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Fundamentals of Roadway Signage

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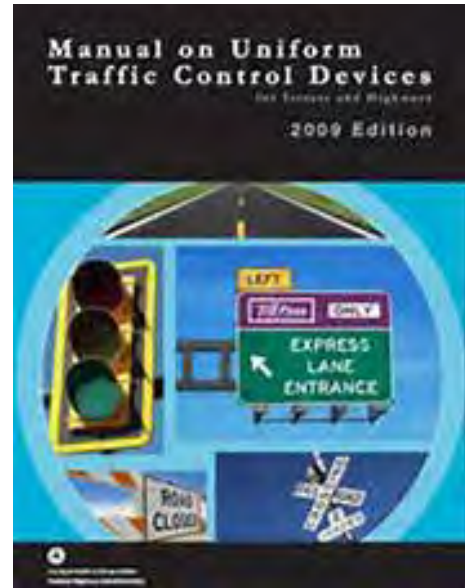
I. Roadway Signage

A. Introduction

The *U.S. Department of Transportation Federal Highway Administration* publishes the Manual on Uniform Traffic Control Devices (MUTCD) which provides guidance to all 50 states related to roadway signage. This guidance ensures that all areas of the country are signed uniformly so there is no confusion for drivers that drive in different states.

The Manual on Uniform Traffic Control Devices (MUTCD) is known as “the national standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel” by law (23 CFR 655, Subpart F).

Please note that this course only provides a sampling of the signs identified in the MUTCD for educational purposes. The most commonly used signs are detailed in this course. A full accounting of signs can be found in the MUTCD.



B. Sign Purpose

The purpose of signs is to promote safety and efficiency by providing for the orderly movement of all road users on all types of roadways.

C. Principles of Signs

In order to be effective signs should meet five requirements:

1. Fulfill a need
2. Command attention
3. Convey a clear, simple meaning
4. Command respect from the road users
5. Give adequate time for proper response

II. Design and Installation of Signs

A. Retroreflection of Sign Elements

Reflective “buttons” can be used to identify symbols, word messages or borders. A material that has a smooth, sealed outer surface over a microstructure that reflects light can be used to identify symbols, word messages, borders or backgrounds.

B. Color of Signs

The color code establishes general meanings for the colors that have been identified as being appropriate for use in conveying traffic control information.

The standard colors are as follow:

Color	Standard Usage
Black	Regulation
Blue	Tourist information and evacuation route
Brown	Recreational and cultural interest
Fluorescent Yellow-Green	Pedestrian, bicycle and school warning
Green	Direction guidance
Orange	Temporary traffic control
Purple	Toll signs
Red	Stop or prohibition
White	Regulation
Yellow	Warning

C. Ground Mount Sign Installation

1. Sign Panel Sizes

Sign panel sizes vary per the roadway designation: conventional road (single lane or multi-lane), expressway or freeway. Generally, the sign panel size is smallest on the single lane conventional roadway and largest on the freeway. However, roadway speed also plays a factor in sign size. As the speed limit increases, the sign panel size also increases so that it is visible at a farther distance. The MUTCD also provides minimum and oversized sign panel sizes so that roadway signing is uniform.

2. Mounting Height

The minimum height measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of signs installed at the side of the road in rural areas shall be 5 feet.

The minimum height measured vertically from the bottom of the sign to the top of the curb, of signs installed at the side of the road in business and commercial areas shall be 7 feet. This is because parking and/or pedestrian movements are likely to occur which may obstruct the view of the sign.

The minimum height measured vertically from the bottom of the sign to the sidewalk shall be 7 feet. If a secondary sign is mounted below the primary sign, it shall not project more than 4 inches into the sidewalk.

Directional, route, regulatory and warning signs on freeways shall be installed with a minimum height of 7 feet measured vertically from the bottom of the sign to the elevation of the near edge of the pavement. If a secondary sign is mounted below another sign on the freeway, the major signs shall be installed with a minimum height of 8 feet and the secondary sign shall be installed with a minimum height of 5 feet.

Where large signs, exceeding 50 square feet, are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be at least 7 feet.

3. Lateral Offset

For post mounted installations, the minimum lateral offset should be 12 feet from the edge of traveled way. If a shoulder wider than 6 feet exists, the minimum lateral offset should be 6 feet from the edge of the shoulder.

Lesser lateral offsets may be used on ramps or interchanges, but not less than 6 feet from the edge of the traveled way. On roadways where it is impractical to locate signs within the desired offset, a lateral offset of a least 2 feet may be used. A lateral offset of at least 1 foot from the face of curb may be used in business and commercial areas.

Post mounted signs shall be breakaway or yielding if within the clear zone.

For overhead sign supports, the minimum lateral offset from the edge of shoulder to the near edge of the sign support shall be 6 feet. Overhead signs shall have a barrier or crash cushion if they are within the clear zone.

Signs on any supports should not intrude into the usable width of a sidewalk.

4. Orientation

Signs should be placed vertically mounted at right angles to the traffic they are intended to serve. Signs that are placed 30 feet or more from the pavement edge should be turned toward the road.

5. Posts and Mountings

Signposts, foundations and mountings shall be constructed as to hold signs in a proper and permanent position and to resist swaying in the wind.

During nighttime conditions, warning strips should be added to the post to enhance visibility. This strip shall be at least 2 inches in width, be placed for the full length of the support and its color shall match the background color of the sign.

6. Maintenance

Maintenance activities should include:

- Proper position
- Cleanliness
- Legibility
- Daytime and nighttime visibility

Damaged or deteriorated signs should be replaced. A schedule for inspecting (both day and night), cleaning and replacing signs should be established to assure adequate maintenance.

Steps should be taken to see that weeds, trees, shrubbery do not obscure the face of any sign. In addition, special attention should be paid to ensure that construction, maintenance and utility materials and equipment do not block sign visibility.

D. Overhead Sign Installations

Overhead signs should be used for:

- Freeways and expressways
- Locations where there is a need for lane use control
- Locations where there is insufficient roadside space

An engineering study may be necessary to determine if overhead signs should be considered for the following conditions:

- Complex interchange/intersection design
- Traffic volume at or near capacity
- Multi-lane exits
- High speed traffic
- Insufficient space for ground mounted signs
- Junction of two freeways
- Left exit ramps

1. Mounting of Overhead Signs

There are a variety of methods for mounting overhead signs. They include the following:

- Overhead truss structure
- Overhead monotube structure
- Overhead roadway/pedestrian bridge structure
- Span wire
- Intersection signal wire

III. Types of Signs

The functions of signs are to provide regulations, warnings and guidance information for road users. Signs can be defined by their function:

- A. Regulatory – traffic laws
- B. Warning – information of a situation that may not be apparent
- C. Object Markers – mark obstructions in or adjacent to the roadway
- D. Guide Signs
 - 1. Conventional Roads
 - 2. Preferential/Managed Lane Signs
 - 3. Advanced Information Signs
- E. Toll Road Signs
- F. General Information Signs
 - 1. General Service Signs
 - 2. Specific Service Signs
- G. Recreational Signs
- H. Changeable and Dynamic Signs
- I. Emergency Management Signs

A. Regulatory Signs

Regulatory signs give notice of traffic laws or regulations. The signs shall clearly indicate the requirement imposed by the regulation and shall be designed and installed to provide adequate visibility and legibility in order to obtain compliance. All regulatory signs shall be supported by laws, ordinances or regulations.

Regulatory signs shall be rectangular unless specifically designed otherwise. The size of regulatory signs shall vary depending on the roadway classification and speed. For example, a multi-lane freeway will require a larger speed limit sign than a two-lane collector road. In addition, if a roadway facility is greater than 3 lanes in each direction, two regulatory signs are required, one for each side of the roadway.

Stop signs (R1-1) are used when a full stop is always required on an approach to an intersection.





Yield signs (R2-1) are used on the approach to a through street where conditions are such that a full stop is not always required.



The yield here to pedestrian sign (R1-5) shall be used if stop lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach. This sign shall only be used where the law specifically requires that the driver must stop for a pedestrian in a crosswalk.

The State Law Yield to Pedestrian within Crosswalk (R1-6) sign is generally used at mid-block pedestrian crossings. It informs the driver that the pedestrian has the right-of-way in the crosswalk. Many of these sign installations are supplemented by solar powered flashing beacons that activate when the pedestrian crossing button is pushed.





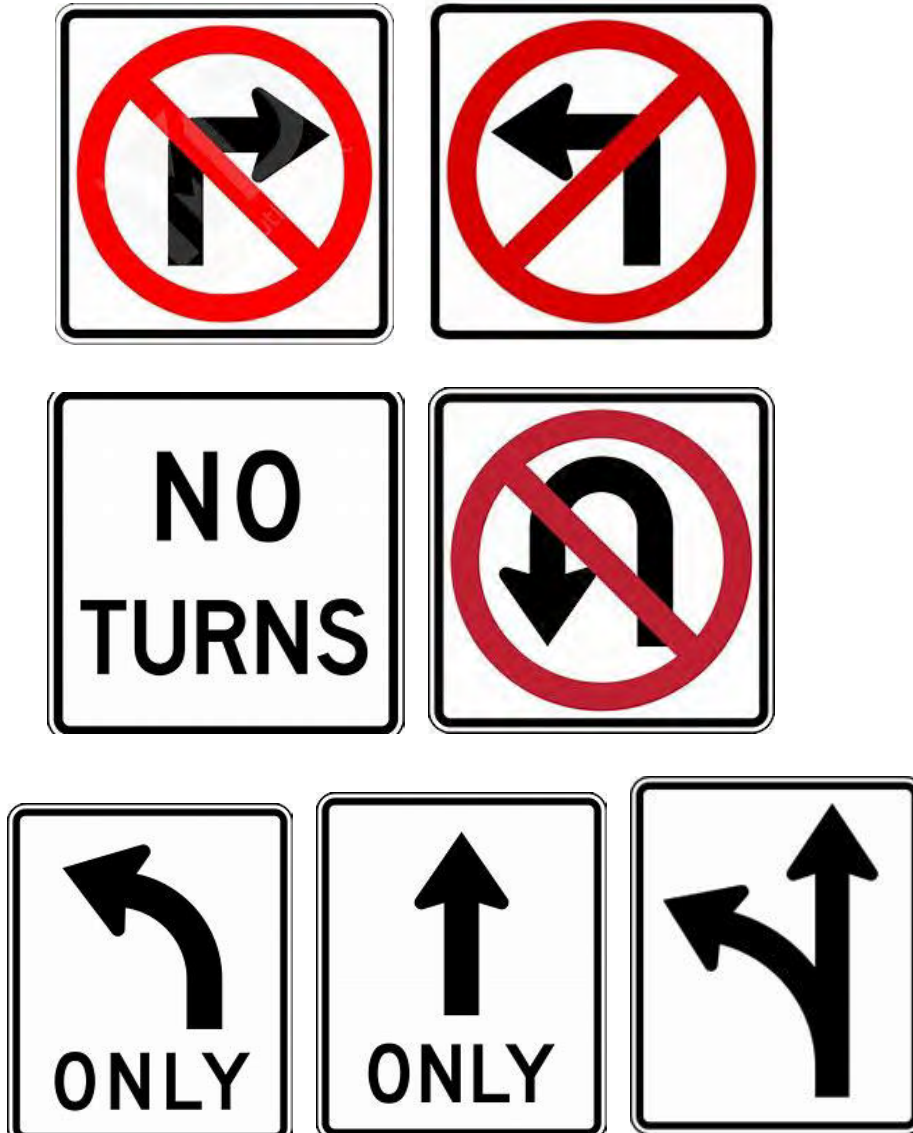
Speed limit signs (R2-1) are used on almost all roadways to inform the driver of the regulatory speed on that facility. The sign shall display the limit established by law. The established speed shall be determined by a speed zone engineering study performed in accordance with traffic engineering practices. They are generally required to be posted after a ramp enters an interstate, after major intersections, spaced evenly along long stretches of roadway and at jurisdictional boundaries.

Signalized Intersection Signing



A traffic laws photo enforced sign (R10-18) may be placed at a signalized intersection where the jurisdiction issues violations based on photo enforcement. A rectangular plaque of the sign can be placed under regulatory signs approaching the intersection.

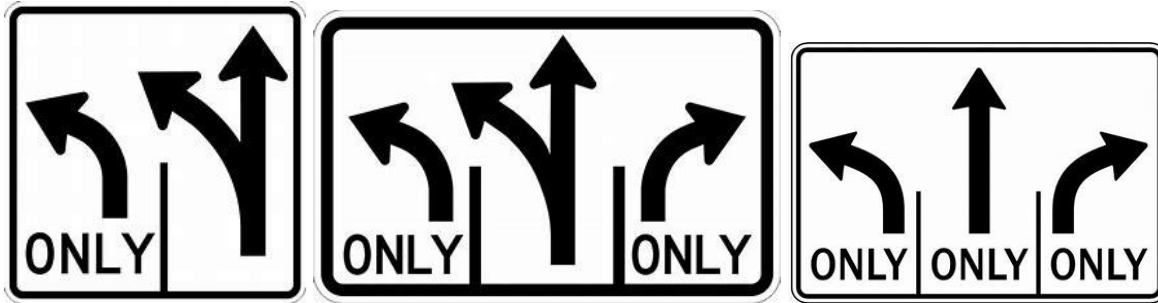
The no right turn (R3-1), no left turn (R3-2), no turns (R3-3), no U-turn (R3-4), left only (R3-5), straight only (R3-5a), left and thru (R3-6), right lane must turn right (R3-7R), and are all movement prohibition signs. They should be placed where they will be most easily seen by road users who might be intending to make the movement.



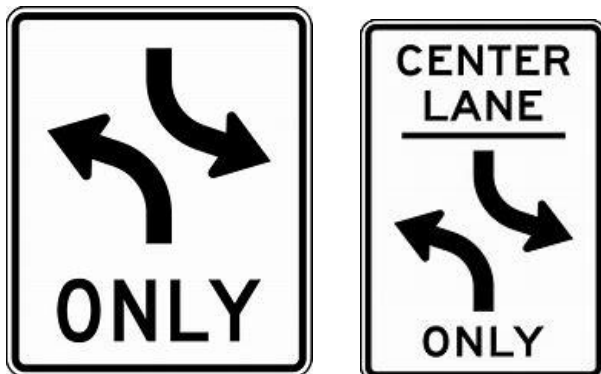
Advance intersection lane control signs such as the combination left only/left and through (R3-8), left only/left and through/right only (R3-8a) and left only/thru only/right only (R3-8b) may be used to indicate the configuration of all lanes ahead.



The words ONLY, OK, THRU and ALL may be used within the border in combination with the arrow symbols of the R3-8 sign series. Where three or more approach lanes are available to traffic, advance intersection lane control signs, if used, shall be post-mounted in advance of the intersection and shall not be mounted overhead.



Two-way left turn only signs (R3-9a) and (R3-9b) should be used in conjunction with the required pavement markings where a non-reversible lane is reserved for the exclusive use of left-turning vehicles in either direction and is not used for passing or through travel. They can be supplemented with Begin (R3-9cP) or End (R3-9dP) sign panels to indicate the start or end of the center two-way left turn lane.

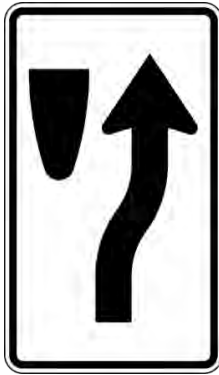




The do not pass (R4-1) sign may be used in addition to pavement markings to emphasize the restriction on passing.

The keep right (R4-7a), (R4-7b) and (R4-7c) signs may be used at locations where it is necessary for traffic to pass only to the right-hand side of a roadway feature or obstruction. The “sister” keep left sign (R4-8) is also available for use in the opposite direction. These signs are most commonly used at the beginning of a raised median section of roadway.





The stay in lane (R4-9) sign may be used on multi-lane highways to direct road users to stay in their lane until conditions permit shifting to another lane.

The do not enter (R5-1) sign shall be used where traffic is prohibited from entering a restricted roadway. The wrong way (R5-1a) sign is used to supplement the do not enter sign where an exit ramp intersects a crossroad or a crossroad intersects a one-way roadway in a manner that does not physically discourage or prevent wrong way entry.



Selective exclusion signs give notice to road users that statutes exclude designated types of traffic from using particular roadways.

The no trucks (R5-2), no motor vehicles (R5-3), no commercial vehicles (R5-4), no pedestrians (R9-3) and no bicycles (R5-6) are just a few examples of the selective exclusion signs available according to roadway restrictions.



The one-way (R6-1) or (R6-2) signs shall be used to indicate roadways upon which vehicular traffic is allowed to travel in only one direction.

They may be placed parallel to the one-way roadways that intersect one-way roadways. At an intersection with a divided highway that has a median width of 30 feet or more, one-way signs shall be placed visible to each crossroad approach on the near right and far left corners of each intersections with the directional roadways. At an intersection with a divided highway that has a median width of less than 30 feet, one-way signs shall be installed.

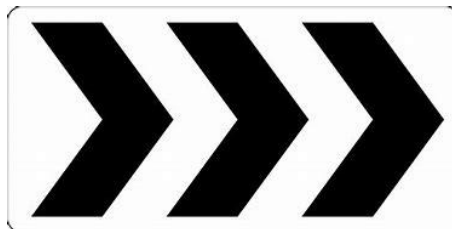
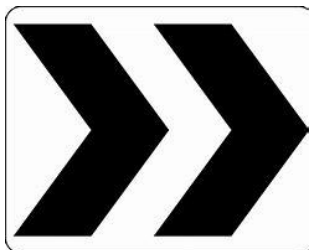


Roundabout Signs

Yield signs should be used in roundabout intersections to assign right-of-way at the entrance to a roundabout. In addition, a roundabout circulation plaque (R6-5P) should be placed below the yield signs on each approach.



Roundabout chevron signs (R6-4) and (R6-6-4a) may be placed on the roundabout island to provide positive guidance in the right direction around the roundabout.



Signs governing the parking of vehicles cover a wide variety of regulations. The no parking any time (R7-1) and one hour parking from X AM – X PM (R7-5) are only two examples of the parking regulation signs available for use.



Traffic signal pedestrian actuation signs (R10-3a) shall be mounted immediately above or incorporated into the push button detector units.

There are a variety of traffic signal signs that may be used at signalized intersections to indicate if there are any restrictions on vehicle movements. The left on green arrow only (R10-5), stop here on red (R10-6), no turn on red (R10-11) and turning vehicles yield to pedestrians (R10-15) signs are only some of the traffic signal signs available for use as determined by the signal timing at the intersection.



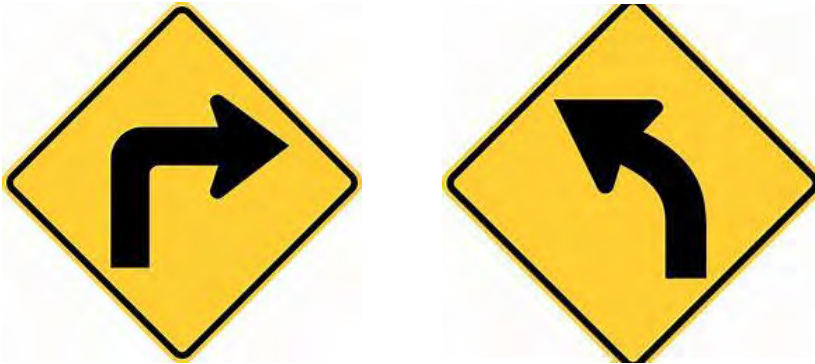
The truck route (R14-1) sign should be used to mark a route that has been designated to allow truck traffic.



B. Warning Signs

Warning signs give notice of a situation that might not be readily apparent. Warning signs alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations.

A turn sign (W1-1) shall be used instead of the curve (W1-2) sign in advance of curves that have advisory speeds of 30 mph or less.



The reverse curve (W1-4) sign should be used instead of multiple curve signs.

A one-direction large arrow (W1-6) sign may be used either as a supplement or alternative to chevron signs in order to delineate a change in horizontal alignment. It may also be used to supplement a turn or reverse turn sign to emphasize the abrupt curvature. Chevron (W1-8) signs may be added to emphasize the curve.



The divided highway (W6-1) sign and divided highway ends (W6-2) sign should be used on the approaches and departures to a section of roadway where the opposing flows of traffic are separated by a median or other physical barrier.



The two-way traffic (W6-3) sign should be used to give warning and notice of the transition to a two-lane, two-way section.





The low clearance (W12-2) sign shall be used to warn road users of clearances less than 12 inches above the statutory maximum vehicle height.

The following is an illustration of a low clearance sign in advance of a bridge overpass.



The dead end (W14-1) sign may be used at the entrance of a single road that terminates in a dead end or cul-de-sac. The no outlet (W14-2) sign may be used at the entrance to a road from which there is no other exit.



Warning signs can also be used to advise the driver of an upcoming regulatory device, such as a stop sign, yield sign, speed limit or signal. The advance traffic control symbol stop ahead (W3-1), yield ahead (W3-2) and signal ahead (W3-3) signs shall be installed on the approach to a primary traffic control device that is not visible for a sufficient distance to permit the road user to respond to the device.



The following illustration shows a signal warning sign with a supplemental signal ahead panel.



The reduced speed limit ahead (W3-5) sign should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph.

A merge (W4-1) sign may be used to warn road users on the major roadway that merging movements might be encountered in advance of a point where lanes from two separate roadways converge as a single traffic lane and no turning conflict occurs. The lane ends merge left/right (W4-2) sign should be used to warn of the reduction in the number of travel lanes in the direction of travel on a multi-lane roadway.



The added lane (W4-3) sign should be installed in advance of a point where two roadways converge and merging movements are not required.



The right/left lane ends (W9-1) sign may be used in advance of the lane ends sign or the lane ends merge left/right (W9-2) sign as additional warning or to emphasize that the traffic lane is ending and that a merging maneuver will be required.





The no passing zone (W14-3) sign should be used to inform the road user that they are entering a section of roadway where passing is not permitted. It should be installed on the left side of the roadway at the beginning of no-passing zones identified by pavement markings or do not pass signs or both.

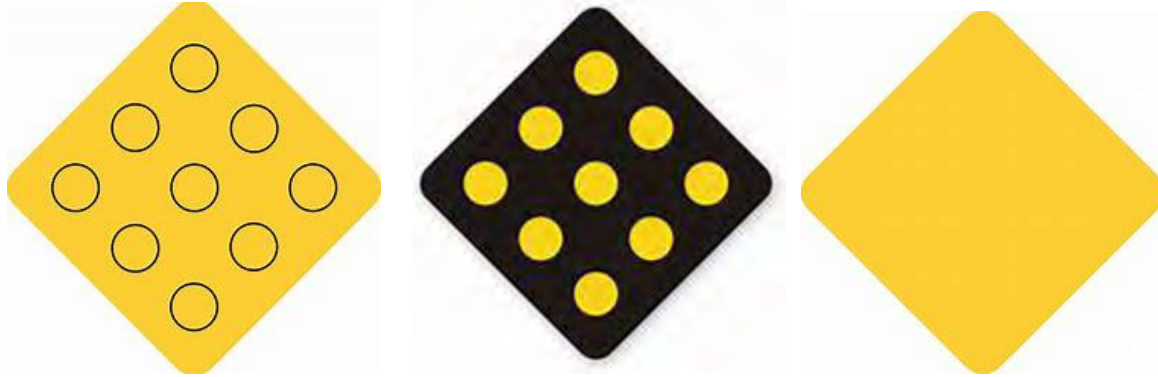
The fire truck traffic warning (W11-8) sign may be used to alert road users to locations where unexpected entries into the roadway by emergency vehicles might occur. It can be supplemented with informational plaques such as the emergency signal ahead (W11-12P) sign panel.



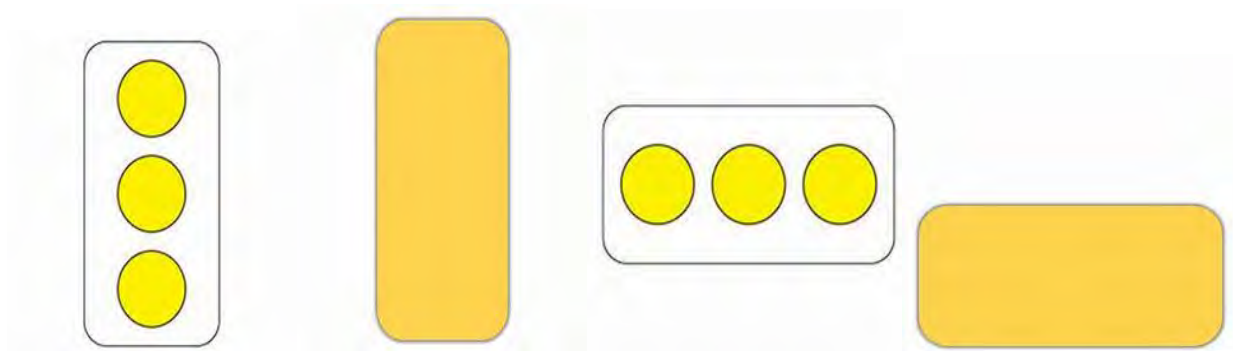
C. Object Markers

Type 1 Object Markers

Type 1 object markers are used to notify the driver of obstructions within the roadway.



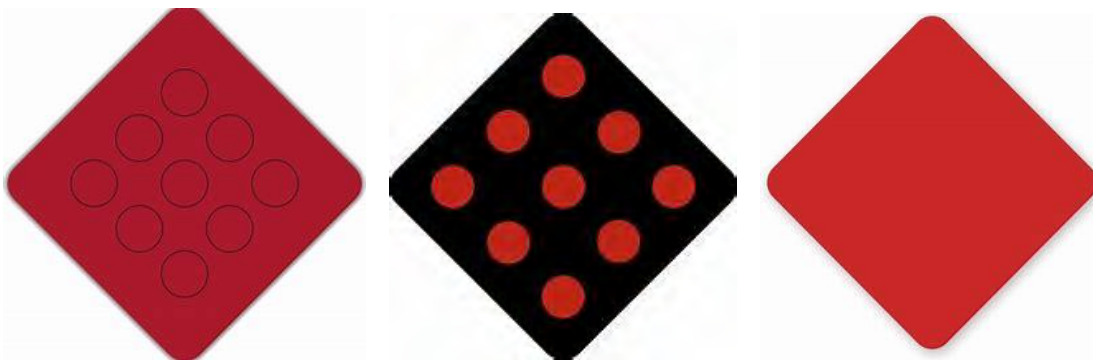
Type 2 object markers are used to notify the driver of obstructions adjacent to the roadway. These obstructions can include underpass piers, bridge abutments, handrails, ends of traffic barriers, utility poles and culvert headwalls.



Type 3 object markers are used to notify the driver of obstructions adjacent to or within the roadway. These obstructions can include approach ends of guardrail and other roadside appurtenances.



Type 4 object markers are used to notify the driver of the end of a roadway. These markers may be used in instances where there are no alternate vehicular paths.



D. Guide Signs

Guide signs show route designations, destinations, directions, distances, services, points of interest and other geographical, recreational or cultural information.

Guide signs are essential to direct road users along streets and highways, to inform them of intersecting routes, to direct them to cities, towns or other important destinations, to identify nearby rivers and streams, parks, forests, and historical sites, and generally to give such information as will help them along their way in the most simple, direct manner possible.

1. Conventional Roads

Route Signs

A route sign assembly shall consist of a route sign and auxiliary signs that further identify the route and indicate the direction. Route sign assemblies shall be installed on all approaches to numbered routes that intersect with other numbered routes.

Where two or more routes follow the same section of highway, the route signs for Interstate, U.S., state and county routes shall be mounted in that order from the left in horizontal arrangements and from the top in vertical arrangements. Route signs for lower-numbered routes shall be placed at the left or top.

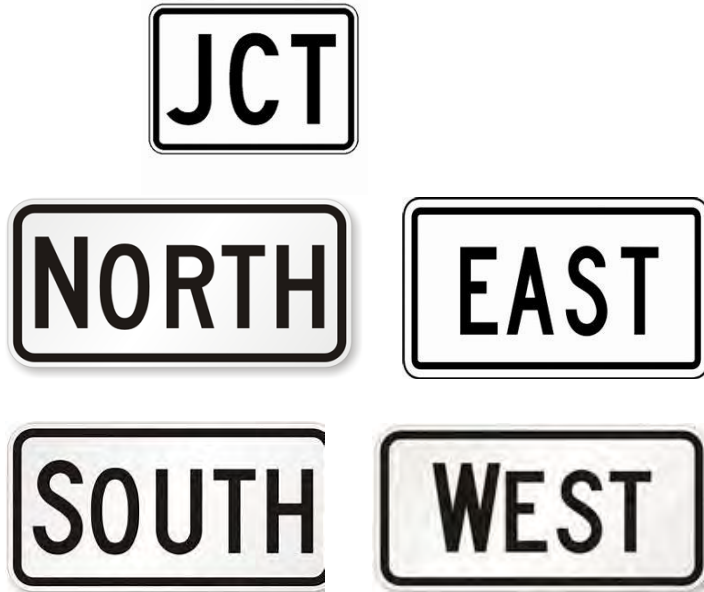
All numbered highway routes shall be identified by route signs and auxiliary signs. The signs for each numbered highway, which are distinctive in shape and color, shall be used only on that system and the approaches thereto.

The most commonly used route signs include the interstate route sign (M1-1), U.S. route sign (M1-4) and county route sign (M1-6).



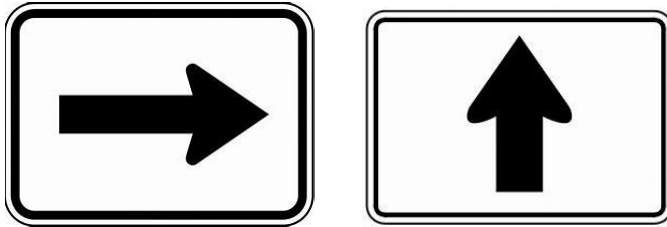
Route Sign Auxiliaries

The most common route sign auxiliary panels include junction (M2-1) and cardinal direction signs such as north (M3-1), east (M3-2), south (M3-3) and west (M3-4). These panels are placed on the same single post as the route sign to inform the road user of route junctions, direction of travel, alternate routes and begin/end routes. The junction assembly shall be installed in advance of every intersection where a numbered route is intersected or joined by another numbered route.



Advance Turn and Directional Arrow Auxiliary Signs

Advance turn arrow auxiliary signs can be used to provide the road user with specific direction to the desired route such as the left (M6-1) and straight ahead (M6-3) panels. These panels shall be mounted directly below the route sign.



Lane Designation Auxiliary Signs

Lane designation auxiliary signs, such as left lane (M5-4), center lane (M5-5) and right lane (M5-6), direct the road user as to which lane is approaching the designated route. These panels may be mounted directly below the route sign.



2. Preferential/Managed Lane Signs

Preferential lanes are lanes designated for special traffic uses such as high-occupancy (HOVs), light rail, buses, taxis or bicycles.



Destination signs shall display the route number or name of a city, town or other traffic generator and an arrow. The down arrows guide the road user to the correct lane to use for the desired route or destination. Destination signs with down arrows are always placed on overhead structures so that the sign panels are centered over the correct lanes.



Interchange split signs shall include specially designed oversized lane usage arrows that indicate which lanes are splitting off at the upcoming interchange. Yellow lane designation panels may also be added to emphasize that specific lanes lead only to the upcoming split lanes. These signs shall also be placed on overhead structures to provide positive guidance.



Destination and distance signs may be used in combination on overhead structures to provide the road user with guidance as to which lane to use for each destination and the distance to the next destination. It should be noted that destination and distance signs are not required to be mounted overhead. They may be placed on multi-posts structures outside the roadway if there is sufficient right-of-way. Exit only guide signs should be placed in the center of the exit lane on the overhead structure. This gives the motorist positive guidance that they are utilizing the correct lane for the exit. Supplemental pavement markings can also be used to reinforce the exit only lane.



3. Advanced Information Signs

Advance guide signs give notice well in advance of the exit point of the principal destinations served by the next interchange and the distance to that interchange. Guide signs can be used to inform road users of advance information such as upcoming exits and corresponding cities/roadways.



The following illustration shows an advance guide sign one mile in advance of the upcoming exit for several cities and crossroads.

E. Toll Road Signs

Toll highways are typically limited access freeway facilities. A portion or an entire route might be a toll highway. The general signing for toll roads will depend on the type of facility and access points. The aspect of tolling and the presence of toll plazas or collection points necessitate additional considerations in the typical signing needs. The notification of the collection of tolls in advance of and at entry point to the toll highway also necessitate additional modifications to the typical signing.



Dynamic message signs can be used in combination with fixed toll plaza signs to convey any changing messages to the road users, such as express lanes “open.”



Special toll only signs should be placed on overhead structures ahead of toll collection sites to ensure drivers are utilizing the correct lanes. Fixed or dynamic message signs can be used as a method to define lane usage to cash lanes and express lanes to provide positive guidance to the road user.





Toll roads require route confirmation signs placed every 3 to 5 miles with long distance exits and 1 to 3 miles for closely spaced exits. These confirmation signs inform the road users of the fact that they are traveling on a certain toll road.



In some areas of the country without exclusive express toll lanes or toll by license plate, cash tolls are still collected. Prior to these toll booth locations, signs should be posted listing the toll rates.



F. General Information Signs

1. General Service Signs

General service signs can include rest area information signs along the interstate. As shown in the illustration below, these signs can include distances to the rest areas, amenities located at the rest areas and arrow signs marking the exit to a rest area.



Other general service signs include notification of locations of hospitals (D9-2), medical services (D9-13) and police (D9-14).



General information signs such as lodging (D9-9) and handicap accessibility (D9-6) can also be found under general service signs.



2. Specific Service Signs

Multi-post signs are generally used for specific service signs along the interstate to inform the motoring public of upcoming gas, food and lodging at certain exits. Some exits can utilize one multi-post sign to include all of the services if only a few services are located at an exit.



Where multiple services are located at an exit, individual multi-post signs designating gas, food or lodging are used in advance of the exit.



Specific service signs along the mainline of the interstate are generally placed one to two miles in advance of an exit to identify the gas, food or lodging available at that exit. The ramp signs are placed alongside the exit ramps with distances and directions to the desired destination. Single post trailblazers are placed along the crossroad to guide the driver to the destination.



G. Recreational Signs

Recreational areas are attractions or traffic generators that are open to the general public for the purpose of play, amusement or relaxation. Recreational attractions include such areas as parks, campgrounds and ski areas.

The following illustration is a multi-post guide sign on the interstate informing the motorist of the exit to the recreation area.



Other recreational signs that can be used alone in conjunction with other signs are the camping (RS-040) sign, swimming (RS-061) sign and golf (RS-128) sign.



H. Changeable and Dynamic Message Signs

Changeable message signs are portable message boards intended to supplement the other work zone devices. They are generally used in complex, high density work zones.

Generally, a message should not exceed *2 X 3 maximum*. This means no more than *two* messages of *three* lines in length. The changeable message sign can accommodate 8 characters per line so abbreviations may be necessary. The messages shall not scroll across the screen. It is necessary for the message to be able to “cycle” twice from the point where the motorists can first read the message. This allows the motorist to read the message in its entirety. The general arrangement of the message from top to bottom is: top line for problem, center line for time, location, or distance ahead, and bottom line for recommendation to driver.

The bottom of the sign panel shall be at least seven feet above the roadway. The changeable message sign shall be moved out of the clear zone when not in use or protected by a barrier. They are legible from at best 900 feet away.



Dynamic message signs are fixed signs that can provide changing information to the motorists via electronic message boards. They can advise road users of unexpected situations. Its flexibility allows traffic control through the traffic management center with changing roadway situations (i.e., traffic crashes, amber alerts, etc).

I. Emergency Management Signing

Each region of the country has specific emergency management signs that identify potential hazards for the road user. Two of the more specific examples of emergency management signs are illustrated below: hurricane evacuation route (EM-1) and tsunami evacuation route (EM-1a).



IV. Summary

From the roadway signage course, you should have a basic understanding of the definition and use of the most commonly used signs in the Manual for Traffic Control Devices (MUTCD).

Information pertaining to design of signs is included retroreflection and color of signs. In addition, guidance of installation of ground mount signs has been discussed as it relates to sign panel sizes, mounting height, lateral offset, orientation, posts/mountings and maintenance. Installation of overhead signs has been covered as it relates to mounting.

Types of signs including their meaning and proper usage on different types of roadways has been covered for standard regulatory and warning signs. The specific use of object markers has been discussed. Guide signs for conventional roads, preferential/managed lanes and advanced information signs for usage on freeways have been covered. Signs specific to toll roads were identified and discussed. General information signs for general service and specific service were also identified. The proper use of recreational signs was also covered. The advantages of using changeable and dynamic message signs with standard roadway signing was discussed. Lastly, emergency management signs were briefly covered.

Please note that this course only provided a sampling of the signs identified in the MUTCD for educational purposes. The most commonly used signs are detailed in this course. A full listing of signs can be found in the MUTCD.