7.5
j				
k				
l				
m	*USE	*USE	*USE	*USE
n	11-9 ARROW	13-14 ARROW	14-18 ARROW	15-24 ARROW
o				
p	**USE	**USE	**USE	**USE
q	1-6 ARROW	3-10 ARROW	5-13 ARROW	6-17 ARROW
r				
s				
t				
u				
v				
w				
x				
y				
z	4D	6D	8D	10D



	HHW CENTER (with Arrow)	
	APPROVED 1/1/03	DATE OF REV. 1/1/11

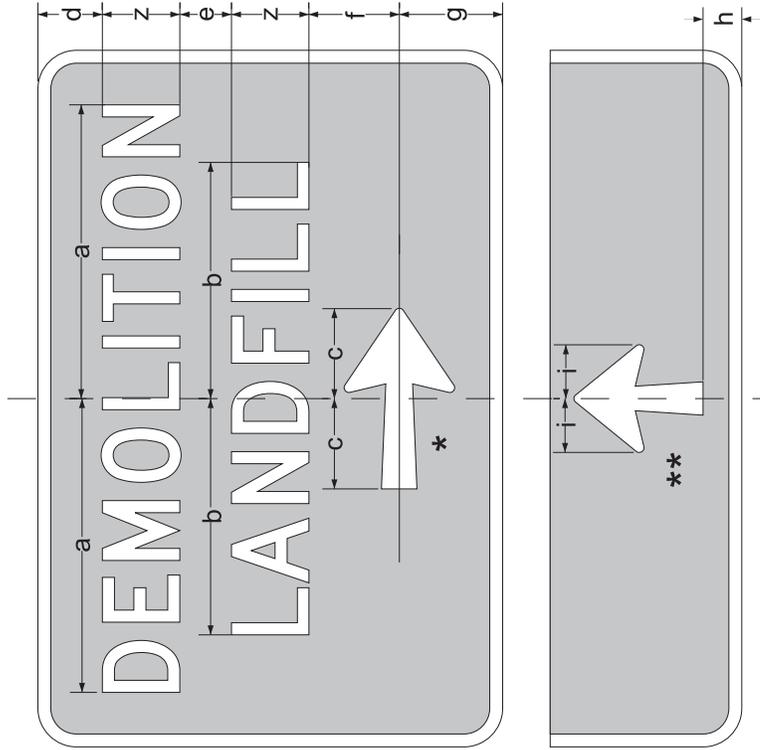
- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.
 4. Arrow to be designated right (R), left (L), or thru (T).
*** The 48 X 48 and 60 X 60 size signs may have square corners.

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	36 X 24	54 X 36	72 X 48***	90 X 60***
RADIUS	1.5	2.25	6	6
MARGIN				
BORDER	.63	1	1.25	1.25
a	15.2	22.8	30.3	37.9
b	12.2	18.3	24.4	30.5
c	4.5	7	9	12
d	3.2	5	6.3	7.8
e	2.5	4	5	6.5
f	4.8	7	9.7	12.2
g	5.5	8	11	13.5
h	2.4	3	4.5	5
i	2.8	4.2	5.6	7.5
j				
k				
l				
m	*USE	*USE	*USE	*USE
n	11-9 ARROW	13-14 ARROW	14-18 ARROW	15-24 ARROW
o				
p	**USE	**USE	**USE	**USE
q	1-6 ARROW	3-10 ARROW	5-13 ARROW	6-17 ARROW
r				
s				
t				
u				
v				
w				
x				
y				
z	4D	6D	8D	10D



 DEMOLITION LANDFILL (with Arrow)	APPROVED	DATE OF REV.	SIGN NUMBER
	1/1/03	1/1/11	D1-X8 (R, L, or T)

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.
 4. Arrow to be designated right (R), left (L), or thru (T).
 *** The 72 X 48 and 90 X 60 size signs may have square corners.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	30 X 36	42 X 48
RADIUS	1.88	3
MARGIN		
BORDER	.75	1
a	10.3	13.7
b	9.9	13.2
c	7	9
d	4.5	6.3
e	3.5	5
f	3.2	4
g	8.56	11.4
h	4.2	5.3
i		
j		
k		
l	*USE	*USE
m	13-14 ARROW	14-18 ARROW
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	6D	8D

TOWN HALL (with Arrow)	APPROVED 5/1/13	DATE OF REV.	SIGN NUMBER D1-X9 (R or L)
-----------------------------------	--------------------	--------------	--

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For arrow dimensions, see page 102, Sign Details.
 4. Arrow to be designated right (R) or left (L).

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 18	Var. X 24
RADIUS	3	3
MARGIN		
BORDER	1	1
a	8	10
b	6	8
c		
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	6-4.5 EMOD	8-6 EMOD

Distance, One-Line	APPROVED	5/1/13	SIGN NUMBER	D2-1
			DATE OF REV.	

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 30	Var. X 36
RADIUS	3	3
MARGIN		
BORDER	1	1
a	8 min.	10 min.
b	6.5	7
c	5	6
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	6-4.5 EMOD	8-6 EMOD

Distance, Two-Line	MINNESOTA DEPARTMENT OF TRANSPORTATION	
APPROVED 5/1/13	DATE OF REV.	SIGN NUMBER D2-2

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.

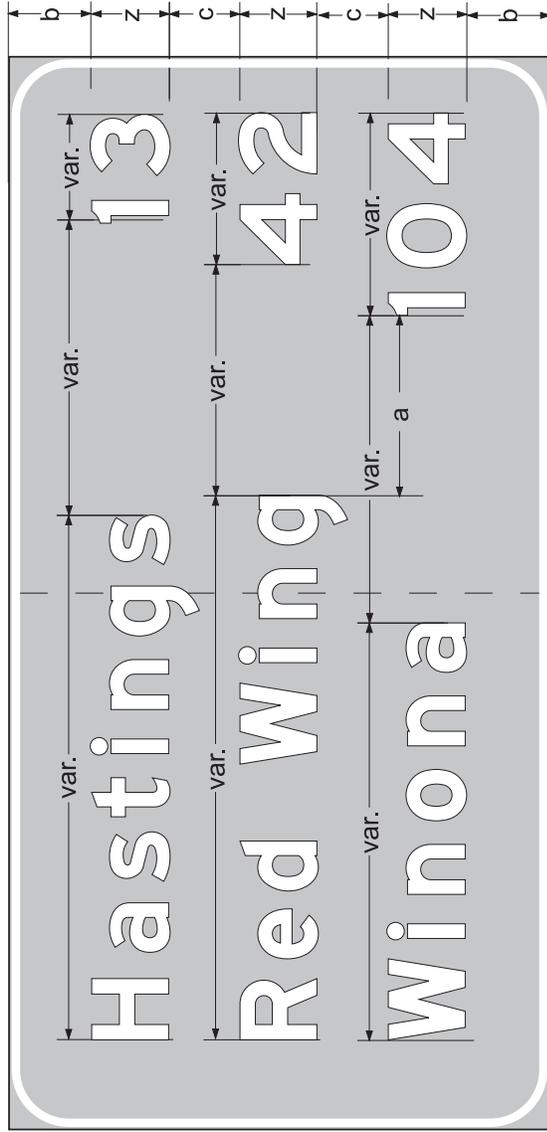
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	Var. X 42	Var. X 48
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	6	8
b	6.5	6.5
c	5.5	5.5
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	6-4.5 EMOD	8-6 EMOD



NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.

 Distance, Three-Line	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		D2-3

HANDOUT

HANDOUT

Standard Signs Manual

NEW, CHANGED, OR DELETED 1/2017

"E" SERIES: GUIDE SIGNS - EXPRESSWAY, FREEWAY

Group 1 - Destination or Interchange

- E1-5aP..... LEFT (Plaque)
- E1-5bP..... LEFT EXIT Number (Plaque)
- E1-5P..... Exit Number (Plaque)**
- E1-6..... FREEWAY ENTRANCE

Group 3 - Supplemental Guide

- E3-X1..... HOSPITAL (Overlay)

Group 5 - Gore Signs

- E5-1..... EXIT (with Arrow)
- E5-1a..... 72" x 60" EXIT (with Arrow and Exit Number)
- E5-1b..... VAR. x 84" EXIT (with Arrow and Exit Number)
- E5-1bP..... Exit Gore - Number (Plaque)

Group 10 - Motorist Services

- E10-1..... Motorist Services Sign
- E10-1 SUPPLEMENT..... Motorist Services Sign Overlays
- E10-3..... HOSPITAL EXIT ___ (NEXT) (SECOND) RIGHT
- E10-4 (R or L)..... HOSPITAL ___ MILES (with Arrow)
- E10-5 (R, L or LR)..... GAS (with Arrows)
- E10-6 (R, L, LR)..... FOOD (with Arrows)
- E10-7 (R, L, LR)..... LODGING (with Arrows)
- E10-8 (R or L)..... HOSPITAL (with Arrow)
- E10-9 (R, L, LR)..... CAMPING (with Arrows)
- E10-10 (R, L, LR)..... DIESEL (with Arrows)
- E10-11 (R, L, LR)..... LP-GAS (with Arrows)
- E10-12 (R, L, LR)..... E85 (with Arrows)
- E10-13 (R or L)..... EV-CHARGING (with Arrows)

Group 11 - Exit Only Warning

- E11-1b..... ONLY (Overlay)
- E11-2..... LEFT (Overlay)
- E11-X2..... PROHIBITED VEHICLES (Overlay)

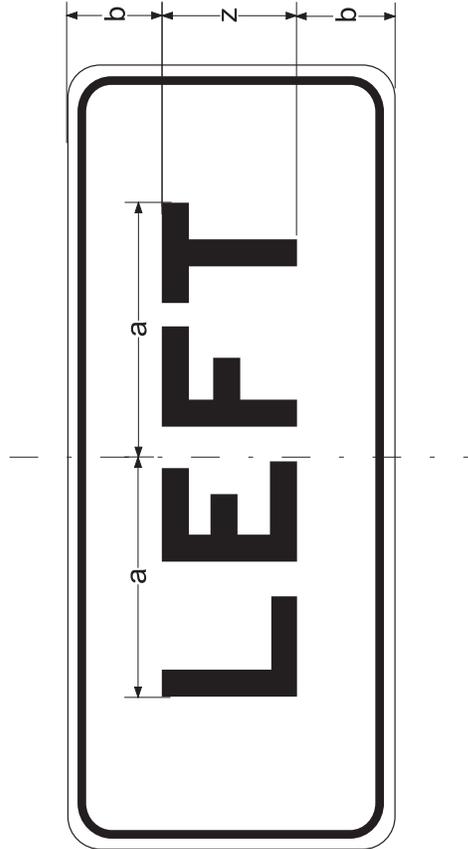
Group 13 - Exit Gore

- E13-1P..... Exit Gore Advisory Speed (Plaque)

HANDOUT

HANDOUT

SIZE DIMENSION	72 X 30
RADIUS	3
MARGIN	.75
BORDER	1.25
a	21.1
b	9
c	
d	
e	
f	
g	
h	
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	12E MOD.



LEFT (Plaque)	APPROVED	DATE OF REV.	SIGN NUMBER
	5/1/13		E1-5aP

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on yellow reflectorized background.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	132 X 54	
RADIUS	6	
MARGIN		
BORDER	2	
a	54	
b	4.9	
c	33.2	
d	12.7	
e	24.1	
f	2.3	
g	varies	
h	varies	
i	8	
j	18	
k	8	
l	10	
m	31.5	
n	7.5	
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y	10E MOD.	
z	15E MOD.	

LEFT EXIT Number (Plaque)	DATE OF REV. 5/1/13	SIGN NUMBER E1-5bP
--------------------------------------	------------------------	------------------------------

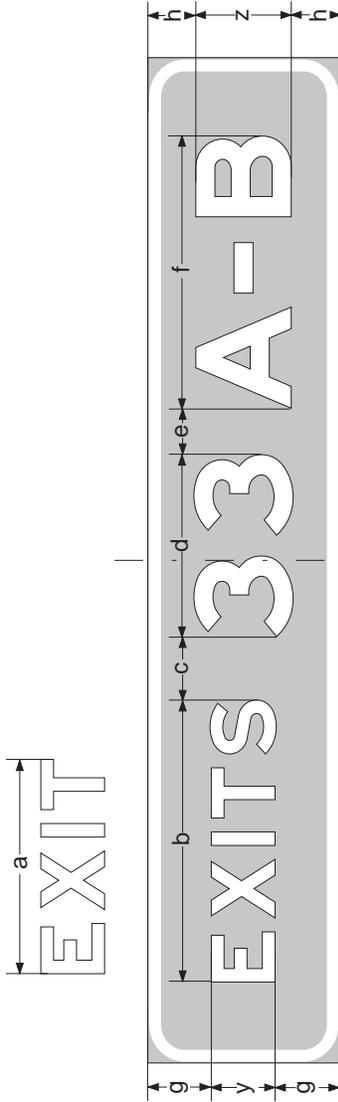
NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For plaque details, see Sign E11-2

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	VAR. X 30
RADIUS	6
MARGIN	
BORDER	2
a	33.3
b	43.8
c	10
d	varies
e	*
f	varies
g	10
h	7.5
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	10E MOD.
z	15E MOD.



DIGITS	SUFFIX CHARACTERS	PANEL WIDTH
1	-	78
2	-	96
3	-	108
1	1	96
1	2	138
2	1	114
2	2	150
3	1	132
3	2	168

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. Appropriate numbers to be specified.
4. Sign panel widths are determined by the number digits and suffix on each panel. See the above chart.

* 7.5" space between the exit number and the letter A.
 9" space between the exit number and all other letters (B, C, D).

	Exit Number (Plaque)	
	APPROVED 5/1/13	DATE OF REV. 1/1/17

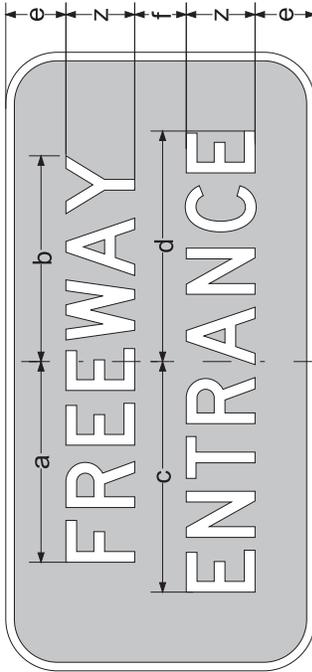
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	36 X 18
RADIUS	3
MARGIN	
BORDER	.5
a	11.7
b	11.9
c	13.3
d	13.5
e	3.5
f	3
g	
h	
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	4D



	FREEWAY ENTRANCE	
	APPROVED 7/1/73	DATE OF REV. SIGN NUMBER E1-6

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	90 X 16	
RADIUS	1.5	
MARGIN		
BORDER		
a	38.7	
b	3	
c		
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	10E MOD.	

HOSPITAL (Overlay)		
APPROVED 1/1/05	DATE OF REV.	SIGN NUMBER E3-X1

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on blue background, fully reflectorized.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	72 X 60	72 X 60
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	22.8	22.8
b	25.7	25.7
c	9.24	11.4
d	10	12
e	5.3	6.7
f	26.7	22.8
g	6	6.5
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v	60 degree	45 degree
w		
x		
y		
z	12F	12F

EXIT (with Arrow)	APPROVED 1/1/73	DATE OF REV.	SIGN NUMBER E5-1
--------------------------	--------------------	--------------	----------------------------

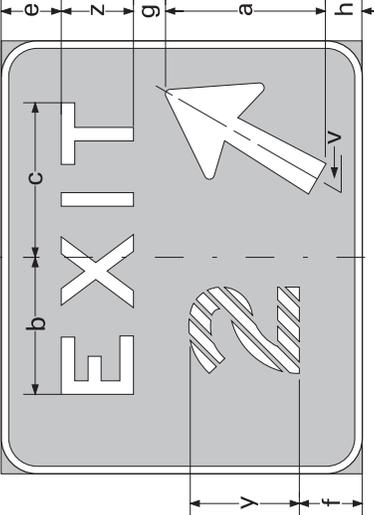
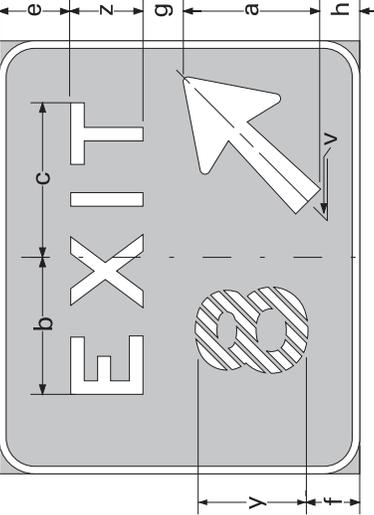
NOTES: 1. All dimensions are in inches.
 2. Color - White legend and border on green background, fully reflectorized.
 3. For 16-29 arrow dimensions see Sign Details, page 102.

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	72 X 60	72 X60
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	26.7	22.8
b	22.8	22.8
c	25.7	25.7
d	7	5
e	10	12
f	10.4	8.9
g	5.3	6.7
h	6	6.5
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v	60 DEG.	45 DEG.
w		
x		
y	18E MOD.	18E MOD.
z	12F	12F

72" x 60" EXIT (with Arrow and Exit Number)	APPROVED	DATE OF REV.	SIGN NUMBER
	9/17/75	5/1/13	E5-1a

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. Appropriate numeral to be specified.
4. For 16-29 arrow dimensions see page 102, Sign Details.
5. For one digit numbers only.

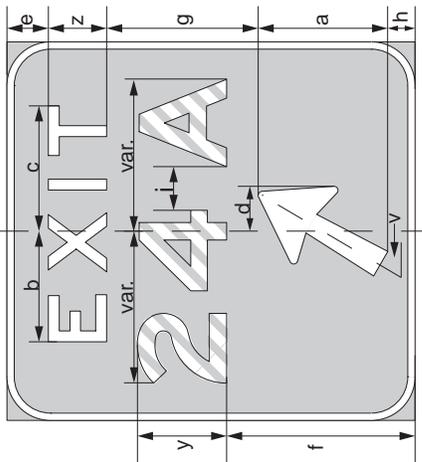
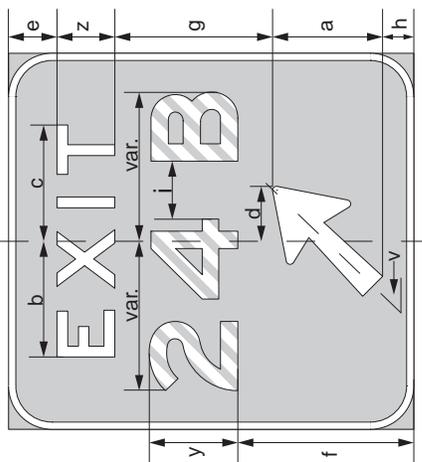
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	VAR. X 84	VAR. X 84
RADIUS	9	9
MARGIN		
BORDER	1.5	1.5
a	26.7	22.8
b	22.8	22.8
c	25.7	25.7
d	9.25	11.4
e	8.5	10
f	38.8	36.5
g	31.2	32.7
h	5.6	6.5
i	***	***
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v	60 DEG.	45 DEG.
w		
x		
y	18E MOD.	18E MOD.
z	12F	12F

WIDTHS OF FREQUENTLY USED PANELS		
DIGITS	SUFFIX CHARACTERS	PANEL WIDTH
1	1	72
2	-	72
3	-	72
2*	1	72
2	1	78
3*	1	90
3**	1	84
3	1	96

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on green background, fully reflectorized.
3. Appropriate numerals to be specified.
4. For 16-29 arrow dimensions see page 102, Sign Details.
5. For two or more digits.

* One of the digits is a 1.
 ** Two of the digits are 1.
 *** 9" space to the letter A; 12" space to a letter other than A.

VAR. x 84" EXIT (with Arrow and Exit Number)

APPROVED: 9/17/75 DATE OF REV.: 12/1/15



SIGN NUMBER
E5-1b

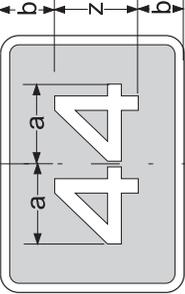
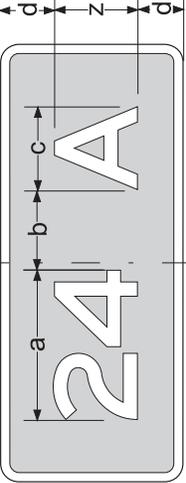
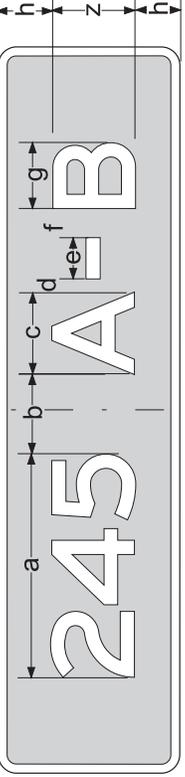
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	42 X 30	72 X 30	120 X 30
RADIUS	3	3	3
MARGIN			
BORDER	1.5	1.5	1.5
a	varies	varies	varies
b	7.5	10	10
c		varies	varies
d		7.5	2.5
e			7.5
f			5
g			varies
h			7.5
i			
j			
k			
l			
m			
n			
o			
p			
q			
r			
s			
t			
u			
v			
w			
x			
y			
z	15E	15E	15E



Exit Gore - Number (Plaque)	SIGN NUMBER	E5-1bP
APPROVED	DATE OF REV.	
5/1/13		

NOTES:

- All dimensions are in inches.
- Color - White legend and border on green background, fully reflectorized.
- Appropriate ramp number to be specified.

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	VAR X 12
RADIUS	
MARGIN	
BORDER	
a	2.6
b	54.9
c	2.5
d	31.1
e	3.8
f	40.5
g	2.3
h	67.5
i	1
j	58.1
k	70.1
l	3.4
m	77.2
n	29.2
o	107.4
p	3.3
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	10E MOD.

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on blue background, fully reflectorized.

Motorist Services Sign Overlays	SIGN NUMBER E10-1 SUPPLEMENT
APPROVED 7/1/73	DATE OF REV. 12/1/05

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	120 X 48	132 X 48
RADIUS	6	6
MARGIN		
BORDER	1.25	1.25
a	38.6	38.6
b	33.2	33.2
c	10	10
d	9.5	9.5
e	9	9
f	39	
g	8.2	
h	1.8	
i	45.5	35.5
j		59
k		3.4
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	10E MOD.	10E MOD.

HOSPITAL EXIT (NEXT) (SECOND) RIGHT	DATE OF REV. 7/1/05	SIGN NUMBER E10-3
APPROVED 1/1/73		

NOTES:

1. All dimensions are in inches.
2. Color - White legend and border on blue background, fully reflectorized.
3. SECOND RIGHT is to be used on the 132 X 48 panel.

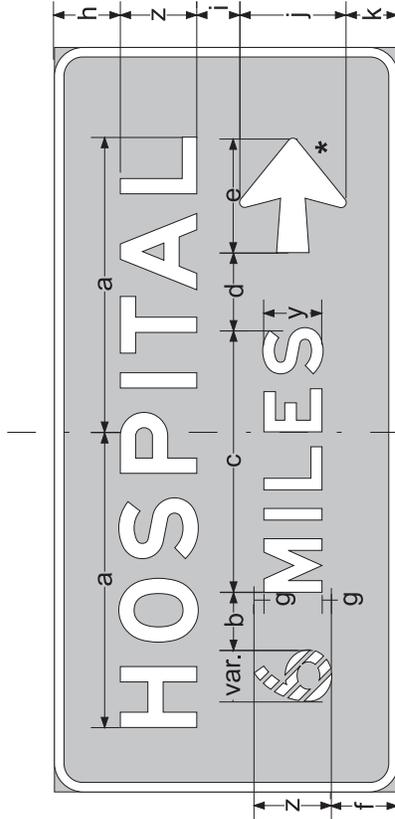
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	78 X 36
RADIUS	3
MARGIN	
BORDER	1
a	30.9
b	6
c	27.4
d	8
e	13
f	7
g	1
h	7
i	4.4
j	11.2
k	5.4
l	
m	
n	* Use
o	5-13 ARROW
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	6E MOD.
z	8E MOD.



	HOSPITAL ___ MILES (with Arrow)	
	APPROVED 1/1/73	DATE OF REV. 5/1/13

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on blue background, fully reflectorized.
 3. Appropriate mileage to be specified.
 4. Arrows to be designated left (L) or right (R).

HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	48 X 12	
RADIUS	1.5	
MARGIN		
BORDER	.75	
a	14.4	
b	6.6	
c	6	
d	4	
e		
f		
g		
h		
i	*Use	
j	1-6 ARROW	
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	4D	

FOOD (with Arrows)	APPROVED 1/1/73	DATE OF REV.	SIGN NUMBER E10-6 (R, L, LR)
-------------------------------	--------------------	--------------	---

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on blue background, fully reflectorized.
 3. For arrow dimensions see Sign Details, page 102.
 4. Arrows to be designated left (L), right (R), or left and right (LR).

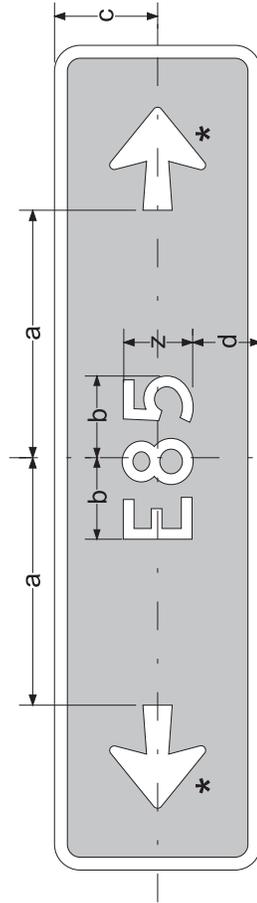
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	48 X 12
RADIUS	1.5
MARGIN	
BORDER	.75
a	14.4
b	4.7
c	6
d	4
e	
f	
g	
h	
i	*Use
j	1-6 ARROW
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	4D



	E85 (with Arrows)	
	APPROVED 3/16/06	DATE OF REV.

- NOTES:
1. All dimensions are in inches.
 2. Color - White legend and border on blue background, fully reflectorized.
 3. For arrow dimensions, see Sign Details, page 102.
 4. Arrows to be designated left (L), right (R), or left and right (LR).

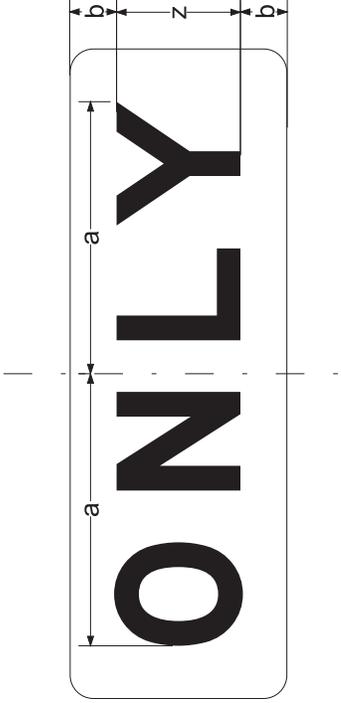
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	42 X 14	52 X 16
RADIUS	1.5	1.5
MARGIN		
BORDER		
a	16.4	20.5
b	3	3
c		
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	8E MOD.	10E MOD.



 ONLY (Overlay)	APPROVED	SIGN NUMBER
	7/26/73	E11-1b
DATE OF REV.		12/1/15

NOTES: 1. All dimensions are in inches.
 2. Color - Black legend on yellow reflectorized background.

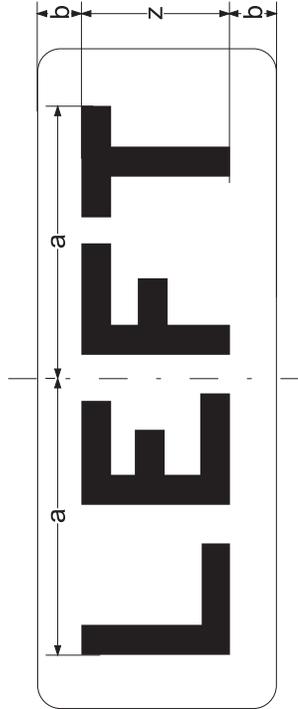
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	44 X 16	54 X 18
RADIUS	1.5	1.5
MARGIN		
BORDER		
a	18.3	21.9
b	3	3
c		
d		
e		
f		
g		
h		
i		
j		
k		
l		
m		
n		
o		
p		
q		
r		
s		
t		
u		
v		
w		
x		
y		
z	10E MOD.	12E MOD.



NOTES: 1. All dimensions are in inches.
2. Color - Black legend on yellow reflectorized background.

	LEFT (Overlay)	
	APPROVED 5/1/13	DATE OF REV.

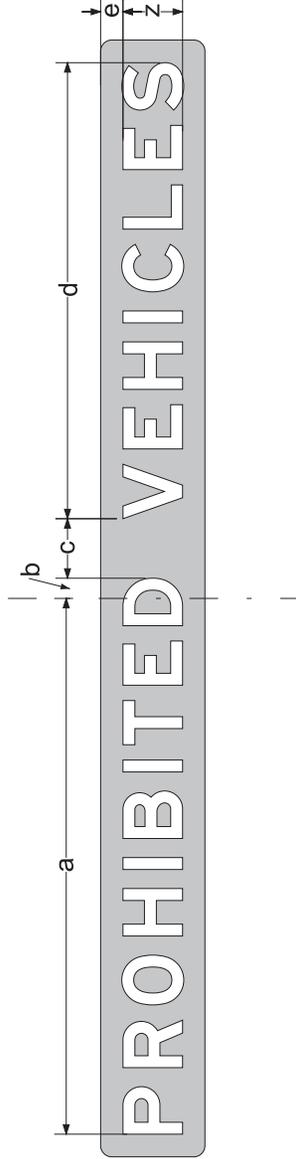
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	114 X 10	150 X 14	186 X 16
RADIUS	1.5	1.5	1.5
MARGIN			
BORDER			
a	54	72	90
b	2	2.7	3.4
c	6	8	10
d	46	61.2	76.6
e	2	3	3
f			
g			
h			
i			
j			
k			
l			
m			
n			
o			
p			
q			
r			
s			
t			
u			
v			
w			
x			
y			
z	6E MOD.	8E MOD.	10E MOD.



 <p>PROHIBITED VEHICLES (Overlay)</p>	APPROVED	SIGN NUMBER
	9/1/79	8/21/06

NOTES: 1. All dimensions are in inches.
2. Color - White legend on red background, fully reflectorized.

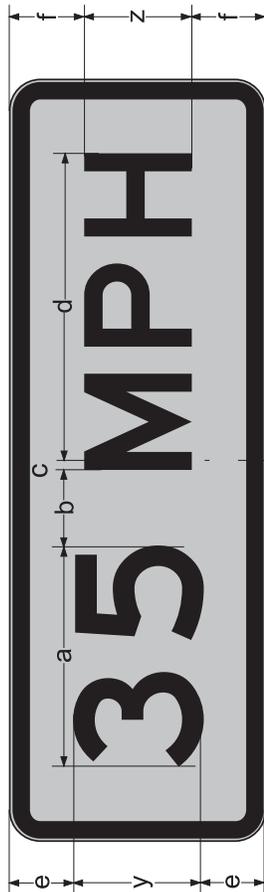
HANDOUT

HANDOUT

HANDOUT

HANDOUT

SIZE DIMENSION	72 X 24
RADIUS	3
MARGIN	.63
BORDER	.88
a	21.1
b	7
c	.9
d	29
e	6
f	7
g	
h	
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	12E
z	10E



	Exit Gore Advisory Speed (Plaque)	
	APPROVED 5/1/13	DATE OF REV. SIGN NUMBER E13-1P

NOTES: 1. All dimensions are in inches.
2. Color - White legend and border on yellow reflectorized background.

HANDOUT

HANDOUT