A Century of Traffic Control Devices and What Lies Beyond

1920s

1930s

1940s

1950s

1960s

2000s

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Early markers were used in the Roman Empire
Used on pioneer trails in America
Automobile age created new demands
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 signal in Michigan
- **1914** - 1st electric signal in Cleveland
- **1920** - 1st 3-color signal in Detroit

Photos are representative (not actual first devices).
1923 Sign Shape Recommendations

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

- **Highest Hazard**
  - RR Grade Crossing
  - Stop Intersection
  - Warning (speed reduction)

- **Caution**
- **Directions or Regulations**
- **Lowest Hazard**
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

- STOP
- KANSAS US 56
- MEN WORKING
- RR
- CURVE
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

1930 Urban Manual

1935 MUTCD
1935  MUTCD (1st 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 STOP TRAFFIC

ONE WAY

LEXINGTON 10
HUNTINGTON 148

RAIL CROSSING ROAD

3 TRACKS

T
Blackout Devices

Addressed in 1942 MUTCD
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
Early Stop & Yield Signs
1954 Revision

Significant sign changes

Secondary messages eliminated

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
- Business Spur 75
- Interstate 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
- Metropolis Utopia
- Only
- Texas US 81
- 81
- Evacuation Route
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
New content
 RR-hwy grade crossings
 Bicycles facilities
Yellow markings on left side
New signs:

![Signs](image)

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
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

Definitions added

Primary units: metric
2003 MUTCD

Primarily an update of the 2000 MUTCD
Some new/revised signs
New sign color
  Pink for incident mgmt
Countdown ped signals
Metric sign changes
2009 MUTCD - current edition
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
- Fine tuning of TCD use
- More devices addressed

MUTCD applies to private property

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

Legibility index = 30 ft/in
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
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
Backplates required
Flashing yellow arrow for left turns
Hybrid beacon (HAWK) for ped crossing
October 2018, FHWA announced intent to publish proposed rulemaking for new edition of MUTCD

Address improvements in TCD practices since 2009

Prepare for automated/connected vehicle technologies related to TCDs

NPA expected in near future
Future of TCDs

Technology advancements
- LEDs
- Color stable pigments and digital printing

Rural and urban differences
- Increases in non-motorized users in urban areas
- Livable streets focus in urban areas
- Higher speeds in rural areas

CAV impacts
CAV Impacts on TCDs

Connected/Automated Vehicles
Technologies may support TCD changes
  Greater uniformity
  Greater investment in TCD maintenance

NCUTCD recommendations to tighten pavement marking uniformity to support AV technologies
  Freeway markings
  Dotted edge line extensions along exit ramps
  Edge lines on major highways (55 mph and 6,000 vpd)
One day in the late 1980s, I was rummaging through my parent’s garage and came across a 1948 MUTCD that my father used when he was a student at the Yale Bureau of Highway Traffic in the mid-1950s. While perusing that document, I found that Stop signs were yellow, highway centerlines could be white, and green guide signs did not exist. It was an eye-opening experience that led me to begin collecting old traffic engineering books. In 1990, I was fortunate enough to acquire a copy of each edition of 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 put together a short paper and presentation on the history of the MUTCD, the paper appearing in the Compendium of Technical Papers for the 1991 ITE Annual Meeting in Milwaukee, Wisconsin. The response to this paper and presentation were so positive, I prepared a series of papers on MUTCD history for ITE Journal. These papers are linked below courtesy of the Institute of Transportation Engineers. Gene Hawkins also prepared a description of the evolution of the use of paper marking color as part of an NCHRP research project on all-white pavement markings.

- **New Developments with the MUTCD**, © Institute of Transportation Engineers, February 1994. Used by permission.
- **Evolution of the U.S. Pavement Marking System**, A brief description of the evolution of pavement marking color was prepared as part of NCHRP Project 428 assessing the feasibility of an all-white pavement marking system. A portion of this document was included as Appendix A in NCHRP Report 484.