

TRAFFIC ENGINEERING

TRAFFIC CONTROL DEVICES

REFERENCE: NYS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES

GENERAL

Traffic control devices are signs, signals, markings or other devices used to regulate, warn or guide highway traffic. When properly used they promote safe orderly and convenient movement of traffic, both motorized and non-motorized. All necessary devices should be in place on any highway open to traffic.

Uniformity of traffic control devices and their application enables highway users to quickly recognize and interpret devices and to react correctly to them. Uniformity means treating similar situations in the same way.

Effective traffic control devices meet five basic requirements. They fulfill a need; command attention; convey a clear, simple meaning; command the respect of road users; and give adequate time for proper response.

The application of traffic control devices should be based on sound engineering principles in conjunction with studies of traffic flow, accidents, speeds, delays, and physical conditions. Once a determination has been made, the devices used must conform to the Manual of Uniform Traffic Control Devices.

SIGNS (GENERAL)

Signs are essential to inform highway users of specific regulations and to call attention to hazards that are not self-evident. They also inform drivers about highway routes, directions, destinations, and points of interest. When considering the need for warning or guide signs, the needs of highway users unfamiliar with the area should be a major consideration.

Traffic signs are standardized in terms of shape, color, legend and symbols to enable highway users to quickly and correctly comprehend the sign message. Basic sign shapes and colors are:

<u>Sign Type</u>	<u>Shape</u>	<u>Color</u>
Regulatory	Vertical Rectangle	Black Legend/White Background
Warning	Diamond	Black Legend/Yellow Background
Guide	Horizontal Rectangle	White Legend/Green Background

There are some signs that do not follow these basic shapes and colors. For example, the STOP sign (Regulatory) is an octagon shape with a white legend on a red background.

Standard signs are specified in a variety of sizes to provide suitable target value and legibility for each type highway environment and condition. Sign size is identified by a letter (usually A, B, C, D, or E). For example, size C should normally be used on conventional two lane highways, size D is normally used on expressways or parkways, and size E is normally used on freeway mainlines.

The minimum height of a roadside sign (difference in elevation between the edge of the roadway and the bottom of the sign) on conventional highways and expressways is seven feet. Where there are multiple signs on the same support, the lowest sign should be at least six feet. At locations where it is considered unlikely that signs would interfere with pedestrians or be blocked by parked vehicles, these minimum heights are reduced to five feet and four feet respectively.

The proper location of a sign is essential to its effectiveness. The NYS MUTCD (Reference Source #3) prescribes placement of a particular type of sign based on the function of the sign and factors such as the 85th percentile speed of traffic. However, it may be necessary to deviate from the prescribed locations to ensure that the motorist's view of the sign is unobstructed, or to achieve adequate spacing between signs. Signs should be erected individually except where one supplements, or where they must be grouped as with Route Markers.

SIGNS (REGULATORY)

Regulatory signs inform highway users of traffic regulations. They are sometimes used to advise of statutory rules which may not be apparent or which require emphasis. Unlike regulations, however, statutory rules are in effect even if not posted.

Stop and *Yield* signs may be used to assign right of way at intersections. Sight distance across the corners of the intersection and the prevailing approach speed on the major highway are significant in determining whether a *Stop* or *Yield* sign should be used.

There are two types of speed limits: linear (along a portion of a highway) or area (all highways within a specified area, except those specifically excluded). Investigations to determine appropriate speed limits should include: the existing speed pattern, intersections and roadside development, traffic volumes, accident experience, and physical conditions of the highway. For linear speed limits longer than 1100 feet, multiple *speed limit* signs are required. The first sign shall be placed at the beginning of the limit. The second sign should be placed within 1100 feet of the first with additional signs being placed at distances equal to 100 times the numerical value of the speed limit. For example, in a 35 MPH speed limit, the third sign would be placed approximately 3500 feet beyond the second.

According to NYS MUTCD (Reference Source #3) which is not three of the five warrants for a traffic signal?

- A. Cost
- B. Placement
- C. Uniformity
- D. Maintenance

Ans. A

Which will not reduce or prevent hydroplaning?

- A. Transverse grooves on cement concrete
- B. Longitudinal grooves on cement concrete
- C. Open graded asphalt
- D. Cross slope

Ans. D

What is the primary purpose of ramp metering?

- A. Reduce congestion or improve merge operations on urban freeways

Ans. A

Define the term generated traffic.

- A. Traffic drawn to an area due to the construction of a highway or land development

Ans. A

What are the advantages of having a parking lot outside a city and shuttle bus to downtown?

- A. Cuts down on travel time
- B. More room at lunchtime for shoppers

Ans. A

What affects the capacity of a city street the most?

- A. The amount of on street parking
- B. The capacity of its major intersections
- C. The percentage of trucks and buses

Ans. B

What normally determines the type of guiderail to be used at a location?

- A. The design speed
- B. The distance from the back of the guiderail to the front face of the fixed object.
- C. The recovery area before the guiderail

Ans. B

What three of four would be the most likely result of changing a two-way city street to a one-way street?

- A. Signal timing would be simplified
- B. Travel time would be reduced
- C. Capacity would be increased

Ans. ABC

Highway density increases when?

- A. Average speed is reduced with no volume change
- B. Average speed increases while volume decreases
- C. Average speed increases with no volume change
- D. Average speed remains the same and volume decreases

Ans. A

On a rural highway, what should the minimum distance to a fixed object be?

- A. 10'
- B. 20'
- C. 30'
- D. 40'

Ans. C

The time it takes a driver to perceive a problem and to begin braking is called the perception and reaction time. This time is normally assumed to be?

- A. ½second
- B. 2.5 seconds
- C. 5 seconds
- D. 10 seconds

Ans. B

At a certain station in a rural area a total count of 2500 cars was made in an 8 hour period. Records in this area indicate that the 8-hour period represents 42.8% of a 24 hour annual traffic volume. Also present information shows a factor of 1.62 may be used to project a 24 hour count 15 years into the future. On this basis, which of the following 24 hour traffic volumes would most likely be expected at the station 15 years from now?

- A. 7,623
- B. 9,462
- C. 10,800
- D. 13,000

Ans. B

Which of the following best describes the primary function of traffic signs?

- A. Promote elimination of road hazards
- B. Promote the safe and efficient movement of traffic
- C. Promote public self enforcement of regulations
- D. To insure that the legal obligations of NYS have been fulfilled

Ans. B

The “glare” elimination from a source of highway lighting may be most efficiently reduced by which of the following?

- A. Decrease effective area of luminaire
- B. Decrease background brightness
- C. Increase luminaire brightness
- D. Increase luminaire mounting height

Ans. D

If a sign 30' high by 20' wide has a wind load of 30 #/SF, what would be the allowable overturning moment? (Assume sign is on the ground)

$$30 \times 20 \times 30 \times 30/2 = 270,000 \text{ Ft. lbs.}$$

(If the sign was mounted with a 7' clearance)

$$30 \times 20 \times 30 \times (30/2 \times 7) = 396,00 \text{ Ft. lbs.}$$

The next two questions are based on the following data:

<u>Speed Range (MPH)</u>	<u>No. Of Vehicles Observed</u>
17.5 - 22.4	7
22.5 - 27.4	28
27.5 - 32.4	36
32.5 - 37.4	53
37.5 - 42.4	47
42.5 - 47.4	14
47.5 - 52.4	10
52.5 - 57.4	5
Total	200

Which one of the following most nearly represents the 85th percentile speed of the vehicles in the above sample?

- A. 40.0
- B. 42.0 ($.85 \times 200 = 170$ vehicles $\sim > 37.5 - 42.4$ range $\therefore 42$ MPH)
- C. 45.0
- D. 47.5

Ans. B

The percentage of the above sample in the 10 MPH pace is most nearly

- A. 7.5
- B. 10.0 [$(32.5 \sim 42.4 \text{ MPH}) = 53+47 \quad 100/200 = 50\%$]
- C. 17.5
- D. 50

Ans. D

A spot speed study taken to aid in a speed limit determination generally requires which one of the following types of samples?

- A. 100% sample of all vehicles
- B. Random sample of all vehicles
- C. Sample of free flowing vehicles
- D. 85% sample of all vehicles

Ans. C

The NYS MUTCD (Ref. Source #3) requires that in no case should a no-passing zone be less than 500 feet in length. Which of the following steps would be most advisable if the actual length of road along which there is inadequate sight distance is less than 500 feet?

- A. A pass with care sign should be used instead of a no-passing zone
- B. The no-passing zone should be replaced by a reduced speed zone
- C. The additional required length should be added at the beginning of the no-passing zone
- D. A keep right sign should be used instead of a no-passing zone

Ans. C

To avoid operational problems with an Interchange, which one of the following is most important?

- A. Provision of 2 lane exits through lanes
- B. Approval of highway patrol authorities
- C. Correlation of minimum advance notice with exit
- D. Correlation of directional signing with the design of the Interchange

Ans. D

Which one of the following is most nearly maximum legibility range of sign messages, using Series D letters and proper spacing?

- A. 15 feet per inch of letter height
- B. 50 feet per inch of letter height
- C. 150 feet per inch of letter height
- D. 200 feet per inch of letter height

Ans. B

Which one of the following is the greatest amount of information ordinarily shown on an expressway guide sign?

- A. The directional information and three destination names
- B. The directional information and two destination names
- C. The directional information and one destination name
- D. The directional information and one destination, and one street name

Ans. B

Which of the following considerations should be taken into account in design controls for the combination of horizontal alignment and profile?

1. The desirable combination of horizontal and vertical alignment often supersedes the need for safe passing sections at frequent intervals on two lane highways
2. Vertical curvature superimposed upon horizontal curvature, or vice versa, generally results in a more pleasing facility
3. Sharp horizontal curvature should not be introduced at or near the top of a pronounced vertical curve
4. Horizontal curvature and profile should be made as flat as feasible at highway intersections

- A. 2, 3, 4, but not 1
- B. 1, 2, 3, but not 4
- C. 1, 2, 4, but not 3
- D. 1, 3, 4, but not 2

Ans. A

Of the following four factors, only three in combination are useful in determining the length of a deceleration lane .

1. Speed at which drivers maneuver into auxiliary lane
2. Speed at which drivers turn after transversing deceleration lane
3. Speed at which drivers merge with other vehicles
4. The manner of deceleration or the deceleration factor

Ans. 1, 2, 4, but not 3

What are four purposes for including channelization islands in intersection design?

Ans. Separation of conflicts; Control of angle of conflict; arrangement to favor a pre dominant turning movement

The installed cost and maintenance cost of traffic signal are usually lowest for which one?

- A. Activated
- B. Semi-Activated
- C. Pre-Timed
- D. Centrally Monitored

Ans. C

In the interest of traffic safety and efficient operations, what is the established AASHTO (Ref. Source #2) design policy relative to “lane balance” at interchanges where ramp traffic merges with through traffic?

Ans. Number of lanes beyond merge of two traffic streams should not be less than sum of all traffic lanes on the merging roadways minus one

When determining the phase for a traffic signal at an intersection requiring three or more phases, what does the term “skip phasing” denote?

Ans. There is no need for each phase to follow preceding phase, providing actuated control equipment is used

Which three of four are proper design principles for designing intersections at-grade?

- A. Reduce number of conflict points
- B. Separate the area of conflict from the main flow
- C. Increase area of conflict
- D. Provide substitute turning paths

Ans. 1, 2, 4, not 3

Which of the following factors should be considered when analyzing the capacity of a signalized intersection?

- A. Width of approach
- B. Parking conditions
- C. Peak-hour traffic
- D. Trucks as % of total traffic

Ans. All of the above

The types of signal indications used for lane use control signals is shown in which one of the groups below?

- A. Circular green and circular red
- B. Red X, circular yellow, downward green arrow
- C. Circular green, circular yellow, circular red

D. Red X, yellow X, downward green arrow

Ans. D

At an isolated intersection, a full traffic actuated control has been installed where volumes fluctuate widely; the control has been adjusted by the traffic engineer to provide the following in seconds:

	<u>G</u>	<u>Y</u>	<u>R</u>
Artery	18-39	4	13-36
Side Road	9-32	3	21-42

In the above situation, what is the minimum cycle length available under low volume conditions?

- A. 17
- B. 34
- C. 36
- D. 48

Ans. B

The progression speed of an existing traffic signal system located along an arterial street could be increased by which of the following?

- A. Decreasing the offsets
- B. Increasing the offsets
- C. Increasing the green time on the main street

Ans. A

Which one of the following defines the ratio of the total number of green signal intervals that are fully utilized by traffic during peak hour to the total number of green intervals for that approach during the same time period?

- A. Design utilization factor
- B. Poisson queue factor
- C. Peak hour factor
- D. Load factor

Ans. D

For which one of the following purposes is cable interconnection between traffic signals most often used?

- A. To insure equal voltage to each controller
- B. To insure constant relationship with starter green between controls
- C. To allow each controller to act independently
- D. To insure current to each control

Ans. B

According to the NYS MUTCD (Ref. Source #3), which three of the following four factors are considered warrants for the installation of traffic signals?

- 1. Peak hour volumes
- 2. Accident experience
- 3. Progression movement
- 4. Minimum vehicular movement

- A. 1, 2, 3, but not 4
- B. 1, 2, 4, but not 3
- C. 1, 3, 4, but not 2
- D. 2, 3, 4, but not 1

Ans. D

The main artery is controlled by four interconnected signals on a 60 second cycle; signals one and two are 200 feet apart; signal three is approximately 1/4 mile from signal two; and signal four is approximately 1/4 mile from signal three. Which one of the following can be the most effective progression timing to maintain a 30 MPH speed in both directions on the artery?

- A. Signals 1, 2 & 3 would be on a simultaneous system with signal 4 timing offset at 50% from signal 3 timing
- B. Signals 1 & 2 would be on a simultaneous system, signal 3 would be offset 50% from signal 2 and signal 4 would be offset 50% from signal 3
- C. All signals would be on a simultaneous system
- D. Signals 1 & 2 would be on a double alternate system, signals 3 & 4 would be on a single alternate system

Ans. A

Freeway surveillance and control projects currently in use are designed to accomplish which three of the following four purposes?

- 1. To decrease mainline accidents
- 2. To increase peak hour level of service
- 3. Monitor pavement occupancy per traffic density
- 4. Automatically detect high accident locations

- A. 1, 2, 3, but not 4
- B. 1, 2, 4 but not 3
- C. 1, 3, 4, but not 2
- D. 2, 3, 4, but not 1

Ans. A

Which one of the following is the primary effect of operating a traffic signal in a rest in red mode?

- A. It permits a shorter vehicle interval setting
- B. It times out the clearance interval in the absence of demand
- C. It times out the green interval when an opposing call is present
- D. It decreases perception and reaction time

Ans. B

Which one of the following is the numerical value to be displayed on the warning sign panel associated with curve warning sign?

- A. The safe speed for the available stopping sight distance
- B. The maximum speed recommended under average environmental traffic conditions
- C. The maximum speed recommended under optimum environmental traffic conditions
- D. The maximum speed recommended under adverse environmental traffic conditions

Ans. C

In a progressive traffic signal system, which of the following elements is generally the same at all intersections in the system?

- A. Offset
- B. Interval
- C. Cycle length
- D. Phase

Ans. C

In marking a climbing lane on a one-way roadway with pavement markings, which one of the following types of lines should be used to separate the climbing lane from adjacent normal lane at beginning of full width climbing lane?

- A. White partial barrier
- B. White broken
- C. White double broken line

D. Single solid white

Ans. C

Under which of the following circumstances would a triple offset signal system be used to its greatest advantage?

- A. At a particular busy intersection which would normally require a three-phase signal
- B. Where there is heavy flow in one direction at one time of day and in the opposite direction at another time
- C. On a one-way street system
- D. Where the cross street traffic is about as heavy as the main street traffic

Ans. B

When the NYS MUTCD (Ref. Source #3) was revised, certain traffic devices were rendered obsolete. Devices in use at the time of revision may be used for which of the following periods of time?

- A. 1 year
- B. 3 years
- C. 5 years
- D. 10 years

Ans. D

According to current NYS vehicle and traffic laws, which one of the following is permitted in a “no standing” zone?

- A. Temporary stop to load or unload goods
- B. Temporary stop to receive or discharge passengers
- C. Stopping with licensed driver in attendance and engine running
- D. Temporary stop to make vehicle repairs, provided emergency lights are flashing

Ans. B

Glare interference from sources of high intensity lighting may be most effectively reduced by which of the following?

- A. Decrease effective area of luminaire
- B. Decrease background brightness
- C. Increase luminaire brightness
- D. Increase luminaire mounting height

Ans. D

Traffic signs should be mounted at a height measured from the roadway to the bottom of the sign at which one of the following?

- A. At least 4 feet
- B. At least 5 feet, where parked cars may obstruct view
- C. At least 7 feet in business and residential areas
- D. At 13 feet for overhead signs

Ans. C

In an existing traffic signal system along a rural or suburban highway route, increased offsets would cause which effect?

- A. Reduction of progressive speed
- B. Reduction of total cycle length
- C. Increase in green time for main highways at each intersection
- D. Increase in green time for side road at each intersection

Ans. A

Which of the following is the most probable reason why the use of signal control at intersections reduces the capacity of a highway?

- A. The probability of accidents is increased
- B. The probability of accidents is decreased
- C. Traffic is deprived of a portion of the time it would otherwise be free to move
- D. Traffic is deprived of a portion of the lane width it would otherwise be free to use

Ans. C

Special hauling permits are required to move vehicles and/or loads that exceed the legal dimensions or weight specified in Section 385 of V&T. Which one of the following state these specified maximum dimensions (overall, inclusive of load bumper, etc.)?

- A. 3' wide, 13½high, 35' single vehicle length, 55' combined vehicle length
- B. 8' wide, 14' high, 35' single vehicle length, 55' combined vehicle length
- C. 8' wide, 13½high, 35' single vehicle length, 50' combined vehicle length
- D. 8.6' wide, 13.5' high, 40' single vehicle length, 65' combined vehicle length

Ans. D

Which one of the following is the most important consideration in selection of Box Beam vs. Cable Guide Rail?

- A. Dynamic “deflection” is compatible with spacing available
- B. Base of Maintenance
- C. Snow drifting
- D. Soil conditions

Ans. A

A “stop” sign properly located on the west side of the intersection where Penfold and Osler Roads cross, is obscured by a grade to drivers eastbound on Penfold until they are 30' in advance of the sign. Several accidents have occurred at the intersection because drivers were not able to stop in time. Which of the following does NYS MUTCD (Ref. Source #3) authorize be done to correct this condition?

- A. Erect a “stop ahead” sign at the location of grade
- B. Move the “stop” sign 88' westward on Penfold Road
- C. Erect a “merging traffic” sign 100' west of the “stop” sign
- D. Erect a “signal ahead” sign in advance of the grade

Ans. A

FHWA guidelines call for each state to see that accident surveillance is conducted on which one of the following groups of roadways?

- A. Interstate and Federal-Aid Primary Roadways
- B. Interstate and Federal-Aid Primary and Secondary Roadways
- C. All roadways except those functionally classified as local streets
- D. All roadways

Ans. D

Under certain circumstances, the NYSDOT may issue a permit to move a vehicle or combination of vehicles, the weight of which exceeds the limits of provided in statute. Under which one of the following circumstances may a permit not be issued?

- A. If the weight exceeds 300,000 pounds
- B. If the load is divisible
- C. If the width exceeds 18'
- D. If the weight exceeds the “bridge formula”

Ans. B

Which one of the following statements regarding accident rates on a two-lane rural highway has the soundest statistical basis?

- A. Accident rates decrease with increase in average daily traffic volumes even beyond the point of congestion
- B. Accident rates increase with increase in average daily traffic volumes up to the point at which congestion occurs, then remains practically constant with further increase in traffic volume
- C. Accident rates show no consistent relationship to changes in traffic volume
- D. Accident rates increase with increase in average daily traffic volumes up to a point at which congestion occurs, then decreases with further increase in traffic volumes.

Ans. D

Variations in flow within the peak hour have definite effects on the operating characteristics of highway intersections and thus influence the capacity that can be obtained in practice. Peaking characteristics are expressed in terms of the peak hour factor which is the ratio of the volume occurring during the peak hour through the maximum rate of flow during a given time period within the peak hour. For an intersection, this ratio is usually based on the maximum rate of flow for which one of the following time periods?

- A. 10 min
- B. 15 min
- C. 30 min
- D. 45 min

Ans. B

In order to determine the effect of trucks and buses on the capacity of a highway it is most useful to know which of the following?

- A. Length of grade
- B. Speed of trucks
- C. The passenger car equivalent
- D. Percent of grade

Ans. C

Which one of the following generally provides the greatest degree of control and limitations with respect to vehicular speed?

- A. An interconnected system with fixed time signals supervised by a master control
- B. An interconnected system of semi-traffic actuated & full traffic actuated signals operating from a common power source
- C. A system of full traffic actuated signals interconnected by time clock within a variable background cycle
- D. A non-interconnected system of full traffic actuated signals of the volume density type

Ans. A

Listed below are three factors numbered I thru III which influence the selection of parallel parking at curbs instead of a 60° angle parking at curbs. In which one of the following is the influence of all three factors stated correctly?

	<u>I. Accident Hazard</u>	<u>II. Hindrance to Traffic</u>	<u>III. No. Of Parked Cars Accommodated</u>
A.	Greater	Less	Greater
B.	Less	About same	Greater
C.	About same	Greater	Greater
D.	Less	Less	Less

Ans. D

Pavement grooving is least likely to be effective when applied at which of the following sections of roadway?

- A. Upgrade
- B. Downgrade
- C. Curve
- D. Intersection

Ans. A

Which one of the following is the main factor for reflectorized highway signs appearing to be luminous to an approaching driver at night?

- A. Reflected light from the vehicles own headlights back to the vehicle
- B. The use of materials which store light energy received in daylight for slow release at night
- C. Low voltage electrical potential between inner and outer layers sign material causing a glow bright enough to be seen at night
- D. The use of super bright pigments in sign paint

Ans. A

Reflex or retrodirective reflection is a significant characteristic of which one of the following traffic devices?

- A. Pavement markings & signs, but not signals
- B. Pavement markings, signs, and signals
- C. Pavement markings & signals but not signs
- D. Signs and signals but not pavement markings

Ans. A

The sight distance standard for no-passing markings to be used on a highway is based on which of the following speeds?

- A. Statutory speed limit
- B. 85th percentile speed
- C. 10 mile pace

Ans. B

Minimum distance from the edge of road to a fixed object, according to Federal Standards for 55 mph is?

- A. 8'
- B. 12'
- C. 30'
- D. 25'

Ans. C

When adding an extra lane on a two-way two-lane highway, the best area for it to be put is?

- A. On a long steep hill extending beyond the vertical curve on crest
- B. On a long steep hill ending 150' before the crest
- C. On a long steep hill ending at the crest
- D. On a long steep hill ending between the crest and PVT
- E. None of the above

Ans. A

Which of the following best describes the primary function of traffic signs?

- A. Promote the elimination of road hazards
- B. Promote the safe and efficient movement of traffic

- C. Promote public self enforcement of regulations
- D. To insure that the legal obligations of NYS have been fulfilled

Ans. B

In order to determine the effect of trucks and buses on capacity, which of the following is the most important to know?

- A. % grade
- B. Length of grade
- C. Highway speed
- D. Passenger-car vehicle equivalency

Ans. D

Which of the following describes the greatest number of items ordinarily placed on a directional sign?

Ans. One direction and the names of two destinations

Two curves in opposite directions are separated by a 350' tangent. The recommended speed of the first curve was found to be 20 mph, that of the second was found to be 25 mph. Which of the following would be the minimum signing for these curves?

Ans. Reverse turn and 20 mph stated speed sign

On which of the following roads can a stop sign be used at on Highway Railroad crossing?

- A. On a state road only
- B. On county roads with the county officials permission
- C. On Interstate expressway
- D. On any road if approved by the Commissioner of the DOT

Ans. D

Why is 176' chosen as the distance when measuring spot speed?

- A. Because this is the maximum distance for which vehicles can maintain constant speed
- B. Because such distance is best to eliminate the effect of parallax
- C. Because this is the distance which minimizes observational error
- D. For computational ease (ft/sec to miles per hour)

Ans. D

What is the Ball Bank indicator used for?

- A. Measure speed
- B. Measure friction in the longitudinal direction
- C. Measure wind speed
- D. To determine the safe speed on a horizontal curve

Ans. D

What is the time base for counts when computing the peak hour factor for an intersection?

- A. 5 min.
- B. 12 min. Note: For intersection $PHF = (\text{Highest count in 15 min.}) / 4$
- C. 15 min. Peak Hour Factor, PHF Count in the hour in which the
- D. 1 hour highest 15 min. count was made

Ans. C

What is the time base for counts when computing the Peak Hour Factor for freeways?

- A. 5 min.
- B. 12 min.
- C. 15 min.
- D. 1 hour

Ans. C

What is spot average speed?

Ans. The average of all vehicles speed passing a given short location (See capacity manual, pg. 15)

What is spot speed?

Ans. The speed of a vehicle as it passes a given location

A traffic signal is located along a highway with a 50 mph speed limit. The signal indications should be visible should be visible to approaching motorists for a distance of?

- A. 400'
- B. 550'
- C. 625'
- D. 230'

Ans. B

Of the following, which describes a loaded cycle at an intersection?

Ans. All cycles that are completely utilized by traffic

What is the length of tractor trailer combination allowed on NYS highways?

- A. 30'
- B. 65'
- C. 60'
- D. 90'

Ans. B

Which is the maximum length of single unit vehicles allowed by law on NYS roads?

- A. 30'
- B. 40'
- C. 50'
- D. 55'

Ans. B

Distribution of vehicles leaving intersection is:

- A. Normal
- B. Poisson
- C. Chi-square
- D. Negative exponential

Ans. B

Which of the following would be given in black on yellow background?

- A. No stopping
- B. Curve warning sign
- C. No parking
- D. Stop

Ans. B

Which are the most important parameters to specify when ordering pre-timed signals for a progression system?

- A. Cycle length and offset
- B. Phase length and offset

Ans. A

Which three of the following four factors should be considered in determining the length of an exit ramp?

1. Speed at which traffic exits
2. Speed at which traffic turns at end of ramp
3. Deceleration factor
4. Speed of merging

- A. 1, 2, 3, but not 4
- B. 1, 2, 4, but not 3
- C. 1, 3, 4, but not 2
- D. 2, 3, 4, but not 1

Ans. A

Two expressways intersect now at-grade. Because of traffic growth it has been decided to build an interchange to replace the at-grade intersection. You have been assigned to make the necessary counts. Where and when would you take counts?

- A. 24 hour traffic counts on both expressways and manual turning counts during peak hours
- B. Take counts on expressways on weekends
- C. Take counts on surrounding roads during week
- D. Take counts on surrounding roads on weekends

Ans. A

Which of the following legends would be found on a regulatory sign

- A. Detour
- B. Truck crossing
- C. Divided highway
- D. Do not enter

Ans. D

Which of the following are considered warrants for a traffic light at an at-grade intersection?

1. Speed
2. Accident experience
3. Progressive movement
4. Minimum vehicular volume
5. Minimum pedestrian volume

- A. All of the above
- B. 1, 2, 3, 4, but not 5

- C. 2, 3, 4, 5, but not 1
- D. 1, 2, 3, but not 4 & 5

Ans. C

Which of the following is the most important factor to consider when determining the length of a vertical curve for a 4-lane divided highway?

- A. Passing sight distance
- B. Stopping sight distance
- C. Rider's comfort
- C. Braking distance

Ans. B

On the freeway, traffic is stop & go with long delays, what is the level of service?

- A. A
- B. C
- C. F
- D. E

Ans. C

Which of the following classifications are used in determining the width of roadways in intersection design?

- 1. One-lane, one-way operation - no provision for passing
 - 2. One-lane, one-way operation - with provision for passing a stalled vehicle
 - 3. Two-lane operation - either one-way or two-way
 - 4. Two-lane operation - either one-way or two-way with provision to pass a stalled vehicle
-
- A. 1, 2, 3 not 4
 - B. 1, 2, 4, not 3
 - C. 1, 3, 4, not 2
 - D. 2, 3, 4, not 1

Ans. A

Which of the following will result from the proper utilization of Median Barriers?

- A. Reduction of accidents
- B. Reduction of severe accidents
- C. Deflection of vehicles back onto roadway
- D. Reduction of single vehicle accidents

Ans. B

Which of the following is the generally accepted method of reducing the number of lanes?

- A. Have the extra lane become the exit lane
- B. Terminate the lane after the interchange
- C. Terminate the lane immediately before the next interchange
- D. Terminate in advance of the interchange with proper signing

Ans. B

Which of the following warrants are used to determine the need for guide rail?

- 1. Design speed
- 2. Height of the drop off compared to the slope
- 3. Distance to fixed objects
- 4. Distance to roadside obstacles
- 5. Deflection of the guide rail

- A. 1, 2, 3
- B. 2, 3, 5
- C. 2, 3, 4
- D. 1, 4, 5

Ans. C

The term clearance interval as related to traffic signals is best described as?

- A. The length of time the green signal is on
- B. The length of time the yellow signal is on
- C. The length of time the red signal is on
- D. The length of time a vehicle needs to cross the intersection

Ans. D

What are the warrants for signing an isolated curve on a highway in NYS?

- A. A curve sign should always be posted if the curve is tighter than 3°
- B. The curve sign may be eliminated if the recommended speed exceeds by more than 10 mph, the legal limit, or the 85th percentile speed on the approach to the curve
- C. The curve sign may be eliminated if the recommended speed is equal to the legal speed limit
- D. The curve sign may be eliminated if requested by local authorities and the accident records show no accidents for the last three years

Ans. B

Which one of the groups below contains four traffic signal indications permitted by the NYS Vehicle and Traffic Law?

- A. Flashing Walk, Flashing Don't Walk, Yellow Arrow, Flashing Red Arrow
- B. Red Arrow, Flashing Walk, Flashing Don't Walk, Yellow Arrow
- C. Green Arrow, Yellow Arrow, Flashing Yellow Arrow, Flashing Don't Walk
- D. Green Arrow, Flashing Don't Walk, Flashing Wait, Red Arrow

Ans. B

In the current concepts of highway capacity, the level of service of a highway is best stated by which of the following?

- A. It is low when driver maneuverability is low
- B. It is based on a design speed exclusive of operating conditions
- C. It has no relation with operating speed
- D. It increases with an increase in the volume to capacity ratio

Ans. A

One of the main arguments for controlling access to highways is that such control will prevent?

- A. Damage to pavement
- B. Damage to shoulders
- C. Accidents caused by excessive speed
- D. Reduction of capacity of the highway

Ans. D

Which three of four are most desirable for right hand freeway exit ramp design?

- 1. Mainline curve right, ramp downgrade
 - 2. Mainline curve left, ramp downgrade
 - 3. Mainline curve right, ramp upgrade
 - 4. Mainline tangent with ramp on upgrade
-
- A. 1, 2, 3, not 4
 - B. 1, 2, 4, not 3
 - C. 1, 3, 4, not 2
 - D. 2, 3, 4, not 1

Ans. C

Which of the following determines the minimum horizontal and vertical curvature?

- A. Sight distance
- B. Degree of superelevation
- C. Design speed
- D. No. of lanes

Ans. A

A four lane arterial highway is congested during rush hours. There are parking lanes on both sides and cross streets. There is 10% bus and truck traffic. What is the most economical method to reduce congestion?

- A. Increase green time on arterial
- B. Eliminate parking during peak hours
- C. Reconstruct to add left turn lanes and bus turnouts
- D. Reconstruct highway to 6 lanes with parking

Ans. B

In 1978, FHWA issued Federal Aid Highway Program Manual 6-4-2-12 requiring Traffic Control Plan (TCP) to be developed and put into effect for controlling traffic during construction of a highway project. Which combination of the following accurately reflects the requirements and scope of TCP?

- 1. Degree of detail TCP depends upon project complexity
 - 2. TCP developed for all projects; consistent with Part 4 of MUTCD
 - 3. Scope of TCP is determined during planning and design phases
 - 4. Contractor can develop his own TCP if the highway agency and FHWA agree, and it is as good as the one in the PS&E
- A. All but 4
 - B. All but 3
 - C. All but 2
 - D. All but 1

Ans. B

AASHTO (green) recommends that sharp horizontal curves should not be introduced at or near a pronounced crest of vertical curve. If this arises and cannot be entirely avoided, what should you do?

- A. Horizontal curve lead the vertical curve
- B. Vertical curve longer than horizontal curve
- C. Vertical curve superimposed on horizontal curve

D. Insure that warning signs are incorporated in the design plan

Ans. A

Records show that many accidents occur at gores due to impacts with existing sign structures located in the gore area. What is the best way to prevent such accidents?

- A. Place guide rail in front of sign
- B. Install a slip impact base on sign and place behind guide rail
- C. Remove sign from gore, pave over gore, and install overhead sign structure across expressway and ramp lanes

Ans. C

Which is the most restrictive traffic sign?

- A. No stopping
- B. No standing
- C. No parking
- D. Bus stop

Ans. A

An automobile moving 30 mph is moving most nearly?

- A. 30' per second
- B. 35' per second
- C. 40' per second
- D. 45' per second

Ans. D

A car starting from rest accelerates at the rate of $8'/\text{sec}^2$. At the end of 6 seconds, the car will have traveled a distance equal to:

- A. 144'
 - B. 136'
 - D. 120'
 - D. 94'
- $$S = \frac{at^2}{2}$$

Ans. A

A car starting from rest accelerates at the rate of $10'/\text{sec}^2$. At the end of 6 seconds, the car will have traveled a distance equal to?

- A. 322'
 - B. 180'
- $$S = \frac{at^2}{2}$$

- C. 155
 - D. 60'
- 2

Ans. B

The time it takes for a driver to perceive a problem and to begin braking is called the perception and reaction time. This time is normally assumed to be?

- A. $\frac{1}{2}$ sec.
- B. 2.5 sec.
- C. 5 sec.
- D. 10 sec.

Ans. B

What are the primary advantages of a frontage road?

- A. Provides local circulation and economical land use
- B. Low cost and prevents driveway access to through road
- C. Low cost and economical land use
- D. Provides local circulation and prevents driveway access to main road

Ans. D

If a car is traveling 50 mph then a sight distance of 400' is sufficient for what?

- A. To pass a slower vehicle
- B. To stop before hitting an object in the road
- C. To see an exit
- D. None of the above

Ans. B

What is the range of maximum grades for private and commercial driveways coming into a state highway?

- A. 3% to 10%
- B. 3% to 12%
- C. 6% to 10%
- D. 6% to 12%

Ans. D

What is the length of taper for a lane drop?

- A. 1500'
- B. 10 x design speed
- C. Lane width x design speed
- D. 500'

Ans. C

TEMPORARY MAINTENANCE AND PROTECTION OF TRAFFIC

Principles of Traffic Control

1. Temporary traffic control is an integral and high priority element of projects from the design through construction stages.
2. Traffic movement should be inhibited as little as possible.
3. Guidance is to be clear and positive while approaching and traversing lane closure.
4. Inspections are to be held on a regular basis.
5. Maintenance of devices is to be held on a regular basis.
6. All project personnel are to receive appropriate training.
7. M&PT is an essential part of all our projects.

8. Good public relations is extremely important.

Basic Purposes of Traffic Control Devices

1. Fulfill a need -- use them only when required.
2. Command attention - meet standards established in the NYS MUTCD* (Ref. Source #3).
3. Convey clear, simple meaning -- let's not further confuse the issue.
4. Adequate response time -- remember traveling at 60 mph you cover a mile in a minute.

Points To Consider Before Developing An M&PT Plan

1. How long will the lane be closed?
2. What type of work is to be done?
3. Will the work occur during the day or night?
4. Weather
5. Traffic speed and volume
6. Type of roadway

Areas Within The Traffic Control Area

1. Advanced Warning -- series of signs informing motorists what to expect
2. Transition -- moving traffic from its normal flow path, normally by use of taper

- L = Length of taper
W = Width of lane closure
S = Speed limit; actual not work zone reduction

LANE CLOSURES

- Speed limit > 40 mph $L = W \times S$
Speed limit \leq 40 mph $L = W \times (S \times S) / 60$

SHOULDER CLOSURES

1/3 L as arrived by using the Lane Closure Formulas

LANE SHIFTS

1/2 L as arrived by using the Lane Closure Formulas

***REMEMBER THESE ARE MINIMUMS
TRAFFIC VOLUME AND SPEED MAY NECESSITATE LONGER TAPER LENGTHS***

3. Buffer - Safety zone in which nothing is placed with the possible exception of an attenuator. This area begins at the end of the transition area and ends at the actual work area. Suggested lengths of this area are:*

30 mph 85 ft.	50 mph 280 ft.
40 mph 170 ft.	55 mph 335 ft.

4. Work area - Remember this area consists of two parts: the area in which we are working and the area directly adjacent to us in which the traveling public is moving.
5. Termination -- used to return traffic to its normal path

QUESTIONS TO CONSIDER

What is the minimum mounting heights for signs?

5'

What is the minimum cone height for roads with speeds > 40 mph?

28"

Which way do the stripes on vertical panels point?

Down towards the side on which traffic is to proceed

Steady burn warning lights are used for what purpose?

Nighttime channelization

When are flashing arrow boards used?

Day or night for lane closures on multi-lane highways

When is the "bar mode" acceptable for use on an arrow board?

It is not

How many arrow boards are used per lane closure?

One per lane to be closed

What is the taper length for closing a 12 ft. lane in a 55 mph zone?
660' (L)

What is the taper length for closing a shoulder in this same area?
220' (Y3L)

What is the taper length for closing an 11 ft. Lane in a 40 mph zone?
295' (L)

What is the proper size and color of a flag used by a flagger?
24" x 24" - red

What is the suggested buffer area length for a 55 mph zone?
335'

Is it permissible to close two lanes with one taper?
No -- two tapers with an intermediate recovery area

As a minimum, what should be checked on an arrow board at night?
Alignment and proper dimming of bulbs

What is the prime advantage of providing a 12' shoulder on a highway?
Provide adequate room for disabled vehicle to get completely off pavement

According to AASHO, what is the major controlling factor of accidents?
Control of access

A car going 20 mph requires 40' to stop. What would be the stopping distance for a car going 40 mph?
160 ft.

What is the maximum allowable axial load?
22,400 pounds

In a "No Standing" zone, what of the following is permitted?
Loading and unloading of passengers

At an intersection, a divided highway is considered as two separate roads when they are how far apart?
30 ft.

The worse place for a heavy fixed object is?

Outside of a horizontal curve

A full barrier is?

Two solid yellow lines on the pavement -- defines a no passing zone

A full bank indicator is used to?

Determine the posting speed of a curve