

## **Part VII. TRAFFIC CONTROLS FOR SCHOOL AREAS**

### **A. GENERAL**

#### **7A-1 Need for Standards**

Traffic control in school areas is a highly sensitive subject. If all the demands of parents and others were met, there would have to be many more police and adult guards for school duty; and many more traffic signals, signs, and markings. Such demands, however, are not always in line with actual needs.

Analyses often show that at many locations, school crossing controls requested by parents, teachers and other citizens are unnecessary and costly and tend to lessen the respect for controls that are warranted. It is therefore important to stress the point that regardless of the school location, safe and effective traffic control can best be obtained through the uniform application of realistic policies, practices and standards developed through engineering studies.

Pedestrian safety depends in large measure upon public understanding of accepted methods for efficient traffic control. This principle is never more important than in the control of pedestrians and vehicles in the vicinity of schools. Neither school children nor motorists can be expected to move safely in school zones unless they understand both the need for traffic controls and the ways in which these controls function for their benefit.

Non-uniform procedures and devices cause confusion among pedestrians and motorists, prompt wrong decisions, and can contribute to accidents. In order to achieve uniformity of traffic control in school areas, comparable traffic situations must be treated in the same manner. Each traffic control device and control method described in this part fulfills a specific function related to specific traffic conditions.

The type of school area traffic control used, either warning or regulatory, must be related to the volume and speed of traffic, street width and the number of children crossing. For this reason, the traffic controls necessary in a school area located on a major highway would not be needed on a residential street away from heavy traffic. Yet, the important point to be made is that a uniform approach to school area traffic controls must be developed to assure the use of similar controls for similar situations (which promotes uniform behavior on the part of motorists and pedestrians).

A school route plan for each school serving elementary and kindergarten students is useful in developing uniformity in the use of school area traffic controls. The plan, developed by the school and traffic officials responsible for school pedestrian safety, consists of a simple map showing streets, the school, existing traffic controls, established school routes, and established school crossings. A typical school route plan map is shown in figure 7-1.

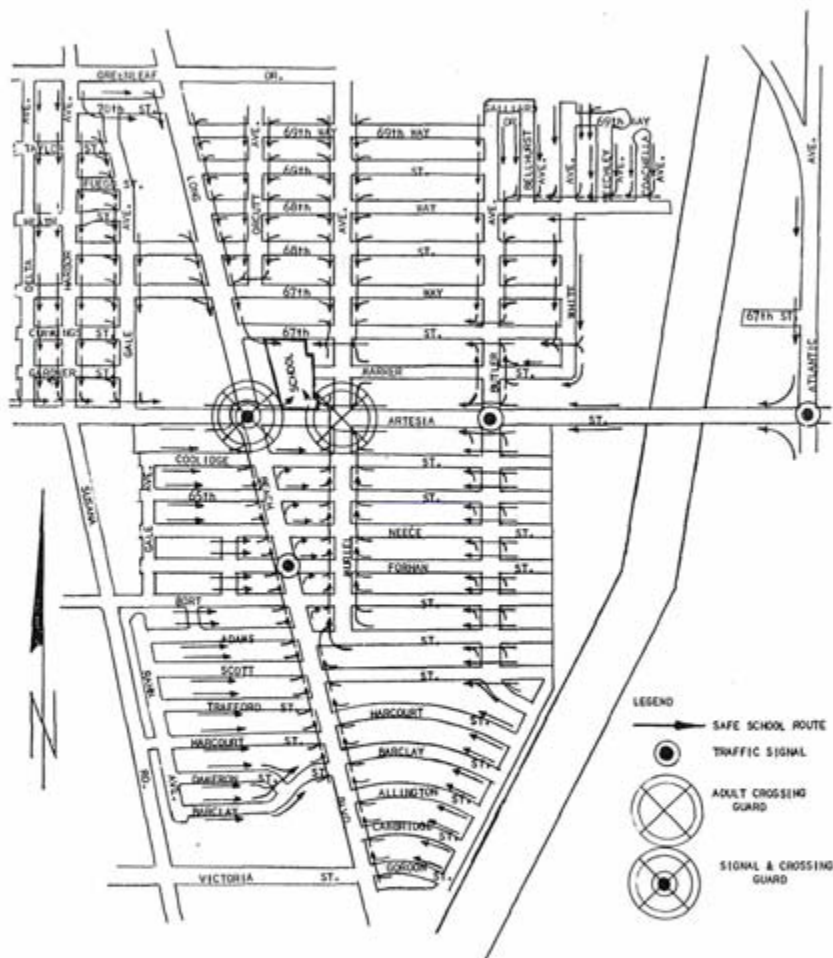


Figure 7-1. Typical school route plan map.

The plan permits the orderly review of school area traffic control needs, and the coordination of school pedestrian safety education and engineering activities.

The following treatment of signs, signals, and markings for school areas is intended to provide in effect a comprehensive handbook in

its field, to be applied as a national standard. It establishes general principles to be observed in designing, installing, and maintaining traffic control devices in school areas, and prescribes specific standards where possible. While it constitutes a part of this Manual, it is designed so that it can be used independently, for the convenience of those who are not concerned with the many other phases of traffic control. To that end some material concerning specifications and devices having more general application is repeated here from preceding parts of this Manual.

Reference to reduced speed signs for school areas and crossings is included in this Manual solely for the purpose of standardizing signing for these zones.

However, this is not to be considered an endorsement of the practice of mandatory reduced speed zones for all school areas and crossings.

### **7A-2 School Routes and Established School Crossings**

School routes should be planned to take advantage of the protection afforded by existing traffic controls. This planning criterion may make it necessary for children to walk a non-direct, longer distance to an established school crossing located where there is existing traffic control, and to avoid the use of a direct, hazardous crossing where there is no existing traffic control.

Factors to be considered when determining the feasibility of requiring children to walk a longer distance to a crossing (at a location with existing traffic control) are:

1. The availability of adequate, safe sidewalks or off roadway sidewalk areas to and from the location with existing control,
2. The number of children using the crossing,
3. The age levels of the children using the crossing, and
4. The total extra walking distance.

### **7A-3 School Crossing Control Criteria**

Alternate gaps and blockades are formed in the vehicular traffic stream in a pattern peculiar to each crossing location. For safety, a pedestrian must wait for a gap in traffic that is of sufficient duration to permit a street crossing without interference from vehicular traffic. When the delay (between the occurrence of adequate gaps) becomes excessive, children may become impatient and endanger themselves by attempting to cross the street during an inadequate gap. This delay may be considered excessive, when the number of adequate gaps in the traffic stream, during the period the children are using a crossing, is less than the number of minutes in that same

time period. With this condition (when adequate gaps occur less frequently than an average of one per minute) some form of traffic control is needed which will create (in the traffic stream) the gaps necessary to reduce the hazard.

A recommended practice for determining the frequency and adequacy of gaps in the vehicular traffic stream is given in the Institute of Traffic Engineers publication, *A Program for School Crossing Protection*.<sup>1</sup>

#### **7A-4 Scope**

This part sets forth basic principles and prescribes standards to be followed in the design, application, installation and maintenance of all traffic control devices and other controls required for the special pedestrian conditions of school areas. Such devices and controls include signs, signals, markings, adult guards, student patrols, and grade separated crossings.

#### **7A-5 Application of Standards**

The standards of this Manual apply to all streets and highways regardless of type or the level of governmental agency having jurisdiction.

All traffic control devices used in school areas shall conform to the applicable specifications of this Manual.

#### **7A-6 Engineering Study Required**

The decision to use a particular device at a particular location should be made on the basis of an engineering study of the location. Thus, while this Manual provides standards for design and application of traffic control devices, the Manual is not meant to be a substitute for engineering judgment. It is the intent that the provisions of this Manual define the standards for traffic control devices, but shall not be a legal requirement for their installation.

#### **7A-7 Maintenance of Traffic Control Devices**

Maintenance of devices must be to high standards to assure that legibility is retained, that the device is visible, that it is functioning properly, and that it is removed if no longer needed.

Special care shall be taken to see that devices in use on a part-time basis are in operation only during the time periods they are required.

Regulatory traffic control devices for school areas should be removed, covered or not operated when they are not needed for extended periods of time, such as during summer vacations.

<sup>1</sup>A Program for School Crossing Protection, Revised 1971, Institute of Traffic Engineers, 2029 K Street, N.W., Washington, D.C. 20006.

## 7A-8 Legal Authority

Traffic control devices shall be placed only by the authority of a public body or official having jurisdiction, for the purpose of regulating, warning, or guiding traffic. No traffic control device or its support shall bear any advertising or commercial message, or any other message that is not essential to traffic control.

## 7A-9 Removal of Confusing Advertising

There should be legal authority to prohibit the display of any unauthorized sign, signal, marking, or device which interferes with the effectiveness of any official traffic control device. The enactment of Section 11-205 of the Uniform Vehicle Code will provide this authority.

## 7A-10 Meanings of "Shall," "Should" and "May"

In the Manual sections dealing with the design and application of traffic control devices, the words "shall," "should" and "may" are used to describe specific conditions concerning these devices. To clarify the meanings intended in this Manual in the use of these words, the following definitions are given:

1. **SHALL**—A mandatory condition. Where certain requirements in the design or application of the device are described with the "shall" stipulation, it is mandatory that these requirements be met.

2. **SHOULD**—An advisory condition. Where the word "should" is used, it is considered to be advisable usage, recommended but not mandatory.

3. **MAY**—A permissive condition. No requirement for design or application is intended.

## B. SIGNS

### 7B-1 Design of Signs

Uniformity in design includes shape, color, dimensions, symbols, wording, lettering, and illumination or reflectorization. The U.S. Department of Transportation, Federal Highway Administration, on request, will furnish (to State and local highway and traffic authorities, sign manufacturers, and similarly interested agencies) detailed drawings of the standard signs illustrated in this Manual. Standardization of these signs does not preclude further improvement by minor changes in the proportion of symbols, stroke width and height of letters, or width of borders. However, all shapes and colors shall be as indicated, all symbols shall be unmistakably similar to those shown and (where a word message is applicable) the wording shall be as provided herein.

Illustrations for new symbol signs include an educational plaque (that may be used with the new symbol sign). These plaques are intended for use during the period necessary for public education. Their inclusion is in recognition that these sign symbols represent a change of considerable magnitude. The intent is that an orderly transition to a consistent symbol system is desirable and that agencies should proceed toward this goal as rapidly as public acceptance and other considerations permit.

In the specifications here given for individual signs, the legend, color, and size are shown in the accompanying illustration and are not always detailed in the text.

### **7B-2 Dimensions**

The sign dimensions prescribed in this Manual shall be standard for application on public highways. An increase above these standard sizes is desirable where greater legibility or emphasis is needed.

### **7B-3 Lettering**

Sign lettering shall be in upper-case letters of the type approved by the National Joint Committee on Uniform Traffic Control Devices and its sponsoring agencies.

### **7B-4 Sign Borders**

All signs illustrated herein have a border of the same color as the legend, at or just inside the edge. When a border is darker than the background, it should be set in from the edge. When the border is lighter, it should extend to the edge of the plate.

### **7B-5 Illumination and Reflectorization**

Ordinarily the signs used for school area traffic control need not be reflectorized or illuminated, but if there is a considerable use of school buildings by children during hours of darkness, it may be desirable to give the signs in the vicinity of the school adequate nighttime visibility.

### **7B-6 Position of Signs**

Signs should be placed in positions where they will convey their messages most effectively without restricting lateral clearance or sight distances. Placement therefore should be accommodated to highway design, alignment and roadside development. Signs should have a maximum practical lateral clearance from the edge of the traveled way for safety of vehicles that may leave the roadway and strike the sign supports. Normally signs should not be closer than 6 feet from the edge of a paved shoulder, or if none, 12 feet from the edge of the traveled way.

In urban areas, if the lateral clearances indicated in the preceding paragraph are not practicable, a lesser clearance may be used (not less than 2 feet from the face of a curb). In urban areas, where sidewalk width is limited or existing poles are close to the curb, a clearance of 1 foot from the curb face is permissible.

~~Portable school signs shall not be placed within the roadway at any time.~~

### 7B-7 Height of Signs

Signs erected at the side of the road in rural districts shall be mounted at a height of at least 5 feet, measured from the bottom of the sign to the level of the roadway edge. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where there are other obstructions to view, the clearance to the bottom of the sign shall be at least 7 feet.

### 7B-8 Erection of Signs

Normally signs should be mounted approximately at right angles to the direction of, and facing, the traffic that they are intended to serve.

### 7B-9 School Advance Sign (S1-1)

The School Advance sign is intended for use in advance of locations where school buildings or grounds are adjacent to the highway. It may also be used in advance of established school crossings not adjacent to a school ground.

Where used, the sign generally shall be erected not less than 150 feet nor more than 700 feet in advance of the school grounds or school crossing. The sign shall have a minimum height and width of 36 inches.



S1-1  
36" x 36"



S2-1  
36" x 36"

### 7B-10 School Crossing Sign (S2-1)

The School Crossing sign is intended for use at established crossings including signalized locations used by pupils going to and from

*standard size  
is 36" x 36" for  
typical rural &  
30" x 30"  
for use in  
urban areas  
& typical city  
street use.*

school, except that at crossings controlled by stop signs, the sign should be omitted. Only crossings adjacent to schools and those on established school pedestrian routes shall be signed. When used, the sign shall be erected at the crosswalk, or at the minimum distance possible in advance of the crosswalk, and shall be a minimum 36" x 36" size.

A School Advance sign (sec. 7B-9) shall be used in advance of the School Crossing sign.

### 7B-11 School Bus Stop Ahead Sign (S3-1)

The School Bus Stop Ahead sign is intended for use in advance of locations where a school bus, when stopped to pick up or discharge passengers, is not visible for a distance of 500 feet in advance. It shall have a minimum 30" x 30" size.

It is not intended that these signs be used wherever a school bus stops to pick up or discharge passengers. These signs are intended for use only where terrain and roadway features limit the approach sight distance and where there is no opportunity to relocate the stop to another location with adequate visibility.



S3-1  
30" x 30"

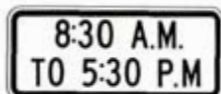


### 7B-12 School Speed Limit Signs (S4-1, S4-2, S4-3, S4-4) S4-9

The School Speed Limit sign shall be used to indicate the speed limit where a reduced speed zone for a school area has been established (in accordance with law, after an engineering and traffic investigation) or when a speed limit is specified for such areas by statute. The sign shall be either a fixed-message sign assembly or a variable display type sign.

The fixed message sign assembly shall consist of a top panel (S4-3), 24" x 8" (the legend SCHOOL in black on a yellow background), a Speed Limit sign (R2-1), 24" x 30", and a bottom panel (S4-1) indicating the specific period or periods of the day and/or days of the week, when the special school speed limit applies. The bottom panel shall be 24" x 10" (or larger if needed) and shall have a black legend on a white background. Alternate legends such as





S4-1  
24" x 10"



S4-2  
24" x 10"



S4-3  
24" x 8"



S4-4  
24" x 10"

WHEN CHILDREN ARE PRESENT (S4-2) may be used if permitted by law. The numerical speed limit displayed on the sign shall be the limit established by law.

Variable display signs may be used to indicate the special school speed limit. These signs may use blank-out messages or other methods to display the school speed limit only during the periods it applies. A Speed Limit Sign Beacon may also be used, with a WHEN FLASHING sign (S4-4), to identify the periods the school speed limit is in force.

Because of special features, it may not always be practical to make variable display signs conform in all respects to the accepted stand-



School Speed Limit  
Sign Assembly



Possible Sign  
With Speed Limit  
Sign Beacon

Established school zone. The School Speed Limit sign shall be a 24"x36" panel carrying the legend NO PASSING IS - SCHOOL IN SESSION. The upper portion of the sign shall have a black legend, NO PASSING IS, on a white background. The lower portion shall have a white legend, SCHOOL IN SESSION, on a black background.

ards. However, during the periods the school speed limit is in force, their basic shape, message, legend layout, and colors should conform to the standard for the fixed message sign, except that if the sign is internally illuminated, it may have a white legend on a black background.

Variable display signs with flashing beacons should be used for the more critical situations, where greater emphasis of the special school speed limit is needed.

Where practical, consideration should be given to including, on the back of variable display signs, a light or device to indicate the speed limit message is in operation or visible.

At the end of an authorized and posted school speed zone, the speed limit for the following section of highway should be posted with a standard Speed Limit sign.

### 7B-13 Parking and Stopping Signs (R7 Series)

Parking signs and other signs governing the stopping and standing of vehicles in school areas cover a very wide variety of regulations and only general specifications can be laid down here. Typical examples are as follows:

1. No Parking 8:00 AM to 5:00 PM School Days Only
2. No Stopping 8:00 AM to 5:00 PM School Days Only
3. 5 Min. Loading 8:00 AM to 5:00 PM School Days Only

The legend on parking signs shall state whatever regulations apply, but the signs shall conform to the standards of shape, color, position and use. Generally, parking signs should display such of the following information as is appropriate, from top to bottom of the sign, in the order listed:

1. Restriction or prohibition.
2. Time of day it is applicable, if not at all hours.
3. Days of week applicable, if not every day.

In addition, there should be a single-headed arrow pointing in the direction the regulation is in effect (if the sign is at the end of a zone) or a double-headed arrow pointing both ways (if the sign is at an intermediate point in a zone). As an alternate to the arrow (if the signs are posted facing traffic at an angle of 90 degrees to the curb line) there may be included on the sign, or on a separate plate below the sign, such legend as **HERE TO CORNER, HERE TO ALLEY, THIS SIDE OF SIGN, or BETWEEN SIGNS.**

Where parking is prohibited at all times or at specified times, parking signs shall have red letters and border on a white background (Parking Prohibition signs); and where only limited-time parking is permitted, or where parking is permitted only in a par-

ticular manner, the signs shall have green letters and border (Parking Restriction signs).

For emphasis the word NO or the numeral showing the time limit in hours or minutes may be in a reversed color arrangement in the upper left-hand corner of the sign, i.e., in white on a rectangular area of red or green.

Parking signs shall have a standard size of 12 inches by 18 inches. If arrows are used to indicate the extent of the restricted zone, the signs should be set at an angle of not less than 30 degrees nor more than 45 degrees with the line of traffic flow to be visible to approaching traffic. If word legends on a separate panel are used to indicate the extent of the restricted zone, the signs should be posted facing traffic at an angle of 90 degrees to the curb line.

## C. MARKINGS

### 7C-1 Functions and Limitations of Markings

Markings have definite and important functions to perform in a proper scheme of school area traffic control. In some cases they are used to supplement the regulations or warnings of other devices such as traffic signs. In other instances they obtain results, solely on their own merits, that cannot be obtained by the use of any other device. In such cases they serve as a very effective means of conveying certain regulations and warnings that could not otherwise be made clearly understandable.

Pavement markings have definite limitations. They are obliterated by snow, may not be clearly visible when wet, and may not be very durable when subjected to heavy traffic. In spite of these limitations, they have the advantage, under favorable conditions, of conveying warnings or information to the driver without diverting his attention from the roadway.

### 7C-2 Standardization

Each standard marking shall be used only to convey the meaning prescribed for it in this Manual.

### 7C-3 Crosswalk Lines

Crosswalk lines shall be solid <sup>yellow</sup>white lines marking both edges of the crosswalk. They shall be not less than 6 inches in width and should not be spaced less than 6 feet apart. Under special circumstances (where no advance stop line is provided or where vehicular speeds exceed 35 MPH or where crosswalks are unexpected) it may be desirable to increase the width of the crosswalk line up to 24"

in width. Crosswalk lines on both sides of the crosswalk should extend across the full width of pavement to discourage diagonal walking between crosswalks.

Crosswalks should be marked at all intersections on established routes to school where there is material conflict between vehicles and kindergarten or elementary students (while crossing), where students are permitted to cross between intersections, or where students could not otherwise recognize the proper place to cross.

For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45° angle or with white longitudinal lines at a 90° angle to the line of the crosswalk. These lines should be approximately 12'' to 24'' wide and spaced 12'' to 24'' apart. When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. Care should be taken to insure that crosswalks with diagonal or longitudinal lines used at some locations do not weaken or detract from other crosswalks (where special emphasis markings are not used).

#### **7C-4 Stop Lines**

Stop lines are solid white lines, normally 12 to 24 inches wide, extending across all approach lanes, and (under both urban and rural conditions) indicate the point at which vehicles are required to stop in compliance with a stop sign, traffic signal, officer's direction, or other legal requirement. When used, the stop line should ordinarily be placed 4 feet in advance of and parallel to the nearest crosswalk line.

#### **7C-5 Curb Markings for Parking Restrictions**

Since curb markings of yellow and white are used for delineation and visibility, it is usually advisable to establish parking regulations through the installation of standard signs. However, when local authorities prescribe special colors for curb markings as supplemental to standard signs, they may be used.

When signs are not used, intended meaning should be stenciled on the curb.

Signs shall always be used with curb markings in those areas where curb markings are frequently obliterated by accumulations of snow and ice.

#### **7C-6 Word and Symbol Markings**

Word and symbol markings on the pavement may be used for the purpose of guiding, warning, or regulating traffic. They should be limited to not more than a total of three lines of words and/or symbols. They shall be white in color.

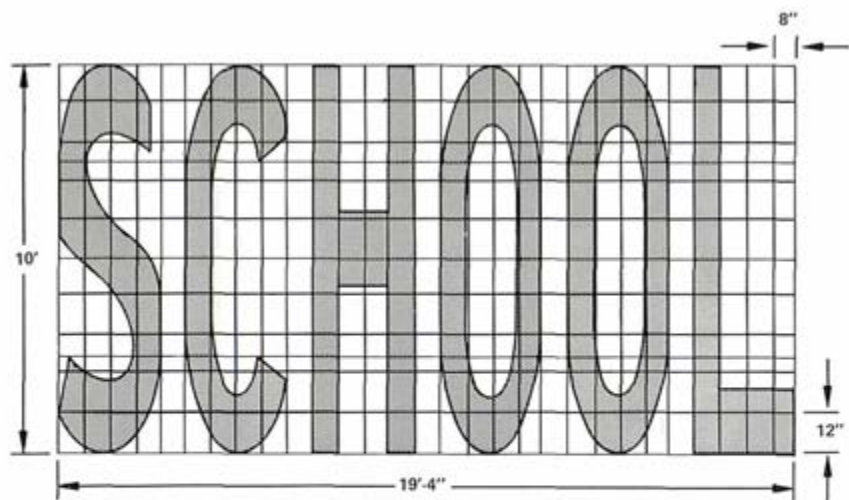


Figure 7-2. Two-lane pavement marking—detail of word "SCHOOL".

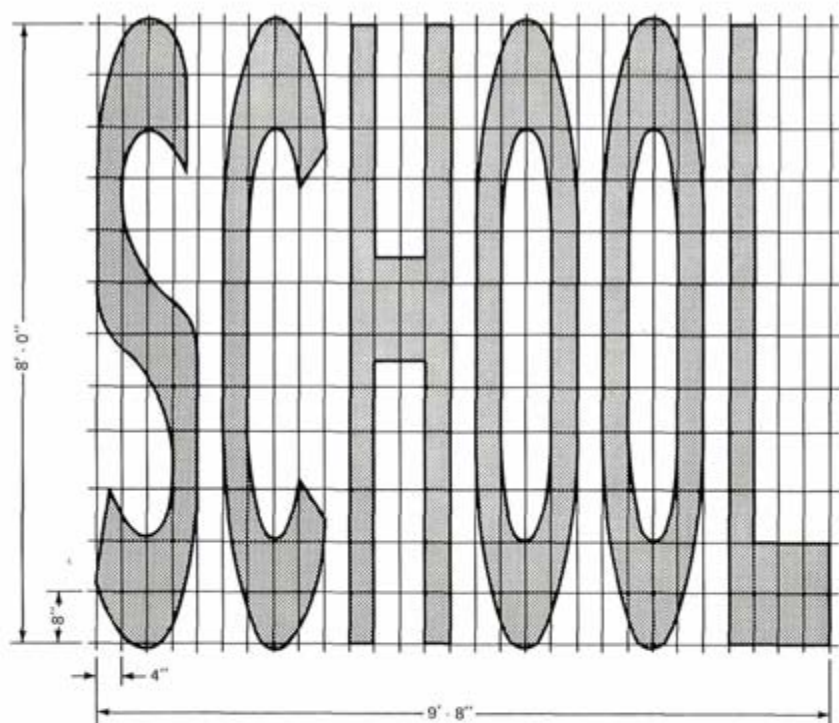


Figure 7-3. Single-lane pavement marking—detail of word "SCHOOL".

Word and symbol markings shall not be used for mandatory messages except in support of standard signs.

The letters and symbols should be greatly elongated in the direction of traffic movement because of the low angle at which they are viewed by approaching drivers. Large letters, symbols and numerals should be used, 8 feet or more in height; and, if the message consists of more than one word, it should read "up" i.e., the first word should be nearest to the driver. Where approach speeds are low, somewhat smaller characters may be used. The space between lines should be at least four times the height of the characters for low speed roads but not more than ten times the height of the characters under any conditions. Recommended designs of elongated letters for the word SCHOOL are shown in figures 7-2 and 7-3.

7C-7 Centerline

A 4 inch

## D. SCHOOL AREA TRAFFIC SIGNALS

### 7D-1 Definition

School signals are standard traffic control signals erected at established school crossings on the basis of a need to create adequate gaps in the vehicular traffic stream for pedestrian crossings.

### 7D-2 Advantages and Disadvantages

When properly designed, located and operated under conditions that fully warrant their use, school signals usually have either or both of the following advantages:

1. Considering initial and operating costs, school signals over a period of several years represent an economy as compared with police supervision or crossing guards.

2. Under conditions of favorable spacing they can be coordinated with adjacent signals to provide for continuous or nearly continuous movement of vehicular traffic.

Properly designed and warranted signals also have some disadvantages and the following should be considered when choosing a specific means of crossing control:

1. School signal control has a much higher initial cost than police supervision or crossing guards. It should not be considered for locations where several years use cannot be expected.

2. In some circumstances, the school signal control requires supplemental control by an adult guard or school safety patrol.

3. If school signal control is to be properly operated, provision must be made for both periodic and emergency maintenance by capable, trained persons.

### 7D-3 Standardization

Because of the great mobility of today's traffic and the ever-increasing range of traffic circulation, it is of primary importance that there be national standardization of those features of traffic signals that affect public participation in traffic movement. This applies without exception to signals at school crossings (where instant recognition and understanding of controls is vital to both students and motorists). Deviations and innovations in school areas, however well-accepted by local people, are bound to lead to confusion and disobedience on the part of strangers.

Design, application, location, and operation lend themselves to a certain degree of standardization, and standards for such features are prescribed herein. A driver or pedestrian must first see signals and then react to their indications. Location and sequence of operation are basic requirements. Signals should be placed where a driver or pedestrian cannot miss seeing them. Standard signal indications and sequences should be used universally so that a signal message can be recognized and heeded at a glance.

### 7D-4 Warrants

A school signal may be warranted at an established school crossing when a traffic engineering study (of pedestrian group size and available gaps in the vehicular traffic stream) indicates that the number of adequate gaps in the traffic stream during the period the children are using the crossing, is less than the number of minutes in that same time period (sec. 7A-3).

When traffic control signals are installed solely under this warrant:

1. Pedestrian indications shall be provided at least for each crosswalk established as a school crossing.

2. At an intersection, the signal normally should be traffic actuated. Intersection installations that can be fitted into progressive systems may use pretimed control.

3. At non-intersection crossings, the signal should be pedestrian actuated, parking and other obstructions to view should be prohibited for at least 100 feet in advance of and 20 feet beyond the crosswalk, and the installation should include suitable standard signs and pavement markings. Special police supervision and/or enforcement should be provided for a new non-intersection location.

A School Advance sign (sec. 7B-9) and a School Crossing sign (sec. 7B-10) may be used at locations where signals are installed under this warrant.

## 7D-5 Meaning of Signal Indications

In Part IV of this Manual meanings and applications for all traffic signal color and arrow indications are given. In this section the meanings are given only for the signal indications generally used at school crossings and the flashing yellow when a speed limit sign beacon is used as part of a variable display School Speed Limit sign assembly (sec. 7B-12).

The CIRCULAR GREEN indication and the GREEN ARROW indication shall have the following meanings:<sup>2</sup>

1. Traffic, except pedestrians, facing a CIRCULAR GREEN signal may proceed straight through or turn right or left unless a sign at such place prohibits either such turn. But vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to other vehicles and to pedestrians lawfully within the intersection or an adjacent crosswalk at the time such signal is exhibited.

2. Traffic, except pedestrians, facing a GREEN ARROW signal, shown alone or in combination with another indication, may cautiously enter the intersection only to make the movement indicated by such arrow, or such other movement as is permitted by other indications shown at the same time. Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.

3. Unless otherwise directed by a pedestrian signal, pedestrians facing any green signal, except when the sole green signal is a turn arrow, may proceed across the roadway within any marked or unmarked crosswalk.

The steady CIRCULAR YELLOW and YELLOW ARROW shall have the following meanings:<sup>3</sup>

1. Traffic, except pedestrians, facing a steady CIRCULAR YELLOW or YELLOW ARROW signal is thereby warned that the related green movement is being terminated or that a red indication will be exhibited immediately thereafter when vehicular traffic shall not enter the intersection.

2. Pedestrians facing a steady CIRCULAR YELLOW or YELLOW ARROW signal, unless otherwise directed by a pedestrian signal, are thereby advised that there is insufficient time to cross the roadway before a red indication is shown and no pedestrian shall then start to cross the roadway.

The steady CIRCULAR RED or RED ARROW shall have the following meanings:<sup>4</sup>

1. Traffic, except pedestrians, facing a steady circular red signal alone shall stop at a clearly marked stop line, but if none, before

<sup>2</sup> Section 11-202, Uniform Vehicle Code, Revised 1968.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.



entering the crosswalk on the near side of the intersection, or if none, then before entering the intersection and shall remain standing until an indication to proceed is shown except as provided in 2. below.

2. When a sign is in place permitting a turn, traffic, except pedestrians, facing a steady CIRCULAR RED signal may cautiously enter the intersection to make the turn indicated by such sign after stopping as required by subsection 1. above. Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.

3. Unless otherwise directed by a pedestrian signal, pedestrians facing a steady CIRCULAR RED signal alone shall not enter the roadway.

4. Traffic, except pedestrians, facing a steady RED ARROW indication may not enter the intersection to make the movement indicated by such arrow, and unless entering the intersection to make such other movement as is permitted by other indications shown at the same time, shall stop at a clearly marked stop line, but if none, before entering the crosswalk on the near side of the intersection, or if none, then before entering the intersection and shall remain standing until an indication to make the movement indicated by such arrow is shown.

5. Unless otherwise directed by a pedestrian signal, pedestrians facing a steady RED ARROW signal indication shall not enter the roadway.

Pedestrian signal indications shall have the following meanings:<sup>5</sup>

1. The DONT WALK indication, steadily illuminated, means that a pedestrian shall not enter the roadway in the direction of the indication.

2. The DONT WALK indication, while flashing, means that a pedestrian shall not start to cross the roadway in the direction of the indication, but that any pedestrian who has partly completed his crossing during the steady WALK indication shall proceed to a sidewalk, or to a safety island.

3. The WALK indication, steadily illuminated, means that pedestrians facing the signal indication may proceed across the roadway in the direction of the indication.

4. The WALK indication, while flashing, means that there is a possible conflict of pedestrians with vehicles.

The flashing CIRCULAR YELLOW indication, displayed as a Speed Limit Sign Beacon, shall mean that the school speed limit shown on the sign is in effect.

<sup>5</sup> Section 11-203, op cit.

## 7D-6 Intersection and Non-Intersection Installations

School signals may be installed at established school crossings at intersection and non-intersection locations under the adequate gap warrant.

Intersection locations have the hazards of turning vehicles and generally require the provision of signal equipment for the control of vehicle traffic on two streets. However, they are less likely to present an element of surprise for drivers, and they may provide a secondary function of improved vehicle access to an arterial street.

Non-intersection locations are free from the hazards of turning vehicles, require vehicle control equipment for one street only, and may offer added convenience to students. However, they can present an element of surprise for drivers who do not expect pedestrian crossings and signal control between intersections. Therefore, special attention should be given to the signal head placement and the signs and markings used at non-intersection locations, to be sure drivers are aware of this special application. Parking should not be allowed within 100 feet in advance of the crosswalk, nor 20 feet beyond.

## 7D-7 Controllers

School signals which are installed only under the adequate gap warrant (sec. 7D-4) shall be the traffic-actuated type unless an intersection installation is fitted into a progressive system and uses pre-timed control.

The traffic-actuated signal, as its name implies, responds to vehicle or pedestrian actuations, and it is necessary that detector and controller equipment be designed for this service. The general characteristics of the various types of detectors and controls that have been developed for use with traffic-actuated equipment are described in a supplemental publication.<sup>6</sup> More comprehensive descriptions and specifications are contained in standards adopted and published by the Institute of Traffic Engineers.<sup>7</sup>

## 7D-8 Pedestrian Detectors

Pedestrian detectors of the push-button or other type shall be designed to operate on a circuit not to exceed 18 volts. They may be mounted on signal standards, wood or steel poles, or individual posts. They should be conveniently located near each end of crosswalks where actuation is required. A mounting height of 3½ to 4

<sup>6</sup>Traffic Control Devices Handbook—Supplement to the Manual on Uniform Traffic Control Devices.

<sup>7</sup>Traffic Actuated Controllers and Detectors. Technical Report Number 3, Institute of Traffic Engineers, 1958.

feet above the sidewalk has been found best adapted to general usage. Permanent-type signs shall be mounted above or in unit with the detectors, explaining their purpose and use. At certain locations it may be desirable to supplement this sign with a larger sign suspended over the sidewalk to call attention to the push button. Where two crosswalks oriented in different directions, end at or near the same location, the positioning of pedestrian push buttons should clearly indicate which crosswalk signal is actuated by each push button. Additional push button detectors may be required on islands or medians where a pedestrian might become stranded.

Special purpose push buttons to be operated only by authorized persons should include a housing capable of being locked to prevent access by the general public. Instruction signs are not necessary in this case.

A pilot light or other means of indication may be installed with a pedestrian push button and normally shall not be illuminated. Upon actuation, it shall be illuminated until the pedestrian's green or WALK indication is displayed.

#### **7D-9 Operation of Pedestrian Signals**

At an intersection the four basic combinations of pedestrian signal intervals with vehicular signal operation are as follows:

1. Combined Pedestrian-Vehicular Interval—a signal phasing wherein pedestrians may proceed to use certain crosswalks and vehicles are permitted to turn across the said crosswalk (the pedestrian indication shall be flashing WALK).

2. Exclusive Crosswalk Interval—a signal phasing wherein pedestrians may proceed to use certain crosswalks but vehicles are not permitted to move across these crosswalks during the pedestrian movement (the pedestrian indication shall be steady WALK).

3. Leading Pedestrian Interval—a signal phasing wherein an exclusive pedestrian interval, in advance of the vehicular interval, is provided for pedestrians (the pedestrian indication shall be steady WALK). When the leading pedestrian interval is terminated, and a combined pedestrian-vehicular interval begins, the WALK indication may begin to flash.

4. All Pedestrian Phase—a signal phasing wherein pedestrians may proceed to cross the intersection in any direction during an exclusive phase while all vehicles are stopped (the pedestrian indication shall be steady WALK).

At non-intersection school signal installations, as there is no parallel vehicular movement, the pedestrian crossing is an exclusive interval.

Pedestrians should be assured of sufficient time to cross the roadway at a signalized intersection:

1. Where traffic signals are of the actuated type, control equipment should provide sufficient pedestrian crossing time when there has been a pedestrian actuation, whenever the minimum vehicular time is less than that needed by the pedestrians.

2. Where traffic signals are not of the vehicle-actuated type, pedestrian actuation may be used to provide sufficient pedestrian crossing time, or the vehicular time should be adjusted to provide the crossing time needed by pedestrians.

3. Under normal conditions, the WALK interval should be at least 7 seconds, so that pedestrians will have adequate opportunity to leave the curb, before the clearance interval is shown. However, the WALK interval itself need not equal or exceed the total crossing time calculated for the street width, as many pedestrians will complete their crossing during the flashing DONT WALK clearance interval.

4. A pedestrian clearance interval shall always be provided where pedestrian signal indications are used. It shall consist of a flashing DONT WALK indication. The duration should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb and travel to the center of the farthest traveled lane before opposing vehicles receive a green indication. (Normal walking speed is assumed to be 4 feet per second.) On a street with a median at least 6 feet in width, it may be desirable to allow only enough pedestrian clearance time on a given phase to clear the crossing from the curb to the median. In the latter case if the signals are pedestrian-actuated, an additional detector shall be provided on the island.

#### **7D-10 Coordination with Adjacent Signals**

A school signal at an established school crossing within half a mile of a signal controlling the same traffic should be coordinated with the adjacent signal.

Coordinated operation normally should include both pretimed signals and traffic-actuated signals within the appropriate distances.

#### **7D-11 Vehicle Change Interval**

A yellow vehicle change interval shall be used following each CIRCULAR GREEN interval and, where applicable, after each GREEN ARROW interval. In no case shall a CIRCULAR YELLOW indication be displayed in conjunction with the change from CIRCULAR RED to CIRCULAR GREEN.

The exclusive function of the yellow interval shall be to warn traffic of an impending change in the right-of-way assignment.

Yellow vehicle change intervals should have a range of approximately 3 to 6 seconds. Generally the longer intervals are appropriate to higher approach speeds.

#### **7D-12 Location and Placement**

The detailed standards and requirements governing the location and placement of all signals, including school signals, are given in Part IV of this Manual. The aspects of these standards and requirements most significant to school signals are given in the following sections.

#### **7D-13 Visibility, Number, and Location of Signal Faces**

Each signal face shall be so adjusted that its indications will be of maximum effectiveness to the approaching traffic for which they are intended.

Visors should be used on all signal faces to aid in directing the signal indication specifically to approaching traffic, as well as to reduce "sun phantom" resulting from external light entering the lens.

The visibility of signals shall be insured by providing, on each approach to an intersection, a minimum of two signal faces for through traffic. They should be continuously visible from the appropriate distances listed in table VII-1, up to the stop line, unless a physical obstruction exists.

Table VII-1

<i>85 Percentile Speed Limit</i>	<i>Minimum Visibility Distance (Ft.)</i>
20	100
25	175
30	250
35	325
40	400
45	475
50	550
55	625
60	700

Where physical conditions prevent drivers from having a continuous view of at least two signal indications as specified herein, a suitable sign shall be erected to warn approaching traffic. It may be supplemented by a Hazard Identification Beacon.

Unless physical conditions make it impractical, at least one, and preferably both of the signal faces as required above, shall be lo-

cated not less than 40 feet nor more than 120 feet beyond the stop line. Such signal faces shall be located between two lines intersecting with the center of the approach lanes at the stop line, one making an angle of 20 degrees to the left of the centerline extended and the other making an angle of 20 degrees to the right of the centerline extended.

When overhead signals are required, the signal faces for any one approach shall not be less than eight feet apart, measured horizontally between centers of faces.

At signalized mid-block crosswalks, there should be at least one signal face over the traveled roadway for each approach.

Pedestrian signal indications should be placed so they attract a pedestrian's attention and they should be readable from as far as the crossing width, to as close as 10 feet.

There shall be pedestrian signals located at each end of each established crosswalk.

The DONT WALK indication shall be mounted directly above or integral with the WALK indication.

Pedestrian indications may be mounted separately or on the same support with other signal heads. When mounted with other signal heads there shall be a physical separation between the two heads. The pedestrian signal head shall be so positioned and adjusted as to provide maximum visibility at the beginning of the controlled crossing.

The transverse location of a signal face mounted on the top of a post or on a short bracket from a post, shall conform to the requirements in section 7D-15.

#### **7D-14 Height of Signal Faces**

The bottom of the housing of a signal face not mounted over a roadway shall not be less than 8 feet or more than 15 feet above the sidewalk or, if none, above the pavement grade of the center of the highway.

The bottom of the housing of a signal face suspended over a roadway shall not be less than 15 feet or more than 19 feet above the pavement grade at the center of the roadway.

Within the above limits, optimum visibility and adequate clearance should be the guiding considerations in deciding signal height. Grades on approaching streets may be important factors, and should be considered in determining the most appropriate height.

Pedestrian signal faces shall be mounted with the bottom of the housing not less than 7 feet nor more than 10 feet above the sidewalk level, and so that there is a pedestrian indication in the line of vision of the pedestrian using the crosswalk to which it applies.

## **7D-15 Transverse Location of Traffic Signal Supports and Controller Cabinets**

In the placement of traffic signal supports, primary consideration shall be given to ensuring the proper visibility of traffic signal faces as described in section 7D-13. However, in the interest of safety, traffic signal supports and controller cabinets should be placed as far as practicable from the edge of the traveled way without adversely affecting signal visibility.

Supports for post-mounted signals at the side of a street with curbs shall have a horizontal clearance of not less than two feet from the face of the curb. Where there is no curb, the support for a post-mounted signal shall have a clearance of not less than two feet from the shoulder within the limits of normal vertical clearance.

Signal supports should not obstruct a crosswalk.

No part of a concrete base for a signal support should extend more than 4 inches above the ground level at any point, except that this limitation does not apply to the concrete base for a rigid (non-breakaway) support.

On medians, the above minimum clearances for supports should be obtained where practicable. Any median supports which cannot be located with the required clearances should be of the breakaway type or should be guarded if at all practicable.

## **7D-16 Portable Traffic Control Signals**

A portable traffic control signal not meeting all the requirements of this Manual, is not recognized as a standard traffic control device.

## **7D-17 Area of Control**

A traffic control signal shall control traffic only at the intersection or mid-block location where the installation is placed.

On a divided highway with a wide median, the crossing of each roadway may be signalized as a separate intersection.

## **7D-18 Design Requirements for School Signal Indications**

The detailed standards and requirements governing the design of signal indications for all signals, including school signals, are given in Part IV of this Manual. The aspects of these standards and requirements most significant to school signals are given in the following sections.

## **7D-19 Number of Lenses per Signal Face**

Each signal face, except in pedestrian signals, shall have at least three lenses, but not more than five. The lenses shall be red, yellow or green in color.

Each pedestrian signal face shall have two indications, white and orange as specified in section 7D-23.

## **7D-20 Size and Design of Signal Lenses**

The aspect of all signal lenses, except in pedestrian signals, shall be circular. There shall be two sizes for lenses, 8 inches and 12 inches nominal diameter.

In no case shall letters or numbers be displayed on the visible part of vehicular signal indications.

All lenses shall conform to the standards in the Standard for Adjustable Face Vehicle Control Signal Heads, Revised 1970, Institute of Traffic Engineers.

## **7D-21 Arrangement of Lenses in Signal Faces**

The lenses in a signal face shall be arranged in a vertical or horizontal straight line, except that in a vertical array lenses of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement. Such clusters shall be limited to two identical lenses or to two or three different lenses of the same color.

In each signal face, all red lenses in vertical signals shall be located above, and in horizontal signals shall be located to the left of all yellow and green lenses.

The circular yellow lens shall be located between the red lens or lenses and all other lenses.

## **7D-22 Illumination of Lenses in Vehicular Signal Faces**

Each lens shall be illuminated independently.

When a signal lens, except in a pedestrian signal, is illuminated and the view of such an indication is not otherwise physically obstructed, it shall be clearly visible to drivers it controls for a distance of at least  $\frac{1}{4}$ -mile under normal atmospheric conditions.

The intensity and distribution of light from each illuminated signal lens should meet the standards set forth in the following Institute of Traffic Engineers reports: Standard for Adjustable Face Vehicle Traffic Control Signal Heads, Revised 1970, and a Standard for Traffic Signal Lamps, December 1967.

## **7D-23 Pedestrian Indications**

Pedestrian signal indications should attract the attention of and be readable to the pedestrian both day and night and at all distances from 10 feet to the full width of the area to be crossed.

All pedestrian indications shall be rectangular in shape and shall consist of the lettered message WALK and DONT WALK. Only internal illumination shall be used.



When illuminated, the WALK indication shall be lunar white, meeting the standards of the Adjustable Face Pedestrian Signal Head Standard, 1963, of the Institute of Traffic Engineers. All except the letters shall be obscured by an opaque material.

When illuminated, the DONT WALK indication shall be Portland orange, meeting the standards referred to above, with all except the letters obscured by an opaque material.

When not illuminated, the WALK and DONT WALK messages shall not be distinguishable by pedestrians at the far end of the crosswalk they control.

The letters shall be at least 3 inches high for crossing where the distance from the near curb to the pedestrian signal indication is 60 feet or less. For a distance over 60 feet, the letters should be at least 4½ inches high.

The light source shall be designed and constructed so that in case of an electrical or mechanical failure of the word DONT, the word WALK of the DONT WALK message will also remain dark.

#### **7D-24 Speed Limit Sign Beacon**

A Speed Limit Sign Beacon is two CIRCULAR YELLOW lens sections each having a visible diameter of not less than six inches, or alternately, one or more CIRCULAR YELLOW lenses, each having a visible diameter of not less than eight inches.

The yellow lens color shall be in accordance with the requirements of the Institute of Traffic Engineers Standard for Adjustable Face Vehicle Traffic Control Signal Heads, Revised 1970.

Where two lens sections are used, they shall be vertically aligned, and they shall be alternately flashed.

Speed Limit Sign Beacons shall be flashed at a rate of not less than 50 nor more than 60 times per minute. The illuminated period of each flash shall not be less than one-half and not more than two-thirds of the total cycle.

All flashing contacts should be equipped with a filter for suppression of radio interference.

When illuminated, the Speed Limit Sign Beacon shall be clearly visible to all drivers it faces for a distance of at least a quarter of a mile, under normal atmospheric conditions, unless otherwise physically obstructed.

A Speed Limit Sign Beacon is intended for use with a fixed or variable Speed Limit sign.

#### **7D-25 School Crossings at Existing Signal Installations**

Intersections where pre-timed or traffic-actuated signals have been installed on the basis of vehicle warrants (Part IV) may be con-

venient locations for established school crosswalks. If so, their use should be encouraged and proper allowance should be made in the signal equipment and operation for this use (secs. 7D-27 and 28).

#### **7D-26 Signal Indications**

When an existing traffic signal installation is to be used as an established school crossing, pedestrian signals shall be located and mounted in the manner specified in sections 7D-14 and 7D-15.

#### **7D-27 Signal Control**

When an existing traffic signal installation is to be used as an established school crossing, the control of the pedestrian signal indications may be accomplished with the timing mechanism normally employed for the traffic signal. For this type of operation, the pedestrian phase or indication is given at a predetermined point during each cycle, or a push button is used to introduce the pedestrian phase or indication (in accordance with the needs of pedestrian traffic).

#### **7D-28 Signal Operation**

When an intersection with an existing traffic signal installation is to be used as an established school crossing, the pedestrian crossing interval can be combined with the vehicular movements in one of the four basic ways set forth in section 7D-9.

The timing of the pedestrian crossing phase shall be in conformance with the provisions of section 7D-9.

### **E. CROSSING SUPERVISION**

#### **7E-1 Types of Crossing Supervision**

There are two types of school crossing supervision :

1. Adult control of pedestrians and vehicles with adult guards or police officers.
2. Student control of only pedestrians with student patrols.

Recommended practices for the organization, operation and administration of an adult crossing guard program are given in Adult Guards For School Crossings<sup>8</sup> and Adult School Crossing Guards.<sup>9</sup>

Recommended practices for the organization, administration and operation of a student patrol program are given in Policies and Practices for School Safety Patrols.<sup>10</sup>

<sup>8</sup> Adult Guards For School Crossings, Traffic Institute of Northwestern University, 1804 Hinman Ave., Evanston, Illinois 60204.

<sup>9</sup> Adult School Crossing Guards, American Automobile Association, Washington, D.C. 20036.

<sup>10</sup> Policies and Practices for School Safety Patrols, National Commission on Safety Education, 1201 16th Street, Washington, D.C. 20036; or National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.

## **7E-2 Adult Guards**

Adult guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps must be created (sec. 7A-3).

## **7E-3 Legal Authority for Adult Guards**

Adult guards should be special police officers appointed by the local police agency.

The local police agency should be responsible for the selection, training and supervision of adult guards.

## **7E-4 Choice of Adult Guards**

High standards for selection of adult guards are essential. Adult guards must understand children and in addition should possess the following qualifications:

1. Average intelligence
2. Good physical condition, including sight and hearing
3. Mental alertness
4. Neat appearance
5. Good character
6. Dependable
7. Sense of responsibility for safety of children.

## **7E-5 Uniform of Adult Guards**

Adult guards should be uniformed so that motorists and pedestrians can recognize them and respond to their signals. It is recommended that their uniforms be distinctively different from those worn by regular police officers.

## **7E-6 Operating Procedures for Adult Guards**

Adult guards should not direct traffic in the usual police regulatory sense. In the control of traffic, they should pick opportune times to create a safe gap. At these times, their presence in the roadway serves as an easily recognized indication that pedestrians are about to use the crosswalk, and that all traffic must stop. When all traffic has stopped, the adult guard allows the children to cross.

## **7E-7 Police Officers**

Police officers should be used for school crossing supervision only in emergency situations on a temporary basis or at very hazardous school crossings where the use of adult guards is not feasible.

## **7E-8 Student Patrols**

Student patrols may be used to direct and control children at crossings near schools where there is no need to create adequate gaps in traffic.

Student patrols may be used to direct and control children at signalized intersections where turning movements are not a problem, and to assist adult guards in the control of children at crossing locations used by large numbers of children.

Student patrols should not be responsible for directing vehicular traffic. They should not function as police.

## **7E-9 Legal Authority for Student Patrols**

Student patrols should be authorized by the local school board. School authorities should be responsible for organizing, instructing and supervising patrols with the assistance of the local police.

## **7E-10 Choice of Student Patrols**

Student patrols should be carefully selected. They should be children from the 5th grade or higher. Leadership and reliability should be determining qualities for patrol membership.

Parental approval should be obtained in writing before a child is used as a member of a student patrol.

## **7E-11 Operating Procedures for Student Patrols**

Student patrols control children, not vehicles. They should stop children back of the curb or edge of the roadway and allow them to cross only when there is an adequate gap in traffic.

# **F. GRADE SEPARATED CROSSINGS**

## **7F-1 Function**

Grade separated crossings may be used to physically separate the crossing of a very heavy volume of school pedestrian traffic and a heavy vehicular flow.

## **7F-2 Types of Grade Separated Crossings**

Grade separated crossings may be either overpasses or underpasses. The design should follow the guidelines given in the published policies of the American Association of State Highway Officials.<sup>11</sup> Ex-

<sup>11</sup> A Policy on Arterial Highways in Urban Areas, 1957, and A Policy on Geometric Design of Rural Highways, 1965; American Association of State Highway Officials, 341 National Press Building, Washington, D.C. 20004.

perience has shown that for pedestrian crossings overpasses are more satisfactory than underpasses, as overpasses are easier to maintain and supervise.

### **7F-3 Criteria for Use of Grade Separated Crossings**

Grade separated crossings should be considered only when the physical characteristics of the location make such a structure feasible. If use of the grade separation will be less convenient than an at-grade crossing, barriers or supervision will be needed to assure a satisfactory level of use.

