The MUTCD: Its History and Future

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Manual on Uniform Traffic Control Devices

Known as the MUTCD
Contains basic principles for traffic control devices
Essential traffic engineering tool
Extensive information
Long history
Multiple versions - many editions
MUTCD History

There have been 10 National MUTCDs


7 TxMUTCD editions
## Summary of MUTCD Evolution

<table>
<thead>
<tr>
<th>Edition</th>
<th>MUTCD Era</th>
<th>Pages</th>
<th>Parts</th>
<th>Size (inches)</th>
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How did we end up with such a large document on traffic control devices?

*FHWA assumed MUTCD ownership*
Traffic Control Devices History

Early markers were used in the Roman Empire
Also used on pioneer trails in America
Automobile age created new demands

Roman Empire  Colonial America  Early 20th Century
Automobile Age
Early Intersection Control

Hand signals, police, and semaphores
Traffic Signal Towers
Early Traffic Signals

Many different signal designs
More Early Signals
Early Traffic Signs

Need for devices increased with more automobile travel.

Little coordination between agencies.
Early Grade Crossings
Early Traffic Control Devices

The wide variety of devices created the need for uniformity

1911 - 1st centerline
Michigan

1914 - 1st electric signal
Cleveland

1920 - 1st 3-color
signal Detroit
1923 Sign Shape Recommendations

Mississippi Valley Assoc of St Hwy Dept
Number of sides represents hazard level

- RR Grade Crossing
- Stop Intersection
- Warning (speed reduction)
- Caution
- Directions or Regulations
1924 Sign Color Recommendations

National Conference on Street and Highway Safety

For signs and signals

- **Red** - stop
- **Green** - proceed
- **Yellow** - caution
- **White** - directions or distance
- **Purple** - intersection
1925 Joint Board Report

Report of Joint Board on Interstate Highways

AASHO led

Developed U.S. Highway system

Included recommendations for standard signs
1927 AASHO Manual

Evolved from Joint Board
First national manual
Rural signs only
Title:
Manual and Specifications for the Manufacture, Display, and Erection of U.S. Standard Road Markers and Signs

Revised 1929 and 1931
1927 Signs

Block letter font
1930 NCHS Manual

Prepared by American Engineering Council

Signs, markings, and signals for urban areas

Title:

Manual on Street Traffic Signs, Signal and Markings

Not Revised
Birth of the MUTCD

Problems of two manuals led to creation of the MUTCD

1927 Rural Manual

Joint Committee

1930 Urban Manual

1935 MUTCD
1935 MUTCD

First MUTCD
- 1935 mimeograph
- 1937 typeset

Signs
- White or yellow
- Diamond, square, circle, octagon, rectangle

Markings
- White, yellow, or black

Signals
- 3-color signal as standard

1937 Typeset
Revised 1939
1935 Signs

- Thru Traffic
- Stop Traffic
- Railroad Crossing
- One Way
- Lexington 10
- Huntington 148
1942 MUTCD

Few major changes
Addressed wartime conditions
  Conservation of materials
  Blackout traffic control

Not Revised
Blackout Devices
1948 MUTCD

Significant rewrite

Signs
  - Simplified messages
  - Eliminated square signs
  - Added advisory plate
  - Rounded alphabet

Pavement markings
  - Yellow - Double center & barrier line
  - White - all other applications
  - Edge lines not recommended

Simplified signal warrants

Revised 1954
1948 Signs

- T-shaped sign
- Curve warning
- Stop Ahead
- Stop
- Speed Limit 50
- Bryan 8
- Hearne 25
- Keep Right

Zachry Department of Civil Engineering, Texas A&M University
Early Stop & Yield Signs
1954 Revision

Significant sign changes

Secondary messages eliminated

Became

New Sign
Traffic Signal Legacies

Non-standard traffic signals continued in use through the 1950s and 1960s in some locations

Darley 2 bulb signal

Wiley signal

NYC Olives
Freeway Guide Sign Tests

New Interstate Highway system created signing and marking challenges

BPR research in mid-1950s

Evaluated freeway guide sign design
  Black, blue, and green backgrounds
  Lower case letters

Other new signs

Results lead to new signing guidelines
1958 AASHO Interstate Manual

Created for the new Interstate Highway system

New features

- White on green guide signs
- Lower case letters
- Green on white service signs

Utilized larger sign sizes

Blue service signs added in 1961 revision

New Interstate Signs

- Interstate 10
- Interstate 75
- Business SPUR
- Interstate 56
- Metropolis Utopia
- Exit 30
- Rest Area 2 Miles
1961 MUTCD

Federal compliance required

New material:

Construction traffic control
Civil defense signing
Freeway guide signing

Not Revised
1961 Signs

- Yield sign
- trunk road sign 56 14 Metropolis Utopia
- merge sign
- US 81 sign
- evacuation route sign

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1971 MUTCD

Significant rewrite
DOT ownership

New features:
Content: school areas
Color: orange
Shapes: pennant, pentagon

International sign influence
Many new symbols

Yellow markings for opposing traffic

Revised 8 times
1978 MUTCD

Update of 1971 edition
Loose leaf (binder) format
Individual page revisions
New content
RR-hwy grade crossings
Bicycle facilities
Yellow markings on left side

Revised 4 times
1988 MUTCD

Update of 1978 edition
  Included new revision (#5)
New content
  Recreational/cultural signs
  Logo signs
  TODS
Planned to be revised only for safety reasons

Rev 3: Part VI
1988 Signs

- Yellowstone National Park: 2 miles
- Tourist Activities:
  - Myrtlewood Gift Shop: Next Right (1)
  - Greenforest Orchard: Next Right (3)
MUTCD During the 1990s

Blue ribbon panel (1989)
- Recognize shortcomings of 1988 MUTCD
- Recommended reformat and rewrite of 1988 MUTCD

Need to clarify intent of language

Examples of language challenges
- “shall be permitted” → “may be justified”
- “shall preferably be” → “it is desirable that”
- “normally should” → “it is necessary that”
- “may be required” → “is intended for use”

Two step process: reformat then rewrite

Started in early 1990s
Rewrite/Reformat Effort

First step
- Evaluate current language
- Reformat language using shall, should, & may
  Classify as standard, guidance, option, support (with headings)

Second step
- Rewrite reformatted language
- Update content
- Fix inconsistencies

Multiple proposed rules in mid- to late-1990s
Resulted in 2000 MUTCD
2000 MUTCD

Millennium edition
Reformatted/rewritten
Significantly different from 1988 MUTCD
First with 8½×11 pages
First to be on the internet
Many errors & shortcomings
   Editorial and technical errors
   Errata did not correct all problems

1 Errata
1 Revision
Significant Changes

New structure
Standard, Guidance, Option, Support

New parts added to MUTCD
Low Volume Roads
Highway-Light Rail Transit Grade Crossings

Islands part deleted
Definitions added

Primary units: metric
2000: Selected Key Changes

Legibility index = 40 ft/in
Sign graphics not accurate
Lane ending symbol (W4-2) dropped
Crosswalk lines dropped from crossing signs
New Yield Line
In-road lights

Courtesy of S. Wainwright
2003 MUTCD

Primarily an update of the 2000 MUTCD

Changes

- Editorial improvements
- Graphics corrected
- Technical corrections
- Some new material

Compressed text

- 982 to 754 pages

2 Revisions
2003: Selected Key Changes

Some new/revised signs

New sign color

  Pink for incident mgmt

Countdown ped signals

Metric sign changes

Accessibility in work zones

Revisions:

1: Pharmacy signing
2: Min sign retro
2009 MUTCD

Current edition (10th overall)
Final rule: Dec 16, 2009
NPA received more comments than any other
1,840 individual letters
15,000+ comments
Many changes
611 significant changes listed in Federal Register final rule
2009: Philosophical Changes

FWHA focus for 2009 MUTCD
- Uniformity
- Complete street concept: all road users
- Aging population
- Innovation

More specific detail, reduced ability to deviate
- Fine tuning of TCD use
- More devices addressed

Compliance dates restructured
- Compliance as part of systematic upgrade

Combine RR and LRT parts

MUTCD applies to private property

New content
- Toll road & managed lanes traffic control
- Purple for toll roads
- Changeable message signs
2009: Selected Key Changes

Paragraphs numbered, guidance italicized, metric values removed

Change in definition for a standard
  Added: “Standard statements shall not be modified or compromised based on engineering judgment or engineering study”

Legibility index = 30 ft/in

Increases in sign sizes - 36 in Stop sign required for some situations

Increased requirements for One Way signs

Requirements for warning signs for changes in horizontal alignment

Revised optional lane guide signing
  Arrow per lane sign

High-visibility safety apparel
  Required for all workers within the public right-of-way

School warning signs: FYG only

Cannot use Speed Limit sign alone to end school speed limit zone

Yield or Stop signs required at passive grade crossings
2009: Signal Changes

12 inch indications for all new installations
Limited use of 8 inch indications
Signal head for each lane when speed $\geq 45$
Backplates required
Flashling yellow arrow for left turns
Hybrid beacon (HAWK) for ped crossing
2009 MUTCD Revisions

Rev 1: engineering judgment & definition of a standard

Added: the MUTCD is not a substitute for engineering judgment

Deleted: standard statements shall not be modified or compromised based on engineering judgment

Rev 2: compliance dates

12 of the previous 58 compliance dates retained
Several of the remaining 12 have been modified
Section 4D.07 Size of Vehicular Signal Indications

Standard:

01 There shall be two nominal diameter sizes for vehicular signal indications: 8 inches and 12 inches. Except as provided in Paragraph 3 below, 12-inch signal indications shall be used for all signal sections in all new signal faces.

Option:

03 Eight-inch circular signal indications may be used in new signal faces only for:

A. The green or flashing yellow signal indications in an emergency-vehicle traffic control signal (see Section 4G.02);
B. The circular indications in signal faces controlling the approach to the downstream location where two adjacent signalized locations are close to each other in approach speeds, horizontal or vertical curves, or other faces for the downstream approach;
MUTCD Resources

MUTCD web site
http://mutcd.fhwa.dot.gov

HTML & PDF versions of MUTCD (incl hotlink)
Lists of changes

2009 MUTCD Revisions 1 and 2, DATED MAY 2012

On May 14, 2012, the FHWA published final rules to revise the MUTCD provisions on engineering judgment and compliance dates. The 2009 MUTCD with Revisions 1 and 2 incorporated is now available. The complete text of the Federal Register notices can be accessed at the following links:

- 2009 MUTCD Revision 1 - Engineering Judgment (PDF, 229KB, HTML)
- 2009 MUTCD Revision 2 - Compliance Dates (PDF, 242KB, HTML)

A U.S. Department of Transportation press release on the adopted revisions is also available.

The printing version of the 2009 MUTCD (PHF 3848) has been placed on the MUTCD web site to assist readers who use the electronic version of the MUTCD in navigating through the many cross-references that contained within the Manual. Helpful cross-referenced chapters, sections, figures, and tables: pop-up definitions, links to external documents and web sites; links to official interpretations; and indications of material affected by known errors are all included in this version of the 2009 MUTCD (with Revisions 1 and 2 included). A description of how to use the additional features that are included in the hotlinks version has also been added to the web site.

The Manual on Uniform Traffic Control Devices, or MUTCD, defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is published by the Federal Highway Administration (FHWA) under 23 Code of Federal Regulations (CFR), Part 667, Subpart F.

The MUTCD, which has been administrated by the FHWA since 1973, is a compilation of national standards for all traffic control devices, including road markings, highway signs, and traffic signals. It is updated periodically to accommodate the nation’s changing transportation needs and address new safety technologies, traffic control tools, and traffic management techniques.

On December 18, 2009, a final rule adopting the 2006 Edition of the MUTCD was published in the Federal Register with an effective date of January 16, 2010. States must adopt the 2006 National MUTCD as their legal state standard for traffic control devices within two years of the effective date. The Federal Register notice, which provides detailed discussion of the FHWA’s decisions on major changes from the 2003 edition, can be viewed at http://edocket.access.gpo.gov/2008/pdf/FHWA-2008-0002.pdf (PDF, 73KB).

FHWA does not print copies of the MUTCD. National organizations have partnered and printed hard copies of the MUTCD. These hard copies are available for sale. Go to ITSUSA, ITE, AAHTC, or NMSA to get sales information.

On May 14, 2012 final rules adopting Revisions 1 and 2 of the 2009 MUTCD were published in the Federal Register with an effective date of June 13, 2012. The Federal Register notices, which provide detailed discussions of the FHWA’s decisions can be viewed at:

Evolution of the MUTCD: Early Standards for Traffic Control Devices

BY H. GENE HAWKINS, JR.

Seventy years ago, traffic control devices were a concern of relatively few individuals in the United States. Signs and markings were placed and maintained by auto clubs, local agencies, or state highway departments, with little Devices (MUTCD), which sets forth the basic principles that govern the design and use of traffic control devices. The MUTCD, first published in 1935, has always been one of the “bibles” of the profession and continues in that capacity.

MUTCD History Resources

Search “Gene Hawkins MUTCD” - goes to CE Profs website
Select MUTCD History link
MUTCD history PPT presentation
ITE Journal articles
Scans of old MUTCDs

One day in the late 1980s, I was rummaging through my parent’s garage and came across a 1946 MUTCD that my father used when he was with the Highway Traffic in the mid-1950s. While perusing that document, I found that Street signs were yellow, highway centerlines could be white. It was an eye-opening experience that led me to begin collecting old traffic engineering books. In 1990, I was fortunate enough to find the national MUTCD from the Eno Foundation for Traffic Safety. These documents provided great insight into how our current system of traffic control devices has evolved over several generations, insight which I felt was largely lost to our current generation of traffic engineers. Armed with these documents, I presented a history of the MUTCD, the paper appearing in the Compendium of Technical Papers for the 1991 ITE Annual Meeting. In response to this paper and presentation, I prepared a series of papers on MUTCD history for ITE Journal. These papers and MUTCD history PPT presentation are available on the MUTCD history website.

Evolution of the MUTCD: Part 2 - The Early Editions of the MUTCD, © Institute of Transportation Engineers, August 1991. Used by permission
Evolution of the MUTCD: Part 3 - The MUTCD Since World War II, © Institute of Transportation Engineers, November 1992. Used by permission
New Developments with the MUTCD, © Institute of Transportation Engineers, February 1994. Used by permission

Links to Previous Editions of the MUTCD
- 2003 and 2000 MUTCDs (link to previous editions on the FHWA website)
- 1988 MUTCD
- 1978 MUTCD (Richard Moer Manual of Traffic Signs site)
- 1971 MUTCD (Richard Moer Manual of Traffic Signs site)
- 1948 MUTCD (scan provided by FHWA)
  - 1954 revision to the 1948 MUTCD (scan provided by FHWA)
- 1942 MUTCD (scan provided by FHWA)
- 1935 MUTCD (scan provided by FHWA)
  - 1939 revision to the 1935 MUTCD (scan provided by FHWA)
- 1930 National Conference on Street and Highway Safety urban TCD manual
  - AASHO Manual and Specifications for the Manufacture, Display, and Erection of Highway Traffic Control Devices

Zachry Department of Civil Engineering
Texas A&M University
Part 2

MUTCD Future
Future of the MUTCD

Two areas of interest:

Recent and upcoming FHWA action

- Request for comments on splitting MUTCD
- Expected 2016 MUTCD edition and related rulemaking activities

Long-range vision and strategic plan

- NCUTCD effort to identify questions and identify needs for the MUTCD of the 2030s
Splitting the MUTCD

January 2013

FHWA Federal Register notice requesting comments on splitting MUTCD into 2 documents

1) Standards document (MUTCD) subject to rulemaking

2) Supplemental document that can be changed without rulemaking

June 2013

FHWA announces that comments were against splitting and FHWA agrees with comments

MUTCD to remain as single document
Rulemaking for Next MUTCD

FHWA has indicated a plan to publish a new edition of the MUTCD in 2017
Expect proposed rulemaking in May 2015

Potential proposed changes

Critical technical changes
Reduce number of shall statements
Improvements in organization and language
Potential Enhancements for Next Edition

Incorporate routine updates
  NCUTCD recommended changes
  Correcting errors or inaccuracies in 2009 Edition

Improve with new content
  Adding content to address new technologies or treatments
  Adding content necessitated by new legislation
  Adding content related to an urgent or critical need

Reassess each standard statement:
  Retain, delete, or downgrade

Eliminate redundant or unnecessary text

Reorganize content where opportunities for improving flow are identified

Reorganize/reconfigure existing figures to better correlate with text
MUTCD Challenges

1988 MUTCD provided guidance while allowing variation

- It provided a “starting point” (liked by experienced traffic engineers)
- Encouraged engineering judgment and shared information about best practices without tying down details to only one way to address a given situation
- Weasel wording was confusing and more difficult to use (liability concerns)
- Required a basic level of knowledge to use as a tool

Modern MUTCD is used by a larger, mostly less experienced audience

- Fewer agency personnel
- More movement during careers

Changing the MUTCD is cumbersome and happens glacially

- Development and public comment seek input from all perspectives
- NCUTCD, as volunteer organization, responds slowly
- FHWA decision makers face competing interests

Results of post-1988 efforts:

- Reformat/rewrite process may have reduced readability
- Significantly more information on TCD principles, more devices addressed
- Increased detail may have decreased engineering flexibility
What is the future of the MUTCD?
If we were to write the MUTCD from a blank sheet of paper, what would we end up with?

Some key questions:
What is the MUTCD?
- Book of standards, engineering guidelines, best practices, other

What audience is the MUTCD written for? (this is a different question from who uses the MUTCD)
- Traffic engineers (new, mid-career, experienced), contractors, lawyers, traveling, public, elected officials, architects, private property owners, other

Who should be responsible for the MUTCD?
- FHWA, NCUTCD, AASHTO, ITE, other

MUTCD needs a long-range (20+ year) vision
Why a Vision and Strategic Plan (VSP)?

MUTCD grown in size and complexity
Most MUTCD changes developed on individual basis without strategic coordination
Critical unknowns not yet defined:
  - MUTCD purpose (why it exists)
  - MUTCD target user (who written for)
  - MUTCD basic content concepts (what goes in it)

2009 MUTCD issues
  - Size of NPA and coordination of revisions
  - Specificity of content mandates

Where does the MUTCD need to go over the next 20 years?
Vision & Strategic Planning (VSP) effort conducted by National Committee on Uniform Traffic Control Devices (NCUTCD)

2010-2012: Initial efforts by NCUTCD task force to develop VSP

2012-2013: Presentations to stakeholder groups and development of white papers

Multiple attempts to create a plan
  Nothing worked well, tried to keep it small
  Result of volunteer committee approach

May 2013: start over
  Combined every document into one file
  Organized the pieces
  Found order from chaos

NCUTCD review: Fall 2013
NCUTCD approval: January 2014
The 20-Year Vision and Strategic Plan for the MUTCD was approved by the NCUTCD Council on January 9, 2014.

Previous versions of the MUTCD vision and strategic plan, along with markups of changes between versions, are located on this page.
Document Structure

79 pages
Front matter
Ch 1: Introduction
Ch 2: MUTCD Opinions, Challenges, Needs, and Questions
Ch 3: Recommended Vision
Ch 4: Recommended Strategic Plan
References and Appendices
Highlights: Front Matter and Introduction (Ch 1)

Background information on development of VSP
Process used to develop VSP
Structure and status of document
Structure: Opinions, Challenges, Needs, and Questions (Ch 2)

Categories:
- TCDs as independent elements
- MUTCD as authoritative reference document
- Structure and organization
- Content
- Use and users
- Administration
- Technology influence

Groups for each category:
- Opinions
- Challenges
- Needs
- Questions
Series of thoughts related to category

Opinions and challenges generally lead to needs and questions.

Needs and questions generally lead to recommendations in the Vision chapter.

44. There is a need for one or more national reference documents that establish requirements, recommendations, and basic principles for traffic control devices.
   a. There is a need to clearly define the purpose, scope, and appropriate content of the single document, or each of the multiple documents. Potential options include:
      i. Revising the CFR so that only standard statements are defined as national standards and including only these standard statements in a primary document and placing other material in one or more other documents.
      ii. Removing content that relates to certain traffic control device activities, such as maintenance and removal. This content could be removed entirely, or it could be placed in a separate document.
   b. If separated into multiple documents, there is a need to define the purpose of each document and the appropriate content for each document.
This chapter recommends what MUTCD should be in 20 years

Chapter structure:

- Fundamental assumptions
- Fundamental recommendations
- Guiding rules for the MUTCD content
- Recommended MUTCD language
- MUTCD content
- MUTCD structure
- MUTCD revisions

525. **Section 1A.XX  Purpose of the MUTCD:** The purpose of the MUTCD is to establish national criteria for the use of traffic control devices that meet the needs and expectations of road users on all streets, highways, bikeways, and private roads open to public travel. This purpose is achieved through the following objectives:

a. Promote national uniformity in the meaning and appearance of traffic control devices.

b. Promote national consistency in the use, installation, and operation of traffic control devices.

c. Provide principles for traffic engineers to use in making decisions regarding the use, installation, operation, maintenance, and removal of traffic control devices.

d. Promote safety and efficiency through appropriate use of traffic control devices.

- Basis for recommendation: The purpose of the MUTCD has never been defined but a clear statement of its purpose is critical in defining what content should be in the MUTCD and how that content should be used.
Highlights: Vision (Ch 3)

- Keep as one document
  - Proposed alternative structure concept
- Define TCD activities
- More levels of mandate
  - Distinguish uniform and consistent standards
  - 4 levels of mandate:
    - Standard, requirement, recommendation, option
- Distinguish user content
  - Engineer (decision)
  - Non-engineer (instruction)
- Better coordinate content
  - Needs more than hyperlinks
  - Concept of “smart tags”
- Limits on size of rulemaking
Phase I: complete strategic plan
   Activities that are beyond volunteer abilities
   Additional outreach
Phase II: 2016 MUTCD
   Content improvement
   No major changes
Phase III: 2024-26 MUTCD
   Restructuring mandates
Phase IV: mid-2030s MUTCD
   Content coordination
   Need to start in near future to finish by mid-2030s
Key thought: MUTCD stability is important
   Don’t want to make all the changes at once
Structure: Appendices

B: History and Growth of the MUTCD
C: Revising the MUTCD
D: National Committee on Uniform Traffic Control Devices
E: Future of Traffic Control Devices
F: ADA Laws and Regulations
Signs Not in the Next MUTCD