The MUTCD: Its History and Future

Gene Hawkins, Ph.D., P.E.
Texas A&M University
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
Presentation Part 1

MUTCD History
The MUTCD: Where It’s Been

There have been 10 editions of the MUTCD.
## Summary of MUTCD Evolution

<table>
<thead>
<tr>
<th>Edition</th>
<th>MUTCD Era</th>
<th>Pages</th>
<th>Parts</th>
<th>Size (inches)</th>
<th>Thickness (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935</td>
<td>Initial</td>
<td>166</td>
<td>4</td>
<td>6×9</td>
<td>3/8</td>
</tr>
<tr>
<td>1947</td>
<td></td>
<td>208</td>
<td>4</td>
<td>6×9</td>
<td>3/8</td>
</tr>
<tr>
<td>1961</td>
<td>Mature</td>
<td>333</td>
<td>8</td>
<td>6×9</td>
<td>3/4</td>
</tr>
<tr>
<td>1971*</td>
<td>Mature</td>
<td>377</td>
<td>8</td>
<td>6×9</td>
<td>3/4</td>
</tr>
<tr>
<td>1978</td>
<td>Mature</td>
<td>425</td>
<td>9</td>
<td>6×9</td>
<td>1 3/8</td>
</tr>
<tr>
<td>1988</td>
<td>Mature</td>
<td>473</td>
<td>9</td>
<td>6×9</td>
<td>1 3/8</td>
</tr>
<tr>
<td>2000</td>
<td>Modern</td>
<td>982</td>
<td>10</td>
<td>8 1/2×11</td>
<td>1 5/8</td>
</tr>
<tr>
<td>2003</td>
<td>Modern</td>
<td>754</td>
<td>10</td>
<td>8 1/2×11</td>
<td>1 1/4</td>
</tr>
<tr>
<td>2009</td>
<td>Modern</td>
<td>864</td>
<td>9</td>
<td>8 1/2×11</td>
<td>1 5/8</td>
</tr>
</tbody>
</table>

How did we end up with a such large document on traffic control devices?

*FHWA assumed MUTCD ownership.

---

**Zachry Department of Civil Engineering, Texas A&M University**
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
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
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
1942 MUTCD

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

Not Revised
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

- Stop Ahead
- U-Turn
- Winding Road
- Speed Limit 50
- Bryan 8, Hearne 25
- 35 M.P.H.
Early Stop & Yield Signs

[Images of various signs including stop, yield, and traffic signs]
1954 Revision

Significant sign changes

THRU
STOP HWY

Became

STOP

Secondary messages eliminated

YIELD
RIGHT OF WAY

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
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
TEXAS
10

BUSINESS
SPUR
75

56
Metropolis
Utopia

EXIT
30
M.P.H.

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
- Metropolis Utopia sign
- Two lane road sign
- Only sign
- US 81 sign
- Evacuation route sign
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
1971 Signs
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
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 $8\frac{1}{2} \times 11$ 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
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
MUTCD applies to private property
Combine RR and LRT parts
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
   Individual arrows
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
Flashning 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;
2000 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 2000 MUTCD with Revisions 1 and 2 incorporated is now available. The complete text of the Federal Register notice 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 HOTLINKS VERSION OF THE 2000 MUTCD IS NOW AVAILABLE

The hotlinks version of the 2000 MUTCD (PDF 314KB) 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. Hotlinks to cross-referenced chapters, sections, figures, and tables, popup 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 2000 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.
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.

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 a Highway Traffic in the mid-1950s. While perusing that document, I found that stop signs were yellow, highway centerlines could be white, and it was an eye-opening experience that led me to begin collecting old traffic engineering books. In 1998, I was fortunate enough to obtain 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 began researching the MUTCD history. In response to this paper and presentation were so positive, I prepared a series of papers on MUTCD history for ITE Journal. These papers developed the MUTCD -- Volume 1 and MUTCD -- Volume 2.

- **Evolution of the MUTCD:** Part 2 - The Early Editions of the MUTCD, Institute of Transportation Engineers, August 1992. 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)
- 1998 MUTCD
- 1997 MUTCD (Richard Moer Manual of Traffic Signs site)
- 1997 MUTCD (Richard Moer Manual of Traffic Signs site)
- 1996 MUTCD (Richard Moer Manual of Traffic Signs site)
- 1996 MUTCD (scan provided by FHWA)
- 1995 MUTCD (scan provided by FHWA)
- 1994 MUTCD (scan provided by FHWA)
- 1993 MUTCD (scan provided by FHWA)
- 1992 MUTCD (scan provided by FHWA)
- 1991 MUTCD (scan provided by FHWA)
- 1990 MUTCD (scan provided by FHWA)
- 1990 National Conference on Street and Highway Safety urban TCD manual
- AASHO Manual and Specifications for the Manufacture, Display, and Erectio

**MUTCD History Resources**

- Search “Gene Hawkins MUTCD” – goes to CE Prof’s website
- Select MUTCD History link
- MUTCD history PPT presentation
- ITE Journal articles
- Scans of old MUTCDs
Presentation 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
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 2016. Expect proposed rulemaking in late 2014 or early 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
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
Vision and Strategic Plan

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:

<table>
<thead>
<tr>
<th>TCDs as independent elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUTCD as authoritative reference document</td>
</tr>
<tr>
<td>Structure and organization</td>
</tr>
<tr>
<td>Content</td>
</tr>
<tr>
<td>Use and users</td>
</tr>
<tr>
<td>Administration</td>
</tr>
<tr>
<td>Technology influence</td>
</tr>
</tbody>
</table>

### 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.
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
Structure: Strategic Plan (Ch 4)

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 levels of mandate

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

- Do Not Enter
- Rail Crossing
- Stop on Red
- Slow School Zone
- East Interstate 20
- Drive Carefully Substandard Roadway
Questions