COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
Bureau of Highway Safety and Traffic Engineering

OFFICIAL TRAFFIC CONTROL DEVICES

Publication 212

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PREAMBLE

The Department of Transportation (Department) publishes Chapter 212 (relating to official traffic-control devices under the authority of 75 Pa.C.S. §§ 3353, 3354, 6103, 6105, 6121, 6122, 6123 and 6123.1.

The purpose of Chapter 212 is to adopt the National MUTCD, to establish new regulations regarding additional study requirements, warrants, principles and guidelines not included in the MUTCD; and to establish greater uniformity for the design, location and operation of all official traffic signs, signals, markings and other traffic-control devices within this Commonwealth.

With the promulgation of Chapter 212, the most recent edition of the National MUTCD, published by the FHWA, is the standard for traffic control in this Commonwealth. As provided in 75 Pa.C.S. §§ 6103(c) and 6121 (relating to promulgation of rules and regulations by department; and uniform system of traffic-control devices).

Chapter 212 was published at 34 Pa.B. 4712 (August 28, 2004) and the public was invited to submit comments. The proposed rulemaking was also submitted to the Independent Regulatory Review Commission (IRRC) and to the House and Senate Transportation Committees. Comments were received from IRRC and from the public.

Under section 5(c) of the Regulatory Review Act, IRRC and the Committees were provided with copies of the comments received during the public comment period, as well as other documents when requested. In preparing the Chapter 212, the Department has considered all comments from IRRC, the House and Senate Committees and the public.

A separate comment and response document was prepared to address these comments and is available upon request. Several commentators expressed concern that Chapter 212 would require local municipalities to be responsible for the installation and maintenance of stop signs, stop ahead signs and other traffic controls on State highways where they intersect with local roads. As explained more fully in the response document, it is the intention of Chapter 212 to clarify local responsibility for stop signs and stop ahead signs on local road approaches where they intersect with State highways. The Department will retain responsibility for the installation and maintenance of these signs and other traffic controls on State highways, except as specifically provided for in Chapter 212.

Under section 5.1(j.2) of the Regulatory Review Act (71 P. S. § 745.5a(j.2)), on December 14, 2005, the Chapter 212 was deemed approved by the House and Senate Committees. Under section 5.1(e) of the Regulatory Review Act, IRRC met on December 15, 2005, and approved Chapter 212.

For questions regarding this Publication, contact the Bureau of Highway Safety and Traffic Engineering by mail at; 400 North Street, 6th Floor, Harrisburg, PA 17120-0064 or by telephone at (717) 787-3620.

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BUREAU OF HIGHWAY SAFETY & TRAFFIC ENGINEERING
CHAPTER 212. OFFICIAL TRAFFIC CONTROL DEVICES

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Subchapter A.

GENERAL PROVISIONS

§ 212.1. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

ADT--Average daily traffic--The total volume of traffic during a number of whole days--more than 1 day and less than 1 year--divided by the number of days in that period.

Active work zone--The portion of a work zone where construction, maintenance or utility workers are on the roadway or on the shoulder of the highway, and workers are adjacent to an active travel lane. Workers are not considered adjacent to an open travel lane if they are protected by a traffic barrier and no ingress or egress to the work zone exists through an opening in the traffic barrier.

Advisory speed--The recommended speed for vehicles operating on a section of highway based on the highway design, operating characteristics and conditions. When posted, the speed is displayed as a warning sign; that is, either a black-on-yellow or a black-on-orange sign.

Angle parking--Parking, other than parallel parking, which is designed and designated so that the longitudinal axis of the vehicle is not parallel with the edge of the roadway.

Assemblage--

(i) An organized gathering of people without vehicles, or with vehicles that are stationary, which encroaches onto a street or highway and interferes with the movement of pedestrian or vehicular traffic.

(ii) The term includes street fairs, block parties and other recreational events.

Bureau--The Bureau of Highway Safety and Traffic Engineering, which is the office of the Department responsible for traffic regulations and statewide policies regarding traffic-control devices.

City of the first and second class--A city so classified in accordance with section 1 the act of June 25, 1895 (P. L. 275, No. 188) (53 P. S. § 101), known as the City Classification Law.

Conventional highway--A highway other than an expressway or a freeway.

Corner sight distance--

(i) *Available corner sight distance*--The maximum measured distance along a crossing highway which a driver stopped at a side road or driveway along that highway can continuously see another vehicle approaching. For the purpose of measuring the available sight distance, the height of both the driver's eye and the approaching vehicle should be assumed to be 3.5 feet above the road surface. In addition, the driver's eye should be assumed to be 10 feet back from the near edge of the highway or the near edge of the closest travel lane if parking is permitted along the highway.

(ii) *Minimum corner sight distance*--The minimum required corner sight distance based on engineering and traffic studies, to ensure the safe operation of an intersection. The minimum value is a function of the speed of the approaching vehicles and the prevailing geometrics.

Crash--

(i) A collision involving one or more vehicles.

(ii) Unless the context clearly indicates otherwise, the term only includes those collisions that require a police report; that is, the collision involves one of the following:

(A) Injury to or death of any person.

(B) Damage to any vehicle involved to the extent that it cannot be driven under its own power in its customary manner without further damage or hazard to the vehicle, to other traffic elements, or to the roadway, and therefore requires towing.

Department--The Department of Transportation of the Commonwealth.

Delineator--A retroreflective device mounted on the road surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.

Divided highway--A highway divided into two or more roadways and so constructed as to impede vehicular traffic between the roadways by providing an intervening space, physical barrier or clearly indicated dividing section.

85th percentile speed--The speed on a roadway at or below which 85% of the motor vehicles travel.

Engineering and traffic study--An orderly examination or analysis of physical features and traffic conditions on or along a highway, conducted in accordance with this chapter for the purpose of ascertaining the need or lack of need of specific traffic restrictions, and the application of traffic-control devices.

Expressway--A divided arterial highway for through traffic with partial control of access and generally with grade separations at major intersections.

Freeway--A limited access highway to which the only means of ingress and egress is by interchange ramps.

Grade--The up or down slope in the longitudinal direction of the highway, expressed in percent, which is the number of units of change in elevation per 100 units of horizontal distance. An upward slope is a positive grade; a downward slope is a negative grade.

Highway--

(i) The entire width between the boundary lines of every way publicly maintained when any part thereof is open to the use of the public for purposes of vehicular travel.

(ii) The term includes a roadway open to the use of the public for vehicular travel on grounds of a college or university, or public or private school, or public or historical park.

Local authorities--

(i) County, municipal and other local boards or bodies having authority to enact regulations relating to traffic.

(ii) The term includes airport authorities except when those authorities are within counties of the first class or counties of the second class.

(iii) The term also includes State agencies, boards and commissions other than the Department, and governing bodies of colleges, universities, public and private schools, public and historical parks.

MUTCD--The current edition of the Manual on Uniform Traffic Control Devices, as adopted by the Federal Highway Administration (FHWA), and available on the FHWA website.

Narrow bridge or underpass--A bridge, culvert or underpass with a two-way roadway clearance width of 16 to 18 feet, or any bridge, culvert or underpass having a roadway clearance less than the width of the approach travel lanes.

Night or nighttime--The time from 1/2 hour after sunset to 1/2 hour before sunrise.

Normal speed limit--The regulatory speed limit or the 85th percentile speed that existed before temporary traffic control was established, for example, prior to the beginning of a work zone.

Numbered traffic route--A highway that has been assigned an Interstate, United States or Pennsylvania route number, consisting of one, two, or three digits, sometimes with an additional designation such as business route, truck route or other similar designation.

Private parking lot--A privately owned parking lot open to the public for parking with or without restriction or charge.

Procession--

(i) An organized group of individuals, or individuals with vehicles, animals or objects, moving along a highway on the roadway, berm or shoulder in a manner that interferes with the normal movement of traffic.

(ii) The term includes walks, runs, parades and marches.

Retroreflective sheeting--

(1) Material which allows a large portion of the light coming from a point source to be returned directly back to a location near its origin, and is used to enhance the nighttime reflectivity of traffic control signs, delineators, barricades and other devices.

(ii) The term includes materials with nonexposed glass bead lens and microprismatic retroreflective sheeting.

Roadway--That portion of a highway improved, designed or ordinarily used for vehicular travel, exclusive of the sidewalk, berm or shoulder. If a highway includes two or more separate roadways, the term refers to each roadway separately but not to all roadways collectively.

Safe-running speed--The average speed for a portion of highway determined by making a minimum of five test runs while periodically recording the speed at different locations while driving at a speed which is reasonable and prudent, giving consideration to the available corner and stopping sight distance, spacing of intersections, roadside development and other conditions.

Sales Store--The Department facility that sells maps and publications.

School--A public, private or parochial facility for the education of students in grades kindergarten through 12.

School zone--A portion of a highway that at least partially abuts a school property or extends beyond the school property line that is used by students to walk to or from school or to or from a school bus pick-up or drop-off location at a school.

Secretary--The Secretary of the Department.

Special activity--

(i) An organized vehicle race, speed competition or contest, drag race or acceleration contest, test of physical endurance, exhibition of speed or acceleration, or any other type of event conducted for the purpose of making a speed record.

(ii) The term includes those races defined in 75 Pa.C.S. § 3367 (relating to racing on highways).

State-designated highway--A highway or bridge on the system of highways and bridges over which the Department has assumed or has been legislatively given jurisdiction.

Stopping sight distance--The length of highway over which a 2-foot high object on the roadway is continuously visible to the driver, with the driver's eye height assumed to be 3.5 feet above the road surface.

TTC--Temporary traffic control--An area of a highway where road user conditions are changed because of a work zone or incident by use of temporary traffic-control devices, flaggers, police officers or other authorized personnel.

TTC plan--A plan for maintaining traffic through or around a work zone.

Through highway--

(i) A highway or portion of a highway on which vehicular traffic is given preferential right-of-way, and at the entrances to which vehicular traffic from intersecting highways is required by law to yield the right-of-way in obedience to a Stop Sign (R1-1), Yield Sign (R1-2) or other traffic-control device when the signs or devices are erected as provided in this chapter.

(ii) The term includes all expressways and freeways.

Traffic Calming--The combination of primarily physical measures taken to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for nonmotorized street users. The primary objectives of traffic calming measures are to reduce speeding and to reduce the volume of cut-through traffic on neighborhood streets.

Traffic-control devices--Signs, signals, markings and devices consistent with this chapter placed or erected by authority of a public body or official having jurisdiction, for the purpose of regulating, warning or guiding traffic.

Traffic restriction--A restriction designated by a traffic-control device to regulate the speed, direction, movement, placement or kind of traffic using any highway.

Traffic signal--

(i) A power-operated traffic-control device other than a sign, warning light, flashing arrow panel or steady-burn electric lamp.

(ii) The term includes traffic-control signals, pedestrian signals, beacons, in-roadway warning lights, lane-use-control signals, movable bridge signals, emergency traffic signals, firehouse warning devices, ramp and highway metering signals and weigh station signals.

Travel lane--

(i) A lane of a highway which is used for travel by vehicles.

(ii) A lane in which parking is permitted during off-peak hours but is restricted for use as a travel lane during peak hours to obtain greater traffic movement.

Warrant--A description of the threshold conditions to be used in evaluating the potential safety and operational benefits of traffic-control devices based upon average or normal conditions.

Work zone--The area of a highway where construction, maintenance or utility work activities are being conducted, and in which traffic-control devices are required in accordance with this chapter.

§ 212.2. Adoption of Federal standards.

(a) *General provisions*. Consistent with the authority contained in 75 Pa.C.S. §§ 6103(c) and 6121 (relating to promulgation of rules and regulations by the Department; and uniform system of traffic-control devices), the Department hereby adopts the MUTCD, as published by the Federal Highway Administration. The MUTCD is adopted in its totality except where this chapter clearly indicates that it is not being adopted, or that additional warrants or criteria are being provided.

(b) *Modification of Federal statutes, regulations or provisions*. As provided in 75 Pa.C.S. § 6103(d), if the MUTCD is amended or modified by the Federal Highway Administration, the amendment will take effect on the effective date specified by the Federal Highway Administration unless the Department publishes a notice in the *Pennsylvania Bulletin* stating that the amendment or modification will not apply.

§ 212.3. Pennsylvania's Supplement to the MUTCD.

The Department will publish this chapter as a supplement to the MUTCD. This publication will be called *Official Traffic Control Devices* (Department Publication 212), and will include an appendix with additional guidance information, including the following:

(1) How to determine various elements associated with engineering and traffic studies.

(2) How to obtain crash rates for various types of roads.

(3) How to measure the various types of sight distance.

(4) Where National study data is located.

§ 212.4. Application.

(a) *General*. This chapter applies to the approval, location, installation, revision, operation, maintenance and removal of all traffic signs, signals, markings and other traffic-control devices on all streets and highways in this Commonwealth. All signs, signals, markings and other traffic-control devices erected shall conform to this chapter. Traffic restrictions, which were posted or erected prior to February 4, 2006, in accordance with any regulations in effect at that time, are not subject to this chapter.

(b) *New restrictions*. Except as noted in §§ 212.109 and 212.117 (relating to bridge speed limits; and weight, size and load restrictions), engineering and traffic studies can be performed by police officers, roadmasters, maintenance supervisors or traffic technicians. The establishment or revision of a traffic restriction may be warranted if one of the following applies:

(1) One or more of the engineering and traffic study warrants covered in this chapter justifies the traffic restriction.

(2) Sound engineering judgment based upon a combination of all data sources substantiates the need for the restriction.

(c) *Removal of an existing restriction*. The removal of an existing traffic restriction may be warranted if one of the following applies:

(1) A study indicates that none of the engineering and traffic study warrants covered in this chapter justify the existing traffic restriction.

(2) The condition that originally justified the restriction no longer exists.

(d) *Warrants no substitute for engineering judgment*. Warrants established under this chapter provide the threshold for consideration of the installation of a traffic-control device, but are not a substitute for engineering judgment. The fact that a warrant for a particular traffic-control device is met is not conclusive justification for the installation of the device.

(e) *Traffic-control during emergencies*. During National, State or local emergencies including floods, fires, hurricanes, tornadoes, earthquakes, terrorist events, sink holes and bridge collapses, the Department on State-designated highways and local authorities on highways under their jurisdiction may suspend existing restrictions or effect temporary restrictions without an engineering and traffic study as provided in 75 Pa.C.S. §§ 6108 and 6109(a)(20) (relating to power of Governor during emergency; and specific powers of department and local authorities). These temporary restrictions expire at the end of the emergency.

(f) *Highway construction projects*. The standards in this chapter apply to all highway construction projects that do not have design field view approval before January 1, 2006, and all highway construction projects that have plans, specifications and estimate (PS&E) packages submitted to the Department's Bureau of Design on or after July 1, 2006. Highway construction projects that have design field view approval before January 1, 2006, and PS&E packages submitted to the Department's Bureau of Design before July 1, 2006, must comply with the standards applicable at the time of design. Those standards may be found in Department Publications 68, *Official Traffic Control Devices*, 1975 Edition, 201M, *Engineering and Traffic Studies*, dated December 1993, and 203M, *Work Zone Traffic Control*, dated September 24, 2002.

(g) *Highway occupancy permits and utility work*.

(1) The standards in this chapter are applicable to all utility work and work performed under a highway occupancy permit, except that work performed under a highway occupancy permit or utility work requiring a permit, with the permit issued before January 1, 2006, must comply with the standards applicable at the time the permit was issued. Those standards may be found in Department Publications 68, *Official Traffic Control Devices*, 1975 Edition, 201M, *Engineering and Traffic Studies*, dated December 1993, and 203M, *Work Zone Traffic Control*, dated September 24, 2002.

(2) The standards in this chapter apply to all utility work performed on or after January 1, 2006, using an emergency permit card under § 459.6 (relating to emergency work).

§ 212.5. Installation and maintenance responsibilities.

(a) *Authority to erect traffic-control devices*. The delegation of responsibilities for the installation and maintenance of traffic-control devices is in accordance with 75 Pa.C.S. §§ 6122 and 6124 (relating to authority to erect traffic-control devices; and erection of traffic-control devices at intersections).

(b) *Traffic-control devices on State-designated highways.*

(1) *Conventional highways.*

(i) Local authorities may not revise or remove any traffic-control device installed by the Department or by a contractor for the Department without written approval of the Department.

(ii) Cities of the first and second class are responsible for the installation, revision, removal, maintenance and operation of all traffic-control devices on the highways within their city boundaries. Department approval is not required, except as follows:

(A) As may be required in an agreement between the city and the Department.

(B) Department approval is required for traffic signals if the city does not have municipal traffic engineering certification in accordance with Chapter 205 (relating to municipal traffic engineering certification).

(iii) Local authorities other than cities of the first and second class shall obtain written Department approval before installing any new, or revising or removing any existing traffic-control device unless noted otherwise in this chapter or as provided in an agreement with the Department.

(iv) Local authorities may install, revise or remove the following devices, and Department approval is not required:

(A) Stopping, standing or parking signs (R7 and R8 Series).

(B) Street name signs (D3 Series).

(C) Crosswalk markings at intersections.

(D) Parking stall markings, except written Department approval is required prior to creating new angle parking.

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(E) Curb markings

(F) Parking meters.

(v) Local authorities, or other agencies as indicated, are responsible for installing, maintaining and operating the following traffic-control devices, subject to Department approval prior to any change in the traffic restriction:

(A) Traffic signals, and all associated signs and markings included on the Department-approved traffic signal plan.

(B) Speed Limit Signs (R2-1) for speed limits of 35 miles per hour or less. The Department will be responsible for all hazardous grade speed limits and bridge speed limits, and for all speed limits at Department rest areas, welcome centers and weigh stations.

(C) Stop lines and yield lines at intersections.

(D) Pedestrian group signs (R9 Series).

(E) Traffic signal group signs (R10 Series).

(F) Street Closed (____) to (____) Sign (R11-10).

(G) Snowmobile Road (____) Closed to All Other Vehicles Sign (R11-11).

(H) All Trucks Must Enter Weigh Station Sign (R13-1-1) and Weigh Station signs (D8 Series) for weigh stations not owned or operated by the Department.

(I) Railroad Crossbuck Sign (R15-1), Track Sign (R15-2), Emergency Notification Sign (I-13a), and other signs, gates, or lights that are within the railroad company's right-of-way, shall be installed by the railroad company.

(J) Signal Ahead Sign (W3-3).

(K) Entrance and crossing signs (W11 Series), which warn of possible crossings by pedestrians, hikers, cattle, farm equipment, ATVs, fire apparatus, and so forth, except the Deer Crossing Sign (W11-3), Elk Crossing Sign (W11-3A), Horsedrawn Vehicle Sign (W11-11), Left Turns and Cross Traffic Sign (W11-21), Left Turns Sign (W11-21-1) and Watch for Turns Sign (W11-21-2) will be the responsibility of the Department.

(L) Children group signs (W15 Series).

(M) Parking Area Sign (D4-1).

(N) Telephone directional signs (D9-1 series), which shall be installed by the telephone company.

(O) Bicycle Route Sign (D11-1).

(P) Traffic Signal Speed Sign (I1-1).

(Q) Trail group signs (I4 Series).

(R) Snowmobile and all terrain vehicles group signs (I12 Series).

(S) School zone speed limits, and all school signs (S Series).

(T) Pavement markings for mid-block crosswalks.

(U) Pavement markings for bicycles such as the bicycle lane symbol.

(2) *Expressways and freeways*. Local authorities may not install, revise or remove traffic-control devices on an expressway or freeway or at an intersection with an expressway or freeway without written Department approval, unless noted otherwise in this chapter.

(c) *Traffic-control devices on local highways*. As provided in 75 Pa.C.S. § 6122, local authorities are responsible for the installation, revision, maintenance, operation and removal of any traffic-control device on highways under their jurisdictions, except local authorities shall obtain written Department approval for the following two items:

(1) Installing, revising or removing any school zone speed limit or traffic signal as indicated in 75 Pa.C.S. § 3365(b) (relating to special speed limitations) and § 6122(a)(2), respectively, except Department approval is not required for cities of the first and second class, and other local authorities that have municipal traffic engineering certification in accordance with Chapter 205.

(2) Revising or removing a traffic-control device installed in accordance with an agreement between the local authorities and the Department.

(d) *Traffic-control devices on local highway approaches to intersections with State-designated highways.*

(1) The Department is responsible for approving the traffic control at intersections of local highways and State-designated highways, including the local highway approaches.

(2) At new intersections, the permittee is responsible for installing traffic-control devices on local highway approaches as required by an approved highway occupancy permit issued in accordance with Chapter 441 (relating to access to and occupancy of highways by driveways and local roads).

(3) At existing intersections, local authorities or permittees are responsible to install, remove and maintain traffic-control devices as required to control traffic on the local highway approaches, including replacement or repair of missing, damaged, blocked or outdated devices in need of upgrade.

(i) Traffic-control devices to be maintained on local roadways include the following, as applicable:

(A) Stop Signs (R1-1) and Yield Signs (R1-2).

(B) Stop lines and yield lines.

(C) No Right Turn Signs (R3-1), No Left Turn Signs (R3-2), No Turns Signs (R3-3), Left Turn Signs (R3-5), Left Lane Must Turn Left Signs (R3-7L), One-Way Signs (R6 Series) and other similar type traffic restriction, prohibitions or lane control signs.

(ii) Local authorities or permittees shall obtain written Department approval before implementing any revised traffic-control scheme at the intersection.

(4) The Department may take appropriate action if it deems it necessary to carry out the maintenance responsibility of a local authority or permittee because of failure or inability to act in a timely manner.

(5) Local authorities are responsible to determine the need for any Stop Ahead Signs (W3-1) and Yield Ahead Signs (W3-2) on local highway approaches to State-designated highways, and for installing and maintaining any warranted signs.

(e) *Police authority*. Police officers may install temporary traffic-control devices on any highway without approval from the Department or the local authorities. These traffic-control devices may be used to close highways during emergencies, to weigh or inspect vehicles, to establish sobriety checkpoints or to conduct other enforcement programs or activities.

§ 212.6. Removal of traffic hazards.

(a) *Interfering signs, lights or markings*. The Secretary and local authorities, under their respective jurisdictions, have the authority to cause the removal of all colored or flashing lighted signs or other lights, signs or markings so located as to interfere with traffic or to be confused with or to obstruct the view or effectiveness of traffic-control devices.

(b) *Trees, plants, shrubs or other obstructions*. The Department on State-designated highways, and local authorities on any highway within their boundaries, may require a property owner to remove or trim a tree, plant, shrub or other obstruction or part thereof which constitutes a traffic hazard. The following are examples of traffic hazards:

(1) The obstruction restricts the stopping sight distance for drivers of through vehicles or the available corner sight distance for drivers entering from side roads or driveways to distances less than the appropriate minimum stopping sight distance or minimum corner sight distance values.

(2) The obstruction critically restricts the sight distance to a traffic-control device.

(3) Vehicle crash records indicate that a crash has involved the obstruction or that the obstruction contributed to one or more of the vehicle crashes.

§ 212.7. Signs and banners across or within the legal limits of a State-designated highway.

(a) *Prohibition*. It is unlawful to place any sign, marking or banner containing advertising matter of any kind on, across or within the right-of-way of any State-designated highway without the written consent of the Department.

(b) *Abatement*. A sign, marking or banner containing advertising matter placed without the written consent of the Department will be declared to be a public nuisance and may be removed by the Department with or without notice to the persons responsible for the placing of the sign, marking or banner containing advertising matter.

§ 212.8. Use, test, approval and sale of traffic-control devices.

(a) *Statutory requirements*. Under 75 Pa.C.S. § 6127 (relating to dealing in nonconforming traffic-control devices), it is unlawful for a person to manufacture, sell, offer for sale or lease for use on the highway, any traffic-control device unless it has been approved and is in accordance with this title.

(b) *Devices requiring Department approval*. Department approval is required prior to the sale or use of the following types of traffic-control devices on any highway:

(1) Delineation devices, including flexible delineator posts, guide rail and barrier-mounted delineators and raised pavement markers.

(2) Pavement marking materials including paint, epoxy, polyesters, methyl methacrylate, thermoplastic, preformed tapes and glass beads.

(3) Retroreflective sheeting materials used for traffic-control devices.

(4) Traffic signal equipment, including the following:

(i) Controller units.

(ii) Signal heads--lane-use traffic-control, pedestrian, and vehicle.

(iii) Detectors--pedestrian and vehicle.

(iv) Load switches.

(v) Flasher units.

(vi) Time clocks.

(vii) Relays.

(viii) Preemption and priority control equipment.

(ix) Electrically-powered signs--variable speed limit signs, blank-out signs and internally illuminated signs, including School Speed Limit Signs.

(x) Portable traffic-control signals.

(xi) Local intersection coordinating units.

(xii) Dimming devices.

(xiii) In-roadway warning lights.

(xiv) Auxiliary devices and systems.

(5) Traffic signs and the associated breakaway sign supports.

(6) Work zone traffic-control devices, including the following:

(i) Arrow panels.

(ii) Barricades.

(iii) Citizen band traffic alert radios.

(iv) Cones.

(v) Crash cushions.

(vi) Drums.

(vii) Portable changeable message signs.

(viii) Portable traffic sign supports.

(ix) Speed display signs, as used to inform motorists of the speed of their vehicles.

(x) Stop/slow paddles.

(xi) Temporary pavement marking tapes.

(xii) Temporary traffic barrier.

(xiii) Tubular markers.

(xiv) Variable speed limit signs.

(xv) Vertical panels.

(xvi) Warning lights.

(7) Yield to pedestrian channelizing devices, which are designed for placement between lanes of traffic to remind motorists to yield to pedestrians in crosswalks.

(c) *Approval procedure*. A manufacturer or person desiring approval for the sale, use or lease of one or more of the devices listed in subsection (b) shall contact the Bureau of Highway Safety and Traffic Engineering.

(d) *Listing of approved traffic-control devices*. Approved traffic-control devices will be listed in the Department's *Approved Construction Materials* (Department Publication 35), available from the Department's Sales Store or through the Department's website.

§ 212.9. Traffic calming.

(a) *General policy*. The Department on State-designated highways, and local authorities on any highway within their boundaries, may implement traffic calming measures in conformance with *Pennsylvania's Traffic Calming Handbook* (Department Publication 383).

(b) *Department approval*. Local authorities shall obtain approval of the Department prior to implementing a traffic calming measure on a State-designated highway, except when the Department's handbook provides otherwise or when the Department has entered into an agreement with local authorities that provides otherwise.

§ 212.10. Requests for changes, interpretations or permission to experiment.

A local authority may submit a request to the Department for a change or an interpretation of the provisions of this chapter, or for approval to use an alternate device or to experiment with a device in a way not provided for in this chapter.

(1) The request must be submitted in writing to the Bureau of Highway Safety and Traffic Engineering.

(2) The request must include information in accordance with Section 1A.10 of the MUTCD (relating to interpretations, experimentation, changes and interim approvals). If appropriate, the Department will forward the request to the Federal Highway Administration according to procedures in Section 1A.10 of the MUTCD.

(3) The type of information to be compiled during any experiment must be identified in the request, and the collection of any data and the development of any follow-up report will be a conditional part of the request.

§ 212.11. Metric measurements.

(a) *General policy*. The following conversion factors may be used for the design and placement of traffic-control devices as included in this chapter:

(1) One inch equals 25 millimeters.

(2) One foot equals 0.30 meter.

(3) One mile equals 1.6 kilometers.

(b) *Metric sign messages*. Unless authorized in writing by the Secretary, sign messages on regulatory, warning and guide signs, except for auxiliary signs used for educational purposes, may not display metric units of measurement.

§ 212.12. Department publications.

The Department will publish or make available documents to assist those persons responsible for conducting engineering and traffic studies; manufacturing traffic signs and other traffic-control devices; erecting, maintaining and operating traffic-control devices; and maintaining traffic in work zones. The following documents will be available from the Department's Sales Store:

(1) *Approved Construction Materials* (Department Publication 35) which contains listings of approved suppliers of specific materials.

(2) *Official Traffic-Control Devices* (Department Publication 212) which contains this chapter, and an appendix containing additional guidance related to elements of appropriate engineering and traffic studies and the provisions of this chapter.

(3) *Pennsylvania Handbook of Approved Signs* (Department Publication 236M) which contains the design and application details of official traffic signs.

(4) *Signing and Marking Standard* (Department Publication 111M) which contains the traffic standards that provide detailed guidance for sign legends, expressway and freeway signs, sign spacing and location criteria and sign posts. The publication also includes detailed drawings of pavement marking lines and symbols, and the placement of delineation devices at on-ramps, off-ramps and lane drops.

(5) *Traffic Signal Design Handbook* (Department Publication 149M) which contains information for use in the design and operation of a traffic signal installation.

(6) *Traffic Signal Standard Drawings, TC-8800 Series* (Department Publication 148M) which contains detailed guidance for the construction of traffic signals, controller assemblies, traffic signal supports, electrical distribution, signal heads and detectors.

(7) *Work Zone Traffic Control Guidelines* (Department Publication 213) which provides additional guidance and suggested temporary traffic-control plans for maintaining traffic through highway construction, maintenance and utility work zones to supplement various situations not included in the MUTCD.

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Subchapter B.

SIGNS

§ 212.101. Official signs.

(a) *Approved signs*. Official traffic signs are identified in the *Pennsylvania Handbook of Approved Signs* (Department Publication 236M) which includes sign standards that show the shape, color, dimensions, legends, application and placement of official signs. When sign messages are required other than those provided for in the *Pennsylvania Handbook of Approved Signs*, the Bureau of Highway Safety and Traffic Engineering may authorize new sign standards. When approved by the Secretary, through the Chief, Traffic Engineering and Operations Division, these signs shall also be regarded as official signs.

(b) *Existing nonstandard signs*. Official signs must replace existing signs of nonstandard design or application as rapidly as is economically feasible.

(c) *Unacceptable variations*. Variations in the proportion of symbols, stroke width and height of letters, width of borders or layout of word or symbol messages will be sufficient cause for the Secretary to order the removal or replacement of a sign, but will not be a defense in prosecution for violation of any mandatory traffic control provided by the sign.

§ 212.102. Sign manufacturers.

Only signs manufactured by the Department or a Department-approved sign manufacturer shall be used on any highway. Commercial or municipal sign manufacturers who wish to obtain Department approval to manufacture signs shall request an application from the Bureau of Highway Safety and Traffic Engineering.

§ 212.103. Sign size.

Signs smaller than the minimum size or larger than the largest size specified on the sign standards in the *Pennsylvania Handbook of Approved Signs* (Department Publication 236M) are not permitted without written approval from the Department.

§ 212.104. Retroreflectorization.

Retroreflective sheeting or other approved retroreflective materials must be used on all signs that do not have sign illumination, unless the sign standard as included in the *Pennsylvania Handbook of Approved Signs* (Department Publication 236M) indicates that the sign does not need to be retroreflective. Type III or higher type retroreflective sheeting is encouraged to improve nighttime visibility of signs, especially for older drivers.

§ 212.105. Sign posts and mountings.

Unless physically protected by guide rail or a barrier, or installed beyond the clear zone as defined in the Department's *Design Manual, Part 2 (Department Publication 13M)*, all sign posts must be of a Department-approved breakaway design as listed in the *Approved Construction Materials* (Department Publication 35), and in accordance with the *Signing and Marking Standards* (Department Publication 111M).

§ 212.106. Additional warrants for Stop Signs (R1-1) and Yield Signs (R1-2).

(a) *Through highways*. The Department and local authorities may designate highways as through highways to permit more continuous movement and less delay to the major flow of traffic.

(1) Stop Signs (R1-1) or Yield Signs (R1-2) may be installed at all approaches to the through highway to provide preferential right-of-way at intersections.

(2) The designation of a highway as a through highway does not prevent modification of the right-of-way assignment at intersections of the through highway.

(3) The justification for the modification at a particular intersection will be based on the warrants in the MUTCD and the additional warrants in subsection (b), (c) or (d).

(b) *Stop Signs (R1-1) at intersections*. In addition to the warrants for stop signs in the MUTCD (relating to stop sign applications), a Stop Sign (R1-1) may be installed on a channelized right-turn roadway at a signalized intersection where the traffic-control signals are not readily visible, and the right-turn roadway does not have separate signals, and a Yield Sign (R1-2) is not appropriate.

(c) *Multiway stop applications*. In addition to the criteria and options warranting multiway stop applications in the MUTCD, the following apply:

(1) The five or more reported crashes in a 12-month period for Warrant B may include both reportable crashes, and nonreportable crashes that are documented in the police files, that occurred during a 12-month period during the most recent 3 years of available crash data.

(2) Multiway stop applications may not be used because of limited available corner sight distance unless there is no practical method of improving the sight distance or reducing the speed limit to satisfy the minimum corner sight distance values.

(d) *Stop and yield control at locations other than intersections*.

(1) *One-lane bridges and underpasses*. Stop Signs (R1-1) are warranted in advance of a one-lane bridge or underpass when roadway geometry is such that drivers cannot see an approaching vehicle in sufficient time for both vehicles to stop prior to entering the bridge or underpass. If sight distance is not a problem, a Yield Sign (R1-2) with the supplemental To Oncoming Traffic Sign (R1-2a) may be installed at both ends of a one-lane bridge or underpass.

(2) *Crossings*. Stop Signs (R1-1) may be installed on highways on a temporary basis at officially designated crossings such as construction haul roads. These Stop Signs (R1-1) should only be visible and in effect during the time periods the crossing is being used and should be supplemented with a flashing red light for added visibility.

(3) *Private roads and driveways*. Stop Signs (R1-1) or Yield Signs (R1-2) may be installed to control traffic exiting from a private road or driveway onto a highway or to control traffic on the highway at a private road or driveway if the warrants applied at highway intersections are satisfied.

(4) *Truck pulloffs on hazardous grades*. A Stop Sign (R1-1) may be installed within an officially designated truck pull-off area in advance of a hazardous grade indicating the location that trucks are to stop within the pulloff.

(5) *Temporary traffic control*. Stop Signs (R1-1) may be installed at both ends of short one-lane construction, maintenance or utility operation to provide self-regulating traffic control providing the one-lane section excluding the tapers is less than 250 feet, the ADT is less than 1,500, and the sight distance is sufficient.

§ 212.107. Except Right Turn Sign (R1-1-1).

When a major traffic movement at an intersection is a right turn, the Except Right Turn Sign (R1-1-1) may be placed below the Stop Sign (R1-1) on that approach to minimize the total delay at the intersection. When this sign is used, Stop Signs (R1-1) are required on all other intersection approaches except for the approach with a corresponding left-turn movement.

§ 212.108. Speed limits.

(a) *General*. This section applies to maximum speed limits established according to 75 Pa.C.S. §§ 3362 and 3363 (relating to maximum speed limits; and alteration of maximum limits). Engineering and traffic studies are not required for statutory speed limits, but documentation should be on file for urban districts and residence districts to show that the requirements defined in the Vehicle Code are satisfied.

(b) *Engineering and traffic studies*. Speed limits established in accordance with 75 Pa.C.S. § 3363 may be established in multiples of 5 miles per hour up to the maximum lawful speed. The speed limit should be within 5 miles per hour of the average 85th percentile speed or the safe-running speed on the section of highway, except the speed limit may be reduced up to 10 miles per hour below either of these values if one or more of the following conditions are satisfied:

(1) A major portion of the highway has insufficient stopping sight distance if traveling at the 85th percentile speed or the safe-running speed.

(2) The available corner sight distance on side roads is less than the necessary stopping sight distance values for through vehicles.

(3) The majority of crashes are related to excessive speed and the crash rate during a minimum 12-month period is greater than the applicable rate in the most recent high-crash rate or high-crash severity rate table included in the appendix of Official Traffic-Control Devices (Department Publication 212). Crashes related to excessive speed include those crashes with causation factors of driving too fast for conditions, turning without clearance or failing to yield right-of-way.

(c) *Variable speed limits*. To improve safety, speed limits may be changed as a function of traffic speeds or densities, weather or roadway conditions or other factors.

(d) *Special speed limits*.

(1) Within a rest area or welcome center, a 25 mile per hour speed limit may be established without the need for an engineering and traffic study if pedestrians walk across the access roadways between the parking lot and the rest facilities.

(2) Within a toll plaza or a truck weight station, an appropriate speed limit may be established without an engineering and traffic study by the authorities in charge to enforce the safety of the operations or to protect the scales.

(e) *Posting of speed limits*. A Speed Limit Sign (R2-1) or variable speed limit sign showing the maximum speed limit shall be placed on the right side of the highway at the beginning of each numerical change in the speed limit, but an additional sign may also be installed on the left side of the highway. If the new speed limit begins at an intersection, the first sign should be installed within 200 feet beyond the intersection. The placement of this sign must satisfy both the requirement to post the beginning of the new speed limit and the requirement to post the end of the previous speed limit. Additional requirements for posting are as follows:

(1) Speed limits of 50 miles per hour or less shall be posted as follows:

(i) A Reduced Speed (____) Ahead Sign (R2-5), or a Speed Reduction Sign (W3-5), shall be placed on the right side of the highway 500 to 1,000 feet before the beginning of every speed reduction unless one of the following applies:

(A) The speed reduction is 10 miles per hour or less.

(B) The speed reduction begins at an intersection and all traffic entering the roadway with the speed reduction has to either stop at a Stop Sign (R1-1) or make a turn.

(C) The new speed limit is posted on variable speed limit signs.

(ii) Speed Limit Signs (R2-1) or a variable speed limit sign showing the maximum speed shall be placed on the right side of the highway at the beginning of the speed limit and at intervals not greater than 1/2 mile throughout the area with the speed limit.

(iii) The end of a speed limit is typically identified by the placement of a sign indicating a new speed limit, but the End Plaque (R2-10) may be placed above a Speed Limit Sign (R2-1) at the end of the zone if the appropriate speed limit is not known on the following section of roadway.

(2) On freeways, a Speed Limit Sign (R2-1) shall be installed after each interchange unless insufficient space exists for the signs.

§ 212.109. Bridge speed limits.

(a) *Establishment.* A bridge speed limit shall be established under 75 Pa.C.S. § 3365(a) (relating to special speed limitations) if an engineering investigation by a professional engineer establishes the need to reduce the vibration and impact of vehicles due to a structural condition of the bridge or elevated structure.

(b) *Posting*. An established bridge speed limit shall be posted similar to other speed limits in § 212.108(e) (relating to speed limits), except that a Bridge Sign (R12-1-2) must be mounted directly above each Speed Limit Sign (R2-1) and Reduced Speed (____) Ahead Sign (R2-5). The sign indicating the beginning of the bridge speed limit should be installed within 50 feet of the beginning of the structure. The end of the bridge or elevated structure must be the end of the bridge speed limit.

§ 212.110. Hazardous grade speed limits.

(a) *Establishment.* A hazardous grade speed limit may be established under 75 Pa.C.S. § 3365(c) (relating to special speed limitations) if an engineering and traffic study establishes the need for all vehicles or vehicles having a gross weight in excess of a designated weight to be limited to a maximum speed on a downgrade.

(1) The designated weight should be 26,000 pounds unless the engineering and traffic study determines that a different weight should be used.

(2) When a hazardous-grade speed limit is established, it should be consistent with the speed that similar vehicles can climb the hill or other Department-approved methodology, except that a hazardous-grade speed limit should not be greater than the lowest advisory speed or legal speed limit either on the hill or at the base of the hill.

(3) A hazardous-grade speed limit may be established when one or more of the following conditions exist:

(i) The length of grade exceeds the value set forth in the following table:

Average Grade	Length of Grade (feet)	
(percent %)	Condition A*	Condition B**
-3	20,000	--
-4	8,000	16,000
-5	5,000	10,000
-6	3,000	6,000
-7	2,000	4,000
-8	1,800	3,600
-10	1,500	3,000
-12	1,250	2,500
-15	1,000	2,000

* Condition A applies if vehicles are required to stop or reduce speed at or before the bottom of the hill or if there is an urbanized area at the base of the hill.

** Condition B pertains to all other locations.

(ii) A crash has occurred on the downgrade that can be attributed to the speed of a vehicle having a gross weight in excess of the designated weight.

(iii) A verified report has been received during the past 3 years of an operator losing control of a vehicle on the grade, and the vehicle is a type having a gross weight in excess of the designated weight.

(b) *Posting*. A hazardous grade speed limit shall be posted with traffic-control devices as follows:

(1) A Reduced Speed (____) Ahead Sign (R2-5), advising of the maximum hazardous grade speed limit, with a Truck Marker (M4-4), or other marker as applicable, mounted directly above the Reduced Speed (____) Ahead Sign (R2-5), shall be placed on the right side of the highway at a distance of 500 to 1,000 feet before the hazardous grade speed limit, except that this advance sign is not required if the hazardous grade speed limit begins at a vehicle pull-off where all applicable vehicles are required to stop.

(2) A Trucks Over (____) Lbs. Speed Sign (R2-2-1), or other sign as applicable, shall be erected at the beginning of the hazardous grade speed zone and at intervals not greater than 1/4 mile throughout the zone.

(3) A Trucks Over (____) Lbs. Speed Sign (R2-2-1), or other sign as applicable, with an End Sign (R2-10) mounted above the Trucks Over (____) Lbs. Speed Sign (R2-2-1) or other sign, shall be installed at the end of the hazardous grade speed limit.

§ 212.111. Turn restriction warrants.

A straight-through or turning movement may be restricted if the movement can be made at an alternate location, and if one or more of the following conditions are present:

(1) A review of vehicle crashes shows that ten crashes have occurred during the previous 3 years, or five crashes have occurred during any 12-month period in the previous 3 years that can be attributed to vehicles making or attempting to make the movement.

(2) When a capacity analysis or field review of the intersection indicates that turning or crossing vehicles are causing unreasonable delays or creating a potential crash situation for through vehicles.

(3) When a field review of the intersection indicates that significant conflicts occur between vehicles making or attempting to make a particular movement and other vehicular or pedestrian movements.

(4) When a field review of the intersection indicates that a turn or straight-through movement delays the platoon of vehicles through a progressive signal system.

(5) When a field review of the intersection indicates that the geometric design or the available corner sight distance does not adequately provide for the movement or the movement frequently cannot be safely executed.

(6) A study shows that the turning movement is frequently being made by through traffic onto a residential street to avoid downstream congestion.

§ 212.112. Signs to prohibit passing.

The No Passing Zone Pennant (W14-3) is the primary sign to identify the beginning of a no-passing zone on a two-lane highway and shall be installed on the left side of the road. The Do Not Pass Sign (R4-1) may be installed on the right side of the roadway to supplement the No Passing Zone Pennant Sign (W14-3). The Pass With Care Sign (R4-2) may be installed at the end of the no-passing zone. Warrants for no-passing zones are included in § 212.202 (relating to no-passing zones).

§ 212.113. One-way streets.

A one-way street may be established if the following conditions are satisfied:

(1) The traffic flow can be accommodated in both directions. Whenever possible, an adjacent parallel street should be used to form a one-way couplet.

(2) The street has a reasonable number of intersections for entrance to or exit from the one-way street or one-way system.

(3) The roadways at the terminal points of the one-way street provide satisfactory transitions to and from the two-way operation.

(4) There will be a reduction of intersection delays.

(5) Existing bus routes can be satisfactorily accommodated.

(6) Emergency vehicles can reasonably and expeditiously reach their destinations.

§ 212.114. Stopping, standing and parking restrictions.

(a) *General*. Stopping, standing or parking may be restricted along the curb or edge of a roadway when one or more of the following conditions exist:

> (1) The distance between the center of the center line pavement markings (or the center of the roadway if center line pavement markings are not present) and the curb or edge of roadway is less than 19 feet on major arterial highways, or less than 18 feet on other roadways.

(2) The street width is such that, if vehicles are parked along one or both curb faces or edges of the roadway, two vehicles cannot move abreast of one another in the same or the opposite direction without one yielding to allow the other vehicle to pass.

(3) A capacity analysis indicates that parking should be removed at all times or during certain hours to accommodate the traffic volume.

(4) At an intersection, the available corner sight distance for a driver on the minor road is less than the necessary minimum stopping sight distance value for the driver on a through roadway.

(5) An analysis of vehicle crashes indicates that at least three crashes during the previous 3-year period have been directly or indirectly attributed to one of the following primary causes:

(i) Vehicles parking on the roadway.

(ii) Vehicles entering or leaving the parked position.

(iii) Drivers or passengers getting out of parked vehicles on the street side.

(iv) Reduced sight distance due to the parked vehicles.

(6) The area is designated as an official bus stop or as a loading and unloading zone.

(7) The area is adjacent to or opposite of a fire station driveway or any other type driveway or intersection where turning maneuvers would be restricted if parking were present.

(8) The width of the shoulder is not sufficient to allow a vehicle or its load to park completely off the roadway.

(9) Along roadways having three or more lanes and speed limits of 40 miles per hour or above, parking may be restricted to allow vehicles to use the berm or shoulder as a clear recovery area.

(b) *Angle parking*. As defined in § 212.1 (relating to definitions), angle parking will only be authorized as follows:

(1) New angle parking may be established only along streets where the following criteria are satisfied:

(i) The parking and maneuver area, as shown in the diagram which follows, adjacent to the near edge of the nearest travel lane equals or exceeds the distance indicated in the following table:

Parking Angle (degrees)	Parking and Maneuver Area (feet)
30	26
45	30
60	37
90	43

(ii) Parked vehicles do not adversely affect the available corner sight distance.

(iii) Additional travel lanes are not required for the existing traffic volumes to achieve a satisfactory level of operation.

(iv) Parking stalls will be adequately marked and spaced.

(v) Pedestrian activity is minimal within the parking maneuver area.

(2) It is recommended that existing angle parking be eliminated if an analysis of vehicle crashes indicates that the parking-related crash rate within the area of existing angle parking is greater than the rate on similar portions of the same street or other streets within the same municipality which have parallel parking.

(c) *Parking meters*. When parking is permitted, local authorities may install parking meters and appropriate pavement markings to designate parking stalls. The hours of effectiveness of parking meters must be indicated either on the meter or within the dome of the meter, but official traffic signs shall be erected to indicate hours when parking is prohibited.

(d) *Prohibition of kinds and classes*. When parking is permitted, local authorities or the Department may prohibit certain kinds and classes of vehicles from parking for safety, capacity or environmental reasons. Official signs must indicate the prohibitions.

(e) *Parking reserved for persons with disabilities*. The Reserved Parking Penalties Sign (R7-8f) shall be installed below all Reserved Parking Signs (R7-8), as provided in 75 Pa.C.S. § 3354(d) (relating to handicapped persons and disabled veterans).

(f) *Miscellaneous restrictions.*

(1) Local authorities or the Department may restrict or regulate parking without an engineering and traffic study to accomplish the following:

(i) Facilitate construction, maintenance or utility operations.

(ii) Eliminate long-term parking or parking in excess of a specified time limit.

(iii) Provide for reserved parking spaces.

(iv) Provide for snow emergency routes.

(v) Provide for mail delivery or pickup.

(2) Restrictions for the elimination of long-term parking must apply only during short periods of time such as early morning hours when it will not seriously inconvenience local residents.

(g) *Double parking*. When parking is permitted, local authorities may, by local ordinance without an engineering and traffic study, authorize double parking (standing or parking on the roadway side of a vehicle stopped or parked at the edge or curb of a roadway) for the purpose of loading or unloading persons or property. On State-designated highways, double parking is not permitted without written approval of the Department.

(h) *Authority*. Local authorities may establish, revise or remove stopping, standing or parking restrictions on State-designated highways within their physical boundaries, except Department approval is required prior to revising or removing any of the following:

(1) Established in conjunction with a State or Federal aid project.

(2) Requested or posted by the Department for safety or capacity reasons.

(3) Included as a condition on a traffic signal permit.

§ 212.115. Posting of private parking lots.

(a) *General*. Posting of private property, including parking lots, giving notice to the public of parking restrictions as required by 75 Pa.C.S. §§ 3353(b)(2) and 3354(d)(3) (relating to prohibition in specified places; and additional parking regulations) must be in accordance with this section.

(b) *Public notice signs*.

(1) The legend on public notice signs at private parking lots must indicate the restrictions which apply. In addition to a primary restriction such as those contained in subparagraph (i), the sign may contain one or more supplemental restrictions or messages of the type included in subparagraph (ii).

(i) Primary restrictions include messages such as private parking, parking by permit only, authorized parking only, private parking for (____) apartment and parking only for patrons of (____).

(ii) Secondary restrictions or messages may include applicable hours of the day, applicable days of the week, applicable charges and warnings that unauthorized vehicles may be towed.

(iii) The name and telephone number of the owner or other person in control or possession of the property should also be included on the legend.

(2) Public notice signs should be erected at each entrance to the private parking lot and positioned so as to face traffic entering the lot. If there are no designated entrances--such as when a lot has one or more sides continuously open to a roadway--one or more signs should be erected so as to be readily visible to an ordinarily observant driver. Minimum message size shall be as follows:

(i) A primary restriction as defined in paragraph (1)(i) must have a minimum letter height of 3 inches. Signs erected at a distance of more than 75 feet from an entrance point must have letter height which is at least one additional inch in high for each 25-foot interval in the distance. The stroke width of the legend must be a minimum of 1/8 of the required height of the legend.

(ii) A secondary restriction as defined in paragraph (1)(ii) must have minimum dimensions equal to one-half of the minimum dimensions required for the primary restriction, except the letter height must be at least 2 inches.

(3) Signs which have application during hours of darkness must have a retroreflectorized sign message or background and be positioned so as to be illuminated by the headlight beams of entering vehicles, or the sign may be illuminated during applicable hours of darkness so as to be readily visible to an ordinarily observant driver.

(4) Under 75 Pa.C.S. § 3353(b), the prosecution of an owner or towing a vehicle from a private parking lot is prohibited unless restrictions are posted in accordance with this subsection.

(c) *Reserved parking signs or markings*.

(1) Special signs may be used to reserve designated parking stalls for named persons or classes of people, for particular vehicles, or for persons with special placards or assigned permit numbers. When used, these signs may be erected at the front of each parking stall or, in the case of parallel parking, at intervals not exceeding 100 feet along the side of the stalls. The minimum size sign must be 12 inches by 12 inches, and the minimum size message must be 2 inches in height.

(2) In lieu of signs to designate parking stalls as noted in subsection (a), pavement markings may be used on the pavement or an applicable curb for this purpose if:

(i) The public notice sign indicates that a permit is required.

(ii) The markings are readily visible to an ordinarily observant driver.

(3) The Reserved Parking Sign (R7-8) shall be used to designate reserved parking stalls for handicapped persons or severely disabled veterans. The Reserved Parking Penalties Sign (R7-8f), which indicates the minimum and maximum fine for violators and that violators may be towed, shall be installed below the Reserved Parking Sign (R7-8).

(4) Parking stalls designated under paragraph (3) for handicapped persons or severely disabled veterans may only be used by vehicles bearing a handicapped person or severely disabled veteran registration plate or displaying a handicapped person or severely disabled veteran parking placard issued by the Commonwealth or another state.

(5) Whenever signs required to implement the provisions of paragraph (3) become either obsolete or missing, they must be replaced with new official signs as rapidly as is feasible. The costs associated with the installation and replacement of the required signs for a particular location must be borne by the owner or person in control or possession of the property on which the signs are to be erected.

§ 212.116. No Turn on Red Sign (R10-11 sign series).

(a) *Warrants for no-turn-on-red restrictions*. The following warrants may be used in addition to the warrants for no-turn on red restrictions in the MUTCD (relating to traffic signal signs).

(1) A right turn on red, or left turn on red from a one-way highway to another one-way highway, may be prohibited from an intersection approach where an engineering and traffic study indicates that one or more of the following conditions exist:

(i) The available corner sight distance between a driver desiring to turn on red and an approaching vehicle on the cross street is less than the minimum shown on the following table:

*Minimum Sight Distance to Approaching Vehicle**							
Speed Limit or 85th Percentile Speed	**Std.**	***Cross Street Approach Grade***					
	Values	**-9%**	**-6%**	**-3%**	**3%**	**6%**	**9%**
25	152	173	165	158	147	143	140
30	197	227	215	205	200	184	179
35	247	287	271	257	237	229	222
40	301	354	333	315	289	278	269
45	360	427	400	378	344	331	320
50	424	507	474	446	405	388	375
55	493	593	553	520	469	450	433

* Measure sight distance from a location 10 feet before a marked pedestrian cross walk or, if none, 10 feet from the edge of the cross street roadway or curb line, where both the eye and the approaching vehicle are 3.5 feet high.

(ii) The intersection has more than four approaches or has restrictive geometry that is likely to cause vehicular conflicts which are not easily recognized by drivers.

(iii) The turning movement is allowed from more than one lane on a specific approach.

(iv) The vehicular turning movement would result in significant vehicular and pedestrian conflicts, such as locations where the crosswalk is designated as a school crossing or is used by large numbers of children, senior citizens or persons with physical disabilities. A no-turn-on-red restriction at these locations may only apply during the time periods that significant vehicular-pedestrian conflicts would occur, in accordance with paragraph (3).

(v) Opposing traffic has unusual movements, such as double left turns, which would not be expected by drivers turning on a red signal.

(vi) An analysis of vehicle crash data indicates that the turn-on-red movement has created an unsafe condition.

(2) Part-time or intermittent prohibition of the turn-on-red movement must be used at locations where a potential safety concern exists for only a portion of the day. These restrictions must be implemented by the use of one or more of the following:

(i) A Restricted Hours Panel (R10-20A) under the No Turn On Red Sign.

(ii) A supplemental message incorporated directly into the No Turn On Red Sign.

(iii) A sign designating the hours the restriction is effective.

(iv) A blank-out No-Turn-On-Red Sign.

(3) A part-time or intermittent prohibition of the turn-on-red movement may be used at an intersection approach where vehicles turning on red would cross an at-grade railroad crossing within 200 feet and the traffic signal controller is preempted during train movements during the time the signal controller is preempted in accordance with paragraph (2).

(b) *Application*. This section applies to signalized roadway and driveway intersections along all highways.

(c) *Engineering and traffic studies*. Engineering and traffic studies required by subsection (a)(1) shall be conducted by local authorities. The Department will be responsible for conducting the study at the following locations:

(1) At intersections where the traffic signal controller is preempted during train movements for a nearby crossing.

(2) At new or revised traffic signal installations when the traffic signal is designed by the Department.

(d) *Department approval*. Written approval of the Department's district executive shall be obtained prior to installation of a No Turn on Red Sign (R10-11 Series) at any intersection where the Department has issued the traffic signal permit.

§ 212.117. Weight, size and load restrictions.

(a) *Weight restriction based on condition of bridge*. Traffic on a bridge may be prohibited or restricted by weight of vehicle, number of vehicles, or kinds or classes of vehicles when an engineering evaluation conducted by a professional engineer establishes the need. Engineering evaluation of a bridge or bridge component may be based on structural analysis and rating computations, testing, engineering judgment or a combination thereof. Restriction is warranted when one or more of the following conditions are present:

(1) The safe load capacity of the bridge is exceeded by the load effect of any of the legal load configurations. The capacity and load effects are to be determined in accordance with the *Bridge Safety Inspection Manual* (Department Publication 238).

(2) Engineering judgment indicates that the condition or material of construction of one or more portions or components of a bridge is such that further use by heavy vehicles may damage the bridge because of severe impact, fatigue or other reasons.

(3) The bridge is damaged due to fire, a vehicle crash or environmental deterioration, and engineering judgment indicates that a vehicle weight restriction is necessary to ensure an adequate level of safety.

(b) *Weight restriction based on condition of highway*. Traffic on a highway may be prohibited or restricted by weight of vehicle, or kinds or classes of vehicles when warranted by an engineering evaluation. Engineering evaluation may be based on structural analysis, testing, engineering judgment or a combination thereof. A restriction is warranted when one or more of the following conditions are present:

(1) The highway pavement or shoulders have inadequate structural capacity or have been weakened due to deterioration, high traffic volumes or climatic condition, and may be seriously damaged unless a restriction is imposed.

(2) An engineering evaluation of previous similar climatic conditions on the highway or on similar highways indicates that vehicles over a certain weight should have been prohibited.

(c) *Size restriction based on condition of bridge or highway*. Traffic on a bridge or highway may be restricted by size of vehicle or kinds or classes of vehicles when, after an engineering evaluation, one or more of the following conditions are found to be present:

(1) A bridge has poor alignment, substandard horizontal or vertical clearance, or creates problems for vehicles with low ground clearance, or the restriction is otherwise necessary to protect the bridge from vehicle crashes or damage.

(2) A highway has inadequate turning radii, horizontal width or creates concerns for vehicles with low ground clearance at one or more locations.

(d) *Weight and size restrictions based on traffic conditions*. Traffic on a highway or bridge may be prohibited or restricted by weight or size of vehicle, or kinds or classes of vehicles when, an engineering evaluation of the horizontal and vertical alignment, prevailing traffic speeds, compatibility of the various types of traffic, history of vehicle crashes or vehicular characteristics, indicates that the movement of certain vehicles constitutes a safety hazard. Restrictions may include weight; height, width or length of vehicles or their loads; types of cargo; speed or gearing; stopping requirements; specified travel lanes; and hours of operation.

(e) *Erection of signs*. Appropriate signs shall be erected within 25 feet of each end of a restricted portion of a highway or bridge whenever vehicles are prohibited under subsection (a), (b), (c) or (d). In the case of a restriction on a highway or bridge which does not begin or end at an intersection with an unrestricted highway, an advance information sign shall also be erected at the intersection nearest each end of the restricted highway or bridge to allow drivers to avoid the restricted highway or bridge.

(f) *Alternate routes*. An alternate route shall be established whenever vehicles are prohibited under subsection (a) or (b) on either a numbered traffic route or a State-designated highway on the National Highway System, as established by the Federal Highway Administration, when the following apply:

(1) A reasonable alternate route exists which is not readily perceived by drivers.

(2) The alternate route can legally, safely, structurally and physically accommodate the weight and size of vehicles and their loads that are being detoured.

(3) Five or more vehicles per day are estimated to be prohibited from using the original route.

§ 212.118. Street name signs.

For street name signs, white lettering on a green background is recommended, but local authorities may use white lettering on blue or brown background, or black lettering on white background, provided the same colors are used systematically throughout the municipality. To improve sign legibility, upper and lower case lettering is recommended.

§ 212.119. Signing of named highways.

Signs carrying the name of the highway will be permitted at intervals of at least every 15 miles on conventional highways.

§ 212.120. General motorist service signs.

The application of general motorist service signs shall be in accordance with the Department's Statewide policy and the *Signing and Marking Standards* (Department Publication 111M), and will be limited to expressways and freeways, except:

(1) Small trailblazer signs shall be installed on conventional highways when motorist services are signed on an expressway or freeway and it is necessary to guide motorists along conventional highways to the physical site of the motorist service.

(2) Hospital symbol signs are permitted on all highways.

§ 212.121. Specific service signs.

(a) The Department may enter into an agreement with a private agency to administer a program for specific service signs for gas, food, lodging, camping and attractions. Specific service signs may only be installed on freeways, except small trailblazer signs shall be installed on conventional highways when it is necessary to guide motorists to the physical site of the specific service. If a trailblazer is required on a local roadway to direct motorists to a specific business, and the local authority refuses to allow the trailblazer on its local highway, specific service signs may not be provided for that business.

(b) Airports may be signed on either major guide signs or on specific service signs at freeway-to-freeway interchanges.

§ 212.122. Recreational and cultural interest area signs.

Recreational and Cultural Interest Area Signs, as described in Chapter 2H of the MUTCD, that is, relating to the RG, RM, RA, RL, RW and RS Series signs, will be authorized for use within any State park, State forest picnic area, Federal recreation area, National forest or public park.

§ 212.123. Tourist-oriented directional signs.

Tourist-Oriented Directional Signs (D7-4) must be of the size and type specified in the Department's *Handbook of Official Signs* (PennDOT Publication 236M) or as specified in an agreement with the Department, instead of the design included in Chapter 2G of the MUTCD (relating to tourist-oriented directional signs). The Department may enter into an agreement with an outside entity to administer a program for tourist-oriented directional signs.

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Subchapter C.

MARKINGS

§ 212.201. Pavement marking standards.

The *Signing and Marking Standards* (Department Publication 111M) contains additional design details for pavement markings. Pavement markings for lane drops, expressways, freeways, on-ramps and off-ramps, and all pavement marking words and symbols must conform to the *Signing and Marking Standards*.

§ 212.202. No-passing zones.

(a) *Additional warrants on two-lane, two-way highways*. In addition to the sight distance warrant in Section 3B.02 of the MUTCD (relating to no-passing zone pavement marking and warrants), no-passing zones may be established at the following locations on two-lane, two-way highways with center line pavement markings:

(1) In advance of a divided highway or an obstruction such as a bridge support pillar, a channelizing island or a safety zone, which separates the two lanes of traffic.

(2) On or within, and in advance of any bridge, tunnel or underpass designated as a narrow bridge or underpass in accordance with § 212.1 (relating to definitions).

(3) In advance of a Stop Sign (R1-1), Yield Sign (R1-2) or traffic signal.

(4) On the approach to an intersection where passing may be undesirable due to the high number of crossing or turning movements.

(5) Within a school zone.

(6) In areas where an analysis of vehicle crashes shows an unusually high number of passing-related crashes.

(7) In areas where the roadside development includes many driveways and intersections where passing would create frequent potential conflicts.

(8) At locations where the roadway width is very restrictive, shoulders are nonexistent or in poor condition, the roadway cross-section has an excessive crown, or obstacles are close to the roadway.

(9) In areas where traffic volumes are very heavy and there would be very limited opportunities for motorists to pass other vehicles.

(10) At locations where a passing zone would otherwise be less than 600 feet in length.

(11) At locations where engineering judgment indicates that allowing passing is undesirable because a better passing area exists farther ahead.

(b) *Minimum advance distance*. No passing zones established according to subsection (a)(1)--(5) must precede the location by the minimum distance noted in the following table:

Speed Limit or 85th Percentile Speed (mph)	**Distance (feet)**
35 or less	300
40	350
45	400
50	450
55	500

§ 212.203. Delineation.

The 4-foot mounting height for delineators specified in the MUTCD (relating to delineator placement and spacing) is not applicable for guide rail and barrier-mounted delineators. In addition, post-mounted delineators may be 4 feet above the ground instead of 4 feet above the near edge of pavement as specified in the MUTCD.

Subchapter D.

HIGHWAY TRAFFIC SIGNALS

§ 212.301. Purpose.

This subchapter sets forth additional guidance and criteria relating to the design, application and operation of traffic-control signals within this Commonwealth. The *Traffic Standards--Signals TC-8800 Series* (Department Publication 148M) and the *Traffic Signal Design Handbook* (Department Publication 149M) contain additional design details, specifications, checklists and forms.

§ 212.302. Traffic-control signals.

(a) *Flashing operation of traffic-control signals*. During flashing operation, a minimum of two vehicular signal heads on each approach must be flashed for the through movement. Any other signal heads may be blanked out.

(b) *Warrants*. In addition to the criteria in the MUTCD, the following applies:

(1) *Traffic volumes*. The traffic volume for channelized right-turn movements may not be included in any warrant analysis.

(2) *Vehicle crashes*. The five or more reported crashes within a 12-month period for Warrant 7 in the MUTCD (relating to Warrant 7, crash experience) may include both reportable crashes, and nonreportable crashes that are documented in the police files, that occurred within a 12-month period during the most recent 3 years of available crash data.

(3) *Warrant 9, ADT volume warrant.*

(i) An "ADT volume warrant" is added as "Warrant 9" and may be used in addition to the eight warrants contained in Sections 4C.02 through 4C.09 of the MUTCD (relating to Warrants 1 through 8). This warrant must apply at a proposed intersection, an intersection revised by a highway construction project, or at the driveway of a proposed commercial or residential development where vehicle counts cannot be taken. If a traffic-control signal is installed under this warrant, a traffic count must be taken within 6 months of the opening of a development or within 2 years of the opening of a highway. If the traffic volumes do not satisfy this warrant, or one or more of the other eight warrants, consideration should be given to removing the traffic-control signal and replacing it with appropriate alternative traffic-control devices, if any are needed.

(ii) This warrant is satisfied when the estimated ADT volumes on the major street and on the higher volume minor street or driveway approach to the intersection, when projected using an accepted procedure such as put forth in the Trip Generation Manual published by the Institute of Transportation Engineers, equals or exceeds the values in either Condition A or Condition B:

Condition A--ADT Volume Warrant					
Number of Lanes for Moving Traffic on Each Approach		**Estimated ADT***			
Major Street	**Minor Street**	**Major Street (Both Approaches)**		**Higher-Volume Minor Street (One Direction Only)**	
		100%	**70%****	**100%**	**70%****
1	1	10,000	7,000	3,000	2,100
2 or more	1	12,000	8,400	3,000	2,100
2 or more	2 or more	12,000	8,400	4,000	2,800
1	2 or more	10,000	7,000	4,000	2,800

Condition B--ADT Volume Warrant					
Number of Lanes for Moving Traffic on Each Approach		Estimated ADT*			
Major Street	Minor Street	Major Street (Both Approaches)		Higher-Volume Minor Street (One Direction Only)	
		100%	70%**	100%	70%**
1	1	15,000	10,500	1,500	1,050
2 or more	1	18,000	12,600	1,500	1,050
2 or more	2 or more	18,000	12,600	2,000	1,400
1	2 or more	15,000	10,500	2,000	1,400

* Based on the volume projected to be present within 6 months of the opening of the development or within 2 years of the opening of the highway.

** May be used if the 85th percentile speed of the major street traffic exceeds 40 miles per hour or the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

§ 212.303. Pedestrian-control signals.

Pedestrian-control signals provide special types of traffic signal indications for the exclusive purpose of controlling pedestrian traffic. These indications consist of the illuminated symbols of a walking person (symbolizing WALK) and an upraised hand (symbolizing DON'T WALK) or the illuminated words WALK and DON'T WALK.

(1) New pedestrian-control signals must use symbolized messages.

(2) Signals using word messages may be retained for their useful service life.

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Subchapter E.

TEMPORARY TRAFFIC CONTROL

§ 212.401. General.

This subchapter supplements the criteria in the MUTCD, and applies to highway construction, maintenance operations and utility work or incident management, either on a highway or so close to a highway that workers, equipment or materials encroach on the highway. Compliance with this subchapter does not relieve the contractor or others of their general responsibility for the protection of the public and the employees in work zones.

§ 212.402. Exempt work.

(a) *General*. The following types of work are exempt from the requirements contained in this chapter and in the MUTCD:

(1) Snow plowing and other snow or ice control operations.

(2) Refuse collection, trash collection, leaf pick-up, street cleaning, municipal street sweeping and residential lawn care.

(3) Operations which do not involve construction, maintenance operations or utility work, such as mail, newspaper, home fuel or other local deliveries.

(4) Studies or inspections of highway or utility features which may be completed without blocking any part of a travel lane.

(5) Construction, maintenance operations or utility work in areas outside the highway right-of-way; except when the work is so close to the highway that workers, equipment or materials encroach on the highway.

(6) Construction, maintenance operations or utility work where all workers, equipment or materials are behind a guide rail, more than 2 feet behind a curb or 15 feet or more from the edge of a roadway.

(7) Mowing operations on roads with less than 10,000 vehicles per day and where equipment does not encroach on the roadway.

(8) Traffic data collection.

(b) *Safety considerations*. While the types of work in subsection (a) are exempt from the specific traffic-control guidelines of this subchapter, they must be accomplished in a manner that will provide an adequate degree of safety for the workers and the public.

§ 212.403. Temporary traffic-control plans.

Plans for construction projects must either reference or include a temporary traffic-control (TTC) plan, which must consist of one of the following:

(1) A reference to a specific figure either in the MUTCD or in the *Work Zone Traffic Control Guidelines* (Department Publication 213) that properly depicts actual site conditions.

(2) A copy of a specific figure either in the MUTCD or the *Work Zone Traffic Control Guidelines* (Department Publication 213) which has been modified to depict actual site conditions and the necessary traffic-control requirements for the specific project.

(3) One or more detailed plan sheets or drawings showing the actual site conditions and the TTC requirements for the specific project.

§ 212.404. Sign supports.

(a) *Post-mounted signs*. Post-mounted signs or signs on fixed supports shall be installed in accordance with the *Signing and Marking Standards* (Department Publication 111M).

(1) Post-mounted sign installations must be of a breakaway or yielding design unless they are adequately placed behind guide rail or median barrier.

(2) Signs may not be mounted on existing utility poles or other structures unless the owner grants written permission and the signs can be properly positioned to convey their messages effectively.

(b) *Portable sign supports*. Portable sign supports must be of a type approved by the Department and listed in *Approved Construction Materials* (Department Publication 35).

§ 212.405. Regulatory speed limits.

(a) *General*. Regulatory speed limits in temporary traffic-control zones and in the area in advance of a work zone where traffic queues are anticipated may be established as follows:

(1) A regulatory speed limit up to 10 miles per hour below the normal speed limit may be established without an engineering and traffic study, provided the reduced regulatory speed limit is at least 25 miles per hour. Regulatory speed limits less than 25 miles per hour or more than 10 miles per hour below the normal speed limit require an engineering and traffic study and the prior approval of the Department for State-designated highways and approval of local authorities for local highways. To qualify for an additional speed limit reduction, the engineering and traffic study must indicate that traffic queues, erratic maneuvers, high vehicle crash rates or undesirable working conditions exist on the project or have existed on similar projects.

(2) Regulatory speed limits for temporary traffic control must be signed with either Speed Limit Signs (R2-1), Work Area Speed Limit Signs (R2-2-2) or variable speed limit signs. For speed limits that are 50 miles per hour or less, the signs must be spaced not greater than 1/2 mile apart throughout the limits of the reduced speed limit zone. Conflicting regulatory or warning signs must be removed, covered, folded or turned so that they are not readable or identifiable by oncoming traffic whenever the reduced regulatory speed limit is in effect.

(3) A Speed Limit Sign (R2-1) showing the speed limit on the section of highway immediately after the work zone must be positioned at the end of the reduced regulatory speed limit, except an R2-1 sign is not necessary if a Work Area Speed Limit Sign (R2-2-2) is used and an End Road Work Sign (G20-2) or End Work Area Sign (G20-3) is in place at the end of the regulatory speed limit.

(b) *Variable speed limits*. In an effort to avoid unnecessary speed restrictions, variable speed limits are encouraged in lieu of static signs. These speed limits may be remotely controlled, either manually or by a computer using hardware and software to monitor functions such as traffic speeds, volumes, densities and queues.

§ 212.406. Channelizing devices.

(a) *Device consistency*. Channelizing devices used to form a particular taper or a particular longitudinal line of devices must all be of a single type. For example, cones, drums, barricades and vertical panels may not be intermixed within the same taper or line, but the type of device being used in a taper may differ from the type of device being used in a longitudinal section.

(b) *Cones*. Cones may only be used as a channelizing device for operations where work is in active progress. The minimum height of cones is 28 inches except cones that are 18 inches high may be used to protect new pavement markings.

§ 212.407. Markings.

When lane line and center line pavement markings on more than 250 linear feet of highway are covered or destroyed by construction, maintenance, utility, permit or other work, they must be replaced, before ending work each day, with standard pavement markings, or with temporary pavement markings as included in the MUTCD.

§ 212.408. Impact attenuators.

The design and application of temporary impact attenuators must comply with the *Roadway Construction Standards* (Department Publication 72M) for concrete median barrier and other obstructions.

§ 212.409. Travel lane rumble strips.

Temporary bituminous rumble strips may be used in the travel lanes to provide an audible warning to alert drivers of a potentially dangerous situation including a median crossover, lane reduction and congested area. Recommended rumble strip designs are available from the Bureau of Highway Safety and Traffic Engineering. When used, the rumble strip patterns must extend onto the shoulder whenever possible to discourage drivers from making erratic maneuvers in an attempt to bypass or avoid the rumble patterns.

§ 212.410. Delineators.

The application of delineators must comply with the *Signing and Marking Standards* (Department Publication 111M).

§ 212.411. Flaggers.

(a) *Helmet*. In addition to the requirements of the MUTCD, flaggers shall wear a protective helmet.

(b) *Mechanical flaggers*. Mechanical flaggers or mannequins, which look and act somewhat like flaggers, may not be used to alert, slow or stop traffic.

§ 212.412. Flagger signaling devices.

A red flag shall only be used to control traffic in emergencies when a Stop/Slow Paddle (R21-10) is not available or at intersections where a single flagger is used within an intersection.

§ 212.413. Portable traffic-control signals.

Portable traffic-control signals may be used to control one-lane, two-way traffic. They may also be used for other special applications such as a highway or street intersection with a temporary haul road or equipment crossing. The design and application of portable traffic-control signals must conform with the applicable requirements of the Department's certificate of approval issued to the manufacturer for portable traffic-control signals, and with any special requirements defined in the TTC Plan. For these applications, it may be desirable to use traffic-actuated or manual control to compensate for unbalanced traffic flows.

§ 212.414. Emergency work.

(a) *General*. Emergency work may be initiated without prior compliance with the traffic-control provisions specified by this subchapter, provided the foreman or lead worker implements all available safety measures, and the traffic control is brought into compliance with this subchapter as soon as possible. The foreman or lead worker may use flares as attention-getting and warning devices.

(b) *Utility work*. Emergency repair for utility work may be initiated under this section or repair to a utility facility undertaken under Chapter 459 (relating to occupancy of highways by utilities) to repair damage resulting from a vehicle crash or collision with the facility, a failed component or storm damage. Utility service connections or disconnections unrelated to a vehicle crash, a failed component, or storm damage must otherwise comply with this subchapter.

(c) *Expediting emergency work*. Emergency work may be completed without installation of work zone traffic-control devices required by this subchapter, if one of the following conditions is met:

(1) Review of the condition indicates that the emergency work can be completed in less time than it would take to install the temporary traffic-control devices, and the work or condition would not create a significant potential hazard.

(2) Temporary traffic control has been set up and it is found that additional traffic-control devices are desirable, but that it would take longer to obtain and install additional traffic-control devices than it would to complete the work.

§ 212.415. Type D Arrow Panels.

Type D Arrow Panels shall only be used on vehicles during short-term stationary, short duration or mobile operations.

§ 212.416. Shadow vehicles.

When used with a truck-mounted attenuator (TMA), the shadow vehicle must be loaded to a weight recommended by the manufacturer of the TMA.

§ 212.417. Flashing warning lights.

If used, flashing warning lights may not be used in a series unless the spacing between successive flashing lights is at least 250 feet.

§ 212.418. Good management principles.

Agencies administering highway construction, utility work and maintenance operations shall mandate the application of the following good management principles:

(1) Keep the temporary traffic-control zones as short as practical to avoid long stretches with no work activity.

(2) Minimize lane restrictions.

(3) Remove all traffic-control devices as soon as practical after the construction, maintenance or utility operation is complete.

§ 212.419. Special controls in work zones.

(a) *General*. Special signing required in 75 Pa.C.S. §§ 3326, 3365, 4309, 6123 and 6123.1 will be in addition to the traffic-control devices required by the MUTCD and shall be installed in accordance with this section.

(b) *Application*. Signing under this section is discretionary in the following work zones:

(1) Short duration work, where the operation will be completed in less than 1 hour.

(2) Mobile operations, where the work moves intermittently or continuously.

(3) Stationary work where the daily duration of the construction, maintenance or utility operation is less than 12 hours and all traffic-control devices are removed from the highway at the completion of the daily operation, including all advance warning signs.

(4) Work along highways other than expressways or freeways where the normal speed limit is 45 miles per hour or less.

(5) Work in response to emergency work or conditions such as a major storm.

(c) *Work Zone--Turn on Headlights Sign (R22-1)*. The Work Zone--Turn on Headlights Sign (R22-1) shall be erected as the first sign on each primary approach to the work zone, generally at a distance of 250 to 1,000 feet prior to the first warning sign. On high-speed roadways including all expressways and freeways, the larger advance distances should be used. If work begins at or near a border to this Commonwealth, the R22-1 signs should be installed within this Commonwealth.

(d) *Active Work Zone When Flashing Sign (W21-19)*. The Active Work Zone When Flashing Sign (W21-19) shall be erected as close as practical to the beginning of the active work zone.

(1) The sign should not be erected within a transition or at a location where workers are put at risk when they may need to turn the light on and off.

(2) When a construction, maintenance or utility project has more than one active work zone and the active work zones are separated by a distance of more than 1 mile, signs for each active work zone shall be erected.

(3) The W21-19 signs shall be installed on temporary sign posts or on Type III barricades, and a white Type B high-intensity flashing light must be attached to the upper portion of each W21-19 sign. The light shall be activated only when workers are present, and deactivated when workers are not anticipated during the next 60 minutes.

(e) *End Active Work Zone Sign* (W21-20). The End Active Work Zone Sign (W21-20) shall be erected immediately at the end of each active work zone, except this sign is not necessary if either the End Road Work Sign (G20-2a) or the End Work Area Sign (G20-3) is installed at the end of the active work zone.

(f) *Work zones on expressways or freeways*. When the work zone is on an expressway or freeway, appropriate signs and lights identified in subsections (c), (d) and (e) at on-ramp approaches to the work zone shall be installed.

(g) *Portable changeable message sign*. A portable changeable message sign (PCMS) may be used in lieu of the R22-1, W21-19 or W21-20 signs.

(h) *Speed display sign*. In Interstate highway work zones with a project cost exceeding $300,000, a speed display sign shall be installed on each mainline approach to the work zone to inform motorists of their speed.

(1) The speed display sign must display the motorist's speed in miles per hour in numerals at least 18 inches in height.

(2) As an alternative, a portable changeable message sign (PCMS) may be equipped with radar and programmed to display vehicles speeds.

(3) PCMSs may also flash appropriate messages such as "YOU ARE SPEEDING" or "SLOW DOWN." The signs shall be placed 1/2 to 1 mile in advance of the physical work zone.

Subchapter F.

TRAFFIC CONTROLS FOR SCHOOL AREAS

§ 212.501. School zone speed limits.

(a) *Establishment.* A 15 miles per hour school zone speed limit may be established in a school zone during the normal hours that walking students are arriving at or leaving school, under 75 Pa.C.S. § 3365(b) (relating to special speed limitations).

(1) To establish a school zone, local authorities shall be responsible to prepare and submit a drawing showing the locations where students walk along or across roadways that are adjacent to school property, the hours that students are going to or from school and the proposed limits for the school zone to the Department for approval.

(2) The Department is responsible for approving the establishment of all school zones, including the locations and hours of operation, except local authorities shall be responsible for approving school zones at the following locations:

(i) On local highways when the municipality has received municipal traffic engineering certification under Chapter 205 (relating to municipal traffic engineering certification).

(ii) On State-designated highways when the municipality has entered into an agreement with the Department thereby transferring to the local authorities the authority to install traffic-control devices without specific Department approval.

(iii) On highways in cities of the first and second class, except not on expressways.

(3) The duration of a 15 miles per hour school zone speed limit should be only long enough to include the time that walking students routinely arrive at or leave school.

(b) *Posting*. A school zone speed limit shall be posted on official traffic-control devices as follows:

(1) At the beginning of the school zone speed limit, one of the following signs or groups of signs shall be posted either on the right side of the roadway or over the roadway:

(i) A Speed Limit Sign (R2-1) with the appropriate school zone speed limit, with a School Panel (S4-3) mounted above the Speed Limit Sign (R2-1) and a When Flashing Sign (S4-4) mounted below the Speed Limit Sign (R2-1), with two flashing speed limit sign beacons.

(ii) A Speed Limit Sign (R2-1) with the appropriate school zone speed limit, with a School Panel (S4-3) mounted above the Speed Limit Sign (R2-1) and a Restricted Hours Panel (R10-20A) mounted below the Speed Limit Sign (R2-1).

(iii) A School Speed Limit When Flashing Sign with a blank-out "15" and flashers as illustrated in the *Traffic Signal Design Handbook* (Department Publication 149M).

(2) An End School Zone Sign (S5-2) shall be posted on the right side of the roadway to define the end of the school zone speed limit.

(3) The limits of a school zone may extend beyond the school property lines to improve the sight distance or to encompass a school crosswalk, except that the length of the zone may not be greater than 1,600 feet.

Subchapter G.

TRAFFIC CONTROLS FOR BICYCLE FACILITIES

§ 212.601. Shared road facilities.

Where there is a need to warn motorists to watch for bicyclists traveling along the highway, the Share the Road Sign (W15-3) sign may be used instead of the Bicycle Warning Sign (W11-1) and the Share the Road Plaque (W16-1) as provided in the MUTCD.

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Subchapter H.

SPECIAL EVENTS

§ 212.701. Processions, assemblages and special activities.

(a) *Criteria*. The closure or partial closure of a highway for a procession, assemblage or a special activity, may be permitted on local roadways by local authorities and on State-designated highways by the Department if the following criteria are satisfied:

(1) *Conventional highways and expressways*.

(i) An alternate route, which is not more than 5 miles longer or five times greater in length than the normal travel distance, is established to detour traffic around any closed routes, except an alternate route is not required if one of the following exists:

(A) The highway to be closed is not a numbered traffic route and is primarily used by local drivers who are familiar with the alternate route.

(B) The highway is only partially or periodically closed and police control can safely maintain traffic on the remainder of the highway.

(C) The highway closing is for less than 20 minutes and excessive traffic backup will not occur during the closing.

(ii) The local authorities provide adequate detour signing or police controls for the rerouting of traffic along the alternate route if required.

(iii) The highway closure or partial closure will not adversely affect adjacent properties.

(iv) A review of previous, similar closures shows no substantial problems or citizen complaints.

(2) *Freeways*.

(i) The freeway has a minimum of two lanes to move traffic in each direction of flow.

(ii) If a procession, it will orderly and uniformly move along the highway and will be easy to control and regulate by police officers.

(iii) If a procession or assemblage, it will use a maximum of one lane of the highway and police officers can safely maintain traffic on the remainder of the highway.

(iv) Delays for traffic entering or leaving the highway at ramps will not be more than 5 minutes and uniformed police officers will control all delayed traffic.

(v) The Secretary and the Commissioner of the State Police have determined that the procession, assemblage or special activity is in the National, State or regional interest or has National, State or regional significance and can be conducted with greater safety for motorists and procession or special activity participants by using the freeway.

(b) *Use of State-designated highways*. The Department may issue a permit for a procession, assemblage or special activity on a State-designated highway if the criteria in subsection (a) and the following requirements are satisfied:

(1) On conventional highways and expressways, the district executive may issue a permit for processions, assemblages or special activities. The permit request must be made in writing by the sponsor, and be received by the district executive at least 3 weeks before the proposed event. The request must include the following items as applicable, a copy of which the sponsor must also submit to the Commissioner of the State Police:

(i) A map of the proposed routing showing all State Route (SR) numbers and the names of all highways, including terminal points for the special activity.

(ii) The known or anticipated number and type of vehicles or pedestrians that will be in the event.

(iii) The purpose, the proposed date and rain date and the time and duration.

(iv) A statement that the sponsor will agree to reimburse the Commonwealth for all costs for police escort and traffic-control services.

(v) A copy of the letter sent from the sponsor of the event to each municipality in which the event is to occur, requesting permission to allow the event.

(vi) A copy of a letter from each municipality in which the event is to occur indicating the following:

(A) Approval of the municipality allowing the sponsor to conduct the event.

(B) A statement that the municipality will agree to fully indemnify, save harmless and, if requested, defend the Commonwealth, Commonwealth departments and their officers, agents and employees from and against claims, suits or actions for injury, death or property damage arising from or because of the acts or omissions of the sponsor, its officers, agents or employees.

(vii) A statement that the sponsor will fully indemnify, save harmless and, if requested, defend the Commonwealth, Commonwealth departments, and their officers, agents and employees from and against claims, suits or actions for injury, death or property damage arising from or because of the acts or omissions of the sponsor, its officers, agents or employees. The sponsor shall also name the Department as an additional insured on its liability policies. The liability insurance policies must be occurrence based and the insurance certificate must indicate that the insurance is occurrence based.

(2) On freeways, the Secretary may issue a permit for processions, assemblages or special activities. The permit request must be made in writing by the sponsor, and be received by the Secretary at least 3 weeks before the proposed partial highway closure. The request must include the following items as applicable, a copy of which the sponsor also submits to the Commissioner of the State Police:

(i) A map showing the location of the assemblage or the proposed routing of the procession or special activity.

(ii) The known or anticipated number and type of vehicles or pedestrians that will be in the event.

(iii) The estimated speed of travel of the procession or special activity.

(iv) The purpose, the proposed date and rain date, and the time and duration.

(v) The reasons the special event should use a freeway, including the safety aspects to both motorists and procession participants.

(vi) A statement that the sponsor of the procession will agree to reimburse the Commonwealth for all costs for police escort and traffic-control services.

(vii) A statement that the sponsor of the special event will fully indemnify, save harmless and, if requested, defend the Commonwealth, Commonwealth departments and their officers, agents and employees from and against claims, suits or actions for injury, death or property damage arising from or because of the acts or omissions of the sponsor, its officers, agents or employees. The sponsor shall also name the Department as an additional insured on its liability policies. The liability insurance policies must be occurrence based and the insurance certificate must indicate that the insurance is occurrence based.

(c) *Use of local roadways*. Requests to close a local roadway for a procession, assemblage or special activity must be made in writing to the local authorities at least 3 weeks before the anticipated road closure. If the procession, assemblage or special activity also requires the closure of State-designated highways, the request must be made in writing to the local authorities at least 2 months before the anticipated road closure.

Appendix

(Publication 212)

1. Purpose and authority.

The purpose of this appendix is to supplement Chapter 212 by providing additional guidance information and references to other documents and resources.

2. Engineering and Traffic Study Elements

(1) ***Crash analysis*****.** This is the orderly review and evaluation of the root causes of crashes involving vehicles or pedestrians at a given location or within a given area along a highway. The term "crash" only includes reportable crashes as defined in Chapter 212, except when the term "nonreportable crash" is explicitly used.

A crash analysis may include the development of a collision diagram and shall consider the following items:

- Total number of crashes during last 5 years.
- Number of crashes by type or causation factor.
- Vehicle type involved.
- Pedestrian involvement.
- Type of traffic control present.
- Roadway or intersection geometrics.
- Cause of crash.
- Time of crash.
- Environmental conditions—rain, snow, fog, ice, clear, sunny, dry roadway, wet roadway, snow on roadway, ice on roadway, and so forth.

Crash rate – is calculated from the number of all reportable crashes per million vehicle miles traveled along a specific segment of roadway shown below:

$$R = \frac{(C * 1{,}000{,}000)}{(T * V * L)}$$

Where:
R = Crash rate per *million vehicle miles traveled*
C = Number of crashes at the study location; within a 5 year time period
T = Time period when crashes are occurring (days) (ex: 1825 days = 5 years)
V = Average Daily Traffic (ADT)
L = Length of road segment (miles)

Fatality crash rate – is calculated from the number of fatalities per 100 million vehicle miles traveled along a specific segment of roadway shown below:

$$R = \frac{(C * 100{,}000{,}000)}{(T * V * L)}$$

Where:
R = Fatality crash rate per *100 million vehicle miles traveled*
C = Number of crashes at the study location; within a 5 year time period
T = Time period when crashes are occurring (days) (ex: 1825 days = 5 years)
V = Average Daily Traffic (ADT)
L = Length of road segment (miles)

Comparing crash rates to the homogenous table – the homogenous crash rate table for road segments is provided each year by Bureau of Highway Safety and Traffic Engineering. This table evaluates average crash rates for various classifications of roadway according to its urban or rural classification, access control, divider type, total width, and ADT range. The homogenous rate table is useful for determining how the crash rate on a section of road compares to the crash rates of other similar roadways within the Commonwealth. If the crash rate on a study section of roadway is significantly higher than the homogenous rate, the study section can be considered to be of concern and may require further analysis.

(2) ***Acceleration lane*****.** Reference: The length of the acceleration lane should be determined using the appropriate tables in Department's Design Manual, Part 2.

(3) ***Alternate route*****.**

Availability of alternate route. A review of the highway network to determine if an alternate route or routes exist.

Evaluation of alternate route. A review of the alternate route or routes to determine if it is capable of handling the additional traffic. The review shall consider the following:

- The structural capability of supporting the kinds and classes of traffic to be detoured.

- The capability of safely accommodating the additional traffic volumes at a reasonable level of service and providing access to intermediate points of interest, without an excessive increase in the overall length.

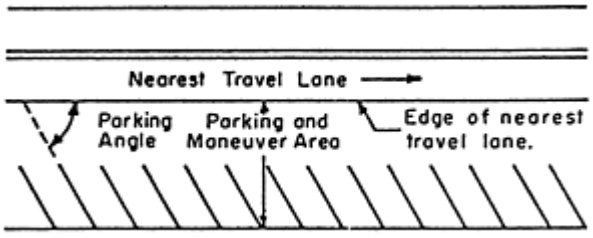
- Restrictions along the alternate route that would create problems for certain kinds or classes of vehicles. For example: steep grades, sharp curves, signalized intersections already operating at maximum capacity, substandard intersection geometrics that would restrict turning movements of certain kinds and classes of vehicles, narrow or one-lane bridges or underpasses and underpasses with substandard vertical clearances.

- The compatibility of the area—type of area, roadside development, and so forth—the alternate route traverses.

(4) ***Angle parking measurements.***

Parking angle. The measurement of the angle between the edge of the roadway and the edge of the angle parking stalls as noted in diagram A *Parking and maneuver area.* The transverse measurement between the front edge of the angle parking stall and the nearest edge of the travel lane as indicated in Diagram A

Diagram A.



(5) ***Arrival and departure hours of students.*** Determine the periods of time during a normal school day that students arrive and leave the school property. Include several separate time periods if classes for different grades start and end at different times and if students leave the school property to walk home for lunch. Include the hours of all walking students' arrivals and departures. This information may be determined through observation at the school and recording the time periods of student arrivals and departures, or the time periods may be determined from school officials based on scheduled school hours.

(6) ***Capacity analysis.*** A common measure of capacity analysis is level of service. Level of service denotes any one of a great number of differing combinations of operating conditions that may occur on a given lane or roadway when it is accommodating various traffic volumes. It is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience and operating cost. Capacity analysis studies shall be made in accordance with the Highway Capacity Manual, current edition, or the Department's Design Manual, Part 2.

(7) ***Gap study for school children.*** A review of the gaps in traffic to determine if the frequency and duration of the gaps is sufficient to permit the safe crossing of school children. Reference: *A Program for School Crossing Protection, Institute of Traffic Engineers,* current edition.

(8) ***Geometric review.*** The following items should be considered in a geometric review:

Intersection alignment. An orderly review of the physical design and configuration of the intersection. This review should consider at least the following items:

- The number of intersection approaches.
- The presence of horizontal or vertical curves on the intersection approaches which create major sight distance problems which may necessitate additional traffic control such as a reduced speed limit or a multiway stop.
- The presence of skewed intersections which create blind spots for approaching motorists.
- The capability of existing channelization to accommodate the kinds and classes of traffic.
- The presence of approach grades in excess of 3% which may necessitate abnormal stopping distance and time required for crossing vehicles to clear the intersection.

Number and spacing of intersections. A physical count of the total number of intersections and driveways along the study section of roadway and their usage.

Railroad grade crossings. An orderly review of railroad grade crossings shall consider at least the following:

- The adequacy of the intersection sight distance for drivers at a nonsignalized railroad grade crossing to see an approaching train and to bring their vehicle to a stop in advance of the crossing.

- The presence of a train preemption phase at signalized highway intersections within 200 feet of the grade crossing to eliminate highway vehicles from being queued on a railroad grade crossing or to clear the railroad grade crossing when a train is approaching.

Roadway cross section. A review of the roadway's crown and superelevation and presence or absence of shoulders, shoulder dropoff and sidewalks.

Roadway surface features. A qualitative review of the roadway's riding surface to consider holes, dips, bumps, rutting and other factors.

Roadway width. A transverse measurement of the roadway between the curbs or the two edges of the roadway, exclusive of shoulders and sidewalks, but including parking lanes and parking maneuver areas. In the event that a highway includes two or more separate roadways, the term ''width'' refers to each separately.

Roadway horizontal and vertical alignment. An orderly review of the roadway's grades, length of vertical curves and the degree of the horizontal curves and turns. Reference: *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, current edition, or the Department's Design Manual, Part 2.

Roadside obstructions. An orderly review of the roadside environment related to effects on sight distance and the lateral movement of vehicles and any fixed objects within the clear zone.

(8) ***Parallel streets.*** A review of the parallel streets adjacent to a proposed one-way street to determine if the parallel street can accommodate the volume and kinds and classes of vehicles which would normally use the proposed one-way street. This review of the parallel streets should consist of at least the following to determine if acceptable parallel streets exist:

- Weight restrictions.
- Lateral width restrictions, especially on turns.
- Vertical clearance limitations.
- Capacity analysis.
- Access to premises.
- Character of neighborhood.

(10) *Past experience.*

Highway closure for processions, assemblages or special activities. This review should consider the following items:

- All traffic crashes during previous similar closures.
- Documented or observed traffic congestion problems, including the delay of through motorists.
- Written or oral citizen complaints.

Highway breakup. This review should consider previous highway breakups and restrictions for the subject road or for other similarly constructed roads during the same climatic conditions.

(11) *Pavement analysis.* A thorough review of the subbase, base and wearing courses of a roadway by a qualified engineer, with consideration being given to the type, speed and volume of traffic and weight of the vehicles using the roadway. In place of a thorough analysis of the pavement, it may sometimes be permissible to rely on previous experience of the pavement or similar pavements during similar climatic conditions.

(12) *Pedestrian volumes.*

(i) Pedestrian volume studies are often important in the establishment of speed restrictions and multiway stops, the hours that school zones are effective, and the installation or operation of traffic signals. These studies normally consist of manual counts of the total number of pedestrians crossing each leg of an intersection, but sometimes they may count the number of crossings at mid-block crosswalks or the number of pedestrians walking on or along the roadway when sidewalks are not available. Pedestrian volumes should normally be tallied in 15-minute intervals. Intersection pedestrian studies are normally made in conjunction with other traffic volume studies.

(ii) A further classification of pedestrian volume is often beneficial especially for traffic signal studies. Typical classifications are: children less than 12 years old and adults; school children and nonschool children; handicapped or elderly people.

(iii) Pedestrian studies should be conducted in accordance with the methods described in the Institute of Transportation Engineers' *Manual of Traffic Engineering Studies, current edition*.

(13) ***Roadside development.*** An orderly review of the number, type and size of businesses, residences or other developments along the highway which generate traffic having the right of access onto the highway. Interference resulting from traffic turning into or out of driveways to the roadside development typically results in lower capacity on the highway and an increase in crashes.

(14) ***Roadside obstructions.*** An orderly review of the roadside environment which either decreases the drivers' sight distance, restricts lateral movement on the roadway or generates potential hazards if the vehicle leaves the highway surface.

(15) ***School route plan.*** A school route plan is a drawing showing the recommended travel paths of school children. This plan should be developed by the school and municipal officials responsible for school pedestrian safety and consist of a simple map showing the streets, the school, existing traffic controls and established school routes and crossings. The school routes should be planned to take full advantage of the protection afforded by existing traffic controls and intersections with sufficient gaps in the traffic to safely permit student usage. The planning may make it necessary for children to walk a nondirect, longer distance to an established school crossing located where there is existing traffic control, and to avoid the use of a potentially hazardous crossing where there is no existing control. Reference: *Manual on Uniform Traffic Control Devices*, Federal Highway Administration, current edition.

(16) ***Sight distance.***

(i) *General.* Sight distance, in general, refers to the maximum distance that a driver can see objects such as traffic signs, pavement markings, fixed objects, vehicles and pedestrians. Particular types of sight distance are further clarified in subparagraphs (ii)—(iv).

(ii) *Corner sight distance.* Corner sight distance refers to the maximum length of highway along which a driver stopped at an intersection or driveway can continuously see another vehicle approaching on another roadway or driveway. For the purpose of measuring the available corner sight distance, the height of both the driver's eye and the approaching vehicle should be assumed to be 3.50 feet above the road surface. In addition, the driver's eye should be assumed to be 10 feet from the near edge of the intersecting roadway or driveway or the near edge of the closest travel lane in the event there is parking permitted on the intersecting roadway or driveway.

(iii) *Passing sight distance.* Passing sight distance is the length of highway upon which a driver can at all times see an approaching vehicle. For the purpose of measuring the available passing sight distance, the eye height of the driver and the height of the approaching vehicle are assumed to be 3.50 feet above the road surface. Minimum passing sight distance values which will allow a vehicle to complete a pass before meeting an opposing vehicle—which might appear after the pass began—shall be as follows:

85th percentile speed (mph)	*Minimum passing sight distance (feet)*
30	500
35	550
40	600
45	700
50	800
55	900
60	1000

(iv) *Stopping sight distance.* Stopping sight distance is the length of highway over which an object is visible to the driver at all times.

- For the purpose of measuring the available stopping sight distance at a particular location, the driver's eye height is assumed to be 3.50 feet above the roadway surface and the object height is assumed to be 2.0 feet above the roadway surface.

- Minimum acceptable stopping sight distance values, using typical friction factors for wet pavements, from, *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, current edition, are indicated in the following table:

Table B - Minimum Stopping Sight Distance (feet)

85th Percentile Speed (mph)	*Coefficient of Friction*	*Grade = -10%*	*Grade = -5%*	*Grade = 0%*	*Grade = +5%*	*Grade = +10%*
25	0.38	166	155	147	140	135
30	0.35	230	210	196	185	177
35	0.34	299	269	249	233	221
40	0.32	389	345	314	291	274
45	0.31	487	425	383	353	330
50	0.30	600	517	462	422	392
55	0.30	706	605	538	490	454
60	0.29	852	721	634	573	528

- The stopping sight distance is computed from the following formula:

$$SSD = 1.47VT + V^2 / 30(f \pm g)$$

Where:
SSD = Stopping Sight Distance (feet).
V = 85th Percentile Speed (miles per hour).
T = Perception Time of driver (2.5 seconds).
f = Coefficient of Friction for Wet Pavements.
g = Percent of Grade of Roadway divided by 100.

(17) *Speed data*.

(i) *Speed limit.* The maximum speed limit as provided in 75 Pa.C.S. § § 3362 and 3363 (relating to maximum speed limits; and alteration of maximum limits) and posted in accordance with Chapter 212 (relating to official traffic control devices).

(ii) *Spot speed.* The instantaneous measure of travel speeds at a specific location by an electronic or electrical device such as radar, or a calculated average speed over a relatively short section of roadway.

- The following guidelines shall be established for taking spot-speed samples:

    - In urban districts, studies should be taken at about .5 mile intervals or at locations where traffic or roadway features change. In rural areas, studies should be made at intervals up to about 2 miles apart if traffic or roadway features are consistent.

    - The study sites should be located on tangent or midblock sections of roadways in order that the speed distribution is not influenced by stop signs, traffic signals, curves and other traffic flow interruptions.

    - Samples should consist of at least 100 observations, except 50 observations is acceptable on low volume highways. Samples should be composed of randomly selected vehicles to ensure a reliable speed distribution. The percentage of trucks in the sample should be approximately the same as the percentage of trucks in the traffic stream.

- The following statistical values may be determined from an adequate size sample of spot speeds in accordance with the *Manual of Traffic Engineering Studies, Institute of Transportation Engineers*, current edition:

    - Average speed.

    - The 85th percentile speed.

(iii) *Safe-running speed.* The safe-running speed for a portion of a highway is determined by making a minimum of five test runs in each direction and periodically recording the running speed at different locations while driving at a speed which is reasonable and prudent considering the spacing of intersections, roadside development, sight distance, and so forth. The safe-running speed for a section of highway is the average test run speed.

(iv) *Recommended speed for curves*. The recommended speed for curves may be determined by making several trial runs through the curve in a car equipped with a ball-bank indicator in accordance with the following guidelines:

- The ball-bank indicator should be transversely mounted in the car and positioned so as to give a ‘‘zero reading’’ when the car is level.

- The speed of the first trial run should be a multiple of 5 miles per hour and should be selected to provide a ball-bank indicator reading less than the following appropriate value from *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials, current edition:

Table C

Posted Speed Limit (mph)	*Ball-bank indicator (degrees)*
20 or less	14
25 and 30	12
35 or more	10

- Succeeding observations should be made at increasing 5-mile-per-hour increments until the reading on the ball-bank indicator equals or exceeds the indicated degree in Table C. The recommended speed for the curve is the highest speed which did not exceed the indicated degree in Table C.

(v) *Design speed.* The speed used in designing the roadway which controls the minimum radius of curves, superelevation, length of vertical curves, sight distance, cross section, and so forth. It is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern. The design speed may be derived by considering the elements listed in this subparagraph with reference to *A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials*, current edition, or the Department's Design Manual, Part 2.

(vi) *Travel time and delay.*

- Travel time varies inversely with travel speed and is a good indicator of the average speed and level of service that is being provided on a given route. The difference between travel times over a route during low traffic volumes and during high traffic volumes is operational delay. This delay consists of such items as time consumed at a stop sign waiting for cross traffic to clear; time consumed at an uncontrolled intersection awaiting the right-of-way; and time losses resulting from congestion, interference with parked vehicles, parking maneuvers and waiting for turning traffic.

- Delay is the time consumed when the traffic is stopped or greatly impeded and is usually expressed in seconds per vehicle. Delay may be either fixed delay, which is normally experienced by vehicles during low traffic volumes at stop signs or traffic signals, or operational delay, which is caused by the interference by other traffic.

- Travel time and delay studies shall be conducted in accordance with the methods described in the *Manual of Transportation Engineering Studies*, Institute of Transportation Engineers, current edition.

(18) ***Structural analysis*****.** A determination of load capacity rating in accordance with the applicable guidelines contained in the most recent edition of the Department's *Bridge Rating Manual*.

(19) ***Traffic signals*****.**

(i) *Phasing and signal display.* Traffic-signal phasing refers to the different segments of the signal cycle allocated to traffic movements receiving the right-of-way. The signal display refers to traffic-signal indications which are provided for vehicles and for pedestrians. The phasing and signal display should always conform with the approved signal permit.

(ii) *Justification for signal installation.* Traffic-signal warrants, as contained in § 212.302 (b) and the MUTCD, current edition.

(20) ***Traffic volumes*****.** Traffic volume studies should be conducted in accordance with the *Manual of Transportation Engineering Studies*, Institute of Transportation Engineers, current edition. The following types of traffic volume studies are frequently used:

(i) *ADT.* The total volume of traffic during a number of whole days—more than 1 day and less than 1 year—divided by the number of days in that period.

(ii) *Peak-hour traffic volume.* The highest number of vehicles passing over a section of a lane or a roadway during 60 consecutive minutes of a normal day. The term ''peak hours'' refers to the peak-hour traffic volume for the morning and the peak-hour traffic volume in the afternoon.

(iii) *Turning movements.* The ADT or peak-hour traffic volume at an intersection categorized to show the number of vehicles turning left, going straight or turning right.

(iv) *Kinds and classes.* Categories of vehicles which may reasonably be segregated from one another for some purpose relating to traffic control, maximum safe weight of structure or pavement, and the like. Common vehicular categories are type, weight and number of axles.

(21) ***Type of highway*****.** Classification of highway by such factors as the number of travel lanes and type of access control; examples include two-lane conventional roadway, expressway and freeway.

(22) ***Intersection delay*****.** Intersection delay should be determined in accordance with the procedure for determining intersection delays in the *Manual of Transportation Engineering Studies*, Institute of Transportation Engineers, current edition, or the technical report, FHWA R. D.-76-135, *A Technique for Measurement of Delay at Intersections*, September, 1976.

References to useful documents

- MUTCD 2003: http://mutcd.fhwa.dot.gov/pdfs/2003/pdf-index.htm
- Older Drivers – "Travel Better, Travel Longer: http://mutcd.fhwa.dot.gov/pdfs/PocketGuide0404.pdf
- Retroreflective Sheeting ID Guide: http://safety.fhwa.dot.gov/roadway_dept/retro/sign/retrore_sheet_id.htm
- Crash Facts and Statistics: http://www.dot.state.pa.us/Internet/Bureaus/pdBHSTE.nsf/InfoFbListing?OpenForm
- Pennsylvania Driver's Manual: https://www.dot3.state.pa.us/pdotforms/pa_forms_manuals/padriversman.pdf
- PennDOT's pavement marking, RPMs & Delineators standards, TC-8600 Series: http://www.dot.state.pa.us/Internet/Bureaus/pdBHSTE.nsf/BHSTEHomepage?OpenFrameset Then click on Traffic Control Standards.
- Traffic Calming: http://www.dot.state.pa.us/Internet/Bureaus/pdBHSTE.nsf/BHSTEHomepage?OpenFrameset Then click on Traffic Calming Handbook.