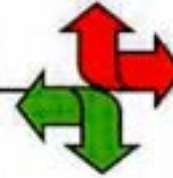


Manual on Uniform Traffic Control Devices (MUTCD)



Knowledge

2009 MUTCD with Revisions 1, 2, and 3, July 2022

Current MUTCD Edition



The [PDF version of the 2009 MUTCD with Revision Numbers 1, 2, and 3 incorporated, dated July 2022](#) is the official current edition.

The most current version of the MUTCD is the **2009 Edition with Revision Numbers 1, 2, and 3, dated July 2022**. The official version of the **2009 MUTCD with Revision Numbers 1, 2, and 3 incorporated** is the [PDF](#) version.

The 2009 MUTCD with Revision Numbers 1, 2, and 3 incorporated may also be viewed in [HTML](#) format, which is accessible to individuals with disabilities, per [Section 508 of the Rehabilitation Act](#). **Disclaimer:** While every effort has been made to assure consistency between the PDF and HTML files posted on the MUTCD Web site, it is possible that the HTML files may not be totally identical in content to the PDF files. The PDF files constitute the official version of the MUTCD and always take precedence over any potentially conflicting MUTCD text or figures that may occur in the HTML files.

[Interim Approvals Issued by FHWA](#)

Changes from the 2009 Edition

A document describing how the 2009 Edition with Revisions 1 and 2 incorporated (May 2012) differs from the 2009 Edition (December 2009) is available in [PDF](#) (19KB) and [HTML](#).

List of Known Errors in the 2009 MUTCD with Revisions 1 and 2 Incorporated

- [List of Known Errors in the 2009 MUTCD with Revisions 1 and 2 Incorporated, updated 1/12/2017 \(PDF version\)](#) (165KB)
- [List of Known Errors in the 2009 MUTCD with Revisions 1 and 2 Incorporated, updated 1/12/2017 \(HTML version\)](#)

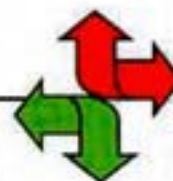
NOTE: FHWA intends to correct these errors via a future rulemaking action. This list of known errors is provided solely for the information of MUTCD users and does not constitute changes to the MUTCD at this time.

Previous MUTCD Editions

To view previous editions of the MUTCD, including the 2009 Edition without Revisions 1, 2 and 3, please visit [Previous Editions of the MUTCD](#). For historical reference and to know what was in effect for a given date, these previous versions will be maintained on this Web site.

PDF files can be viewed with the [Acrobat® Reader®](#)

Manual on Uniform Traffic Control Devices (MUTCD)



Knowledge

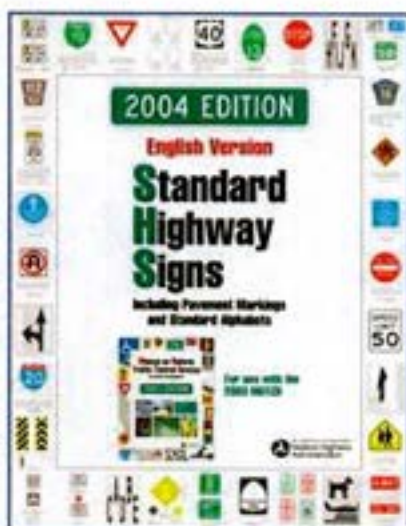
Standard Highway Signs and Markings

The 2009 MUTCD sign layouts are now available

The Federal Highway Administration has developed the design details of the new signs added in the 2009 Edition of the MUTCD and signs whose designs have been modified in the 2009 MUTCD. The new designs are provided in the form of a Supplement to the 2004 Edition of Standard Highway Signs.

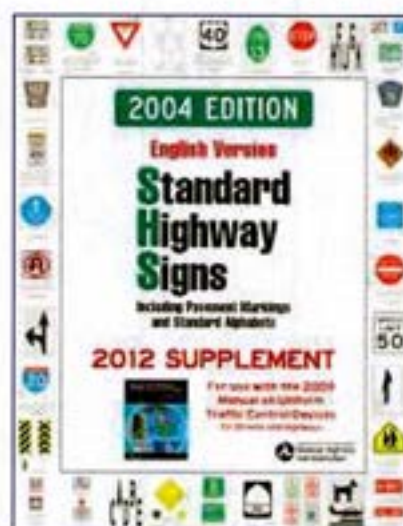
The contents of the 2012 Supplement will be incorporated into a new edition of *Standard Highway Signs*. This new edition will be released concurrently with the next edition of the MUTCD. This effort is programmed for 2017, however the timeline is subject to change. The new edition of *Standard Highway Signs* will contain the details for all signs and pavement markings in the MUTCD, expanded sign design guidelines, and details for symbolic traffic and lane-control signal indications.

2004 Edition, English Version, and 2012 Supplement



[2004 Edition](#)

[Known Errors in Standard Highway Signs, 2004 Edition](#)



[2012 Supplement to the 2004 Edition](#)

How to use the 2012 Supplement with the 2004 Edition

These links represent the current version of Standard Highway Signs and the 2012 Supplement to the 2004 Standard Highway Signs. The 2012 Supplement contains the new and revised sign designs adopted in the 2009 Edition of the MUTCD. Where a sign design is included in the 2012 Supplement, its previous design in the 2004 Standard Highway Signs is superseded. Together, these two documents are a companion to the 2009 Edition of the MUTCD.

NEW! FHWA Word Calculator for Highway Signs

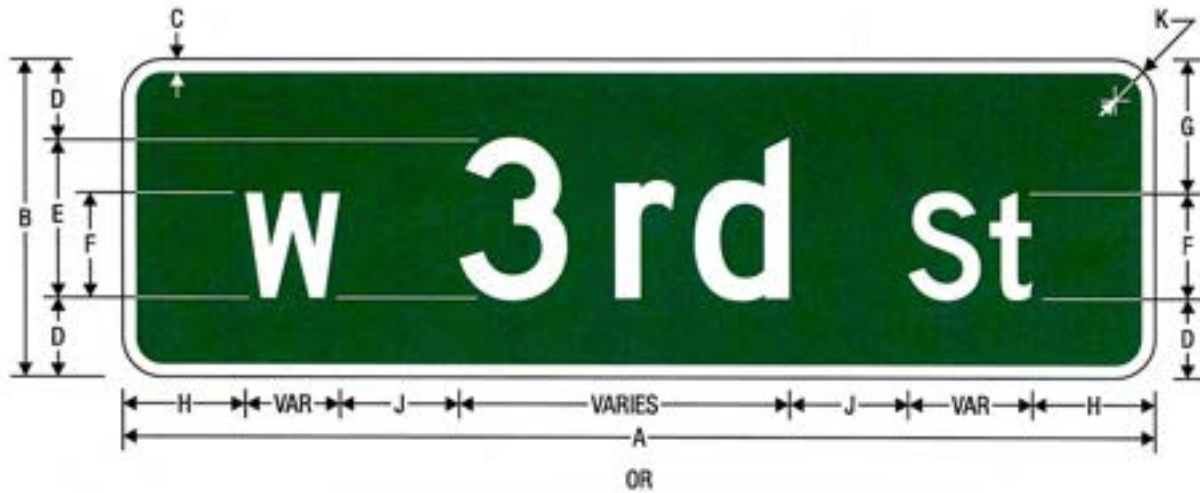
Try the [new design tool](#) to automatically determine the length of any traffic sign legend. Now, you can quickly and easily determine word lengths and estimate sign sizes based on the results. All the FHWA Standard Alphabet letter series—B, C, D, E, E(mod), and F—are supported for both upper- and lower-case letter forms. The tool can also be used to verify the output of sign design software programs.

Vector-based PDF and EPS Sign Formats

Undimensioned, full-size layouts for selected signs are provided for use by sign fabricators in the electronic fabrication process. These full-size layouts are made available in vector-based PDF and EPS formats that can be used directly with electronic vinyl cutting equipment.

- [Full-size PDF and EPS Files](#)





D3-1 (Sheet 1 of 3)
 Street Name Sign



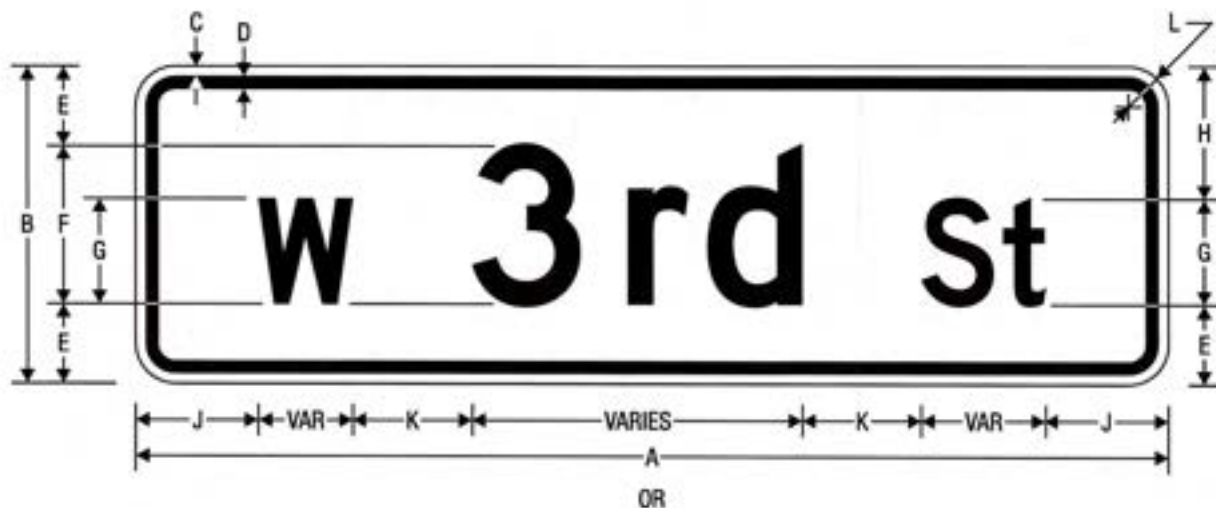
D3-1 – PRINCIPAL LEGEND WITH DESCENDING STROKES



D3-1 – WITHOUT BORDER, PRINCIPAL LEGEND WITH OR WITHOUT DESCENDING STROKES

	A	B	C	D	E	F	G	H	J	K	L	M	N
	VAR	8	0.375	2	4 D	3 D	3	3 (MIN)	3	1	1.75	2.25	2.75
C	VAR	12	0.5	3	6 D	4 D	5	4.5 (MIN)	4.5	1.5	2.75	3.25	4.75
	VAR	18	0.75	5	8 D	5.33 D	7.67	5.33 (MIN)	6	1.875	5	5	7.67
	VAR	24	1	6	12 D	8 D	10	9 (MIN)	9	2.25	5.5	6.5	9.5

COLORS: LEGEND, BORDER – WHITE (RETROREFLECTIVE)
 BACKGROUND – GREEN (RETROREFLECTIVE)
 BACKGROUND (ALTERNATE) – BLUE OR BROWN (RETROREFLECTIVE)



D3-1 (Sheet 2 of 3)
Street Name Sign
(ALTERNATE COLOR ARRANGEMENT)

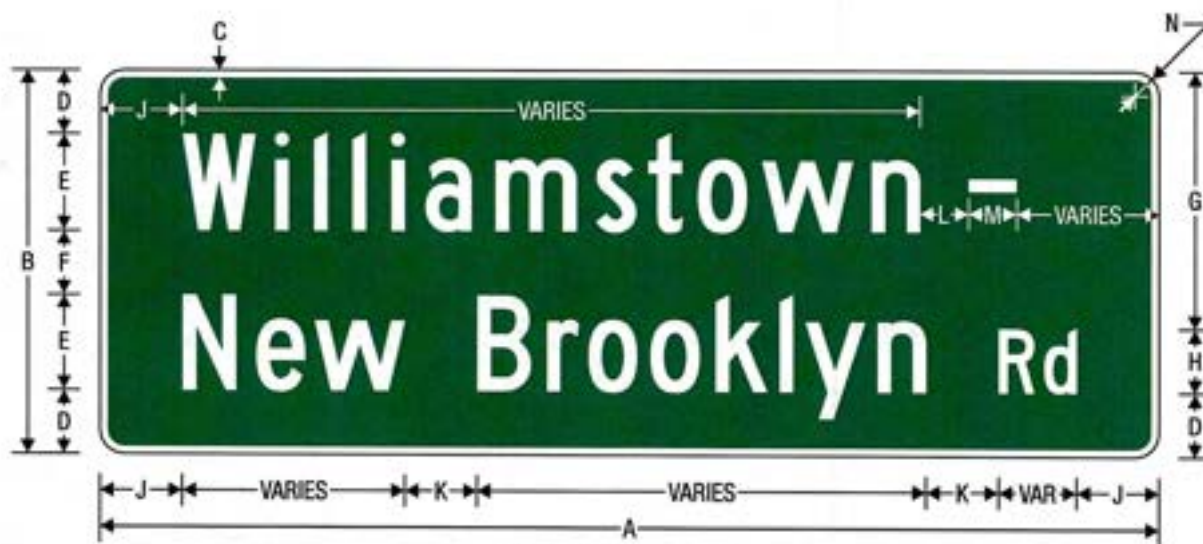


D3-1 - PRINCIPAL LEGEND WITH DESCENDING STROKES
(ALTERNATE COLOR ARRANGEMENT)

C

A	B	C	D	E	F	G	H	J	K	L	M	N	P
VAR	8	0.25	0.375	2	4 D	3 D	3	3 (MIN)	3	1	1.5	2.5	2.5
VAR	12	0.375	0.5	3	6 D	4 D	5	4.5 (MIN)	4.5	1.5	2.5	3.5	4.5
VAR	18	0.5	0.75	5	8 D	6 D	7	5.33 (MIN)	6	1.875	4.5	5.5	6.5
VAR	24	0.625	0.875	6	12 D	8 D	10	9 (MIN)	9	2.25	5	7	9

COLORS: LEGEND, BORDER — BLACK (NON-RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)



D3-1 (Sheet 3 of 3)
 Street Name Sign

	A	B	C	D	E	F	G	H	J	K	L	M	N
	VAR	15	0.375	2.25	4 C	2.5	9.75	3 C	3 (MIN)	3	2	2	1
C	VAR	24	0.5	4	6 C	4	16	4 C	4.5 (MIN)	4.5	3	3	1.5
	VAR	33	0.75	5.5	8 C	6	22.17	5.33 C	5.33 (MIN)	6	4	4	1.875
	VAR	48	1	8	12 C	8	32	8 C	9 (MIN)	9	6	6	2.25

COLORS: LEGEND, BORDER — WHITE (RETROREFLECTIVE)
 BACKGROUND — GREEN (RETROREFLECTIVE)
 BACKGROUND (ALTERNATE) — BLUE OR BROWN (RETROREFLECTIVE)

Transportation Safety Division

3M™ High Intensity Prismatic Reflective Sheeting Series 3930

Product Bulletin Series 3930
June 2021

Replaces Product Bulletin 3930 Dated May 2018

1 Description

High Intensity Prismatic Reflective Sheeting Series 3930 ("**Sheeting**") is a non-metalized microprismatic lens reflective sheeting designed for use in the production of durable reflective traffic control signs and delineators that are exposed vertically in service ("**Signs**"). Applied to properly prepared Sign substrates, the Sheeting provides long-term reflectivity and durability.

Sheeting is available in the following colors.

Table 1. Product codes by color.

Color	Product Code
White	3930
Yellow	3931
Red	3932
Orange	3934
Blue	3935
Green	3937
Brown	3939

2 Specifications

2.1 Daytime Color (x, y, Y)

The chromaticity coordinates and total luminance factors of the retroreflective Sheeting conform to the limits presented in Table 2.

Table 2. Daytime color specification limits.^a

Color	1		2		3		4		Reflectance Limit (Y%)	
	x	y	x	y	x	y	x	y	Minimum	Maximum
White	0.303	0.300	0.368	0.366	0.340	0.393	0.274	0.329	27	
Yellow	0.498	0.412	0.557	0.442	0.479	0.520	0.438	0.472	15	45
Red	0.648	0.351	0.735	0.265	0.629	0.281	0.565	0.346	2.5	15
Orange	0.558	0.352	0.636	0.364	0.570	0.429	0.506	0.404	10	30
Blue	0.140	0.035	0.244	0.210	0.190	0.255	0.065	0.216	1	10
Green	0.026	0.399	0.166	0.364	0.286	0.446	0.207	0.771	3	12
Brown	0.430	0.340	0.610	0.390	0.550	0.450	0.430	0.390	1	9

a. The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System.

2.1.1 Color Test - Ordinary Colored Sheeting

Conformance to standard chromaticity (x, y) and luminance factor (Y%) requirements shall be determined instrumentally, in accordance with ASTM E1164, on Sheeting applied to smooth test panels cut from aluminum alloy 6061-T6 or 5052-H38. Chromaticity and luminance factor values shall be determined using a HunterLab ColorFlex 45/0 spectrophotometer.¹ Calculations shall be performed using CIE Illuminant D65 and the 2° standard observer.

2.2 Coefficient of Retroreflection (R_A)

The values shown in Table 3 are minimum coefficients of retroreflection.

Table 3. Minimum coefficient of retroreflection, R_A, for new Sheeting (cd/lux/m²).

Entrance Angle ^a	Sheeting Color	Observation Angle ^b	
		0.2°	0.5°
-4°	White	560	200
	Yellow	420	150
	Red	84	30
	Orange	210	75
	Blue	30	13
	Green	56	21
	Brown	18	7.5
30°	White	280	100
	Yellow	210	75
	Red	42	15
	Orange	105	37
	Blue	14	6
	Green	28	10
	Brown	8.5	3.5

a. Entrance Angle – The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

b. Observation Angle – The angle between the illumination axis and the observation axis.

1. The instrumentally determined color values of retroreflective sheeting can vary significantly depending on the make and model of colorimetric spectrophotometer used, as well as the color and retroreflective optics of the sheeting (David M. Burns and Timothy J. Donahue, Measurement Issues in the Color Specification of Fluorescent Retroreflective Materials for High Visibility Traffic Signing and Personal Safety Applications, Proceedings of SPIE: Fourth Oxford Conference on Spectroscopy, 4826, pp. 39–49, 2003). For the purposes of this document, the HunterLab ColorFlex 45/0 spectrophotometer shall be the referee instrument.

2.2.1 Test for Coefficient of Retroreflection

Conformance to coefficient of retroreflection requirements shall be determined instrumentally, in accordance with ASTM E-810 "Test Method for Coefficient of Retroreflection of Retroreflective Sheeting." Per ASTM E-810, the values presented in Table 3 are averages of R_A values obtained at 0° and 90° rotations.

2.3 Printed Colors and Overlay Films

When processed according to 3M recommendations, the coefficient of retroreflection of a screen-printed transparent color on white Sheeting shall be not less than 70% of the R_A value of the corresponding colored Sheeting presented in Table 3. White Sheeting covered with 3M ElectroCut™ Film Series 1170, when processed according to 3M recommendations, shall have a coefficient of retroreflection of not less than 100% of the value of the corresponding colored Sheeting, as presented in Table 3. The chromaticities and luminances of printed colors and overlay films shall conform to the specifications presented in Table 2.

3 Physical Properties

3.1 Fabrication Lines

The manufacture of prismatic Sheeting results in the presence of fabrication lines in the final product, as shown in Figure 1. The Sheeting's fabrication lines are slightly thicker than its seal pattern legs and noticeable under shop light but not observable on the road, either in daylight or at night, under typical use conditions.

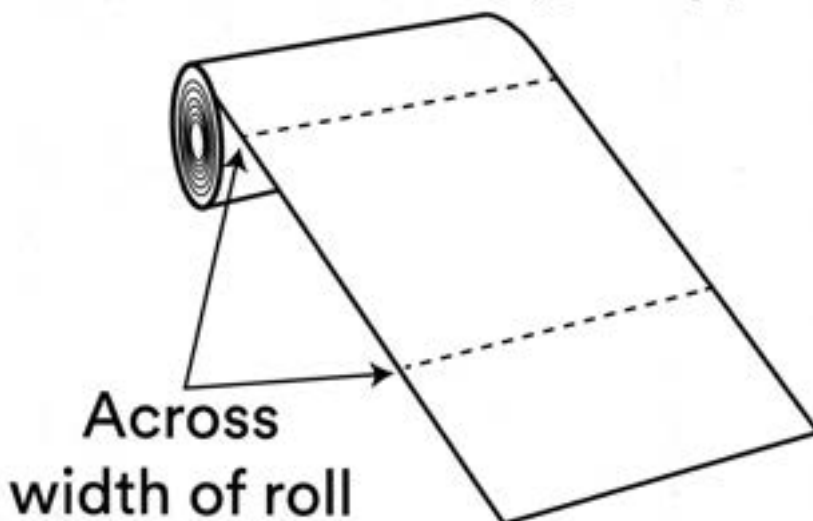


Figure 1. Fabrication lines.

3.2 Adhesive

Sheeting has a pressure-sensitive adhesive that is recommended for application at temperatures of 65 °F (18 °C) and higher.