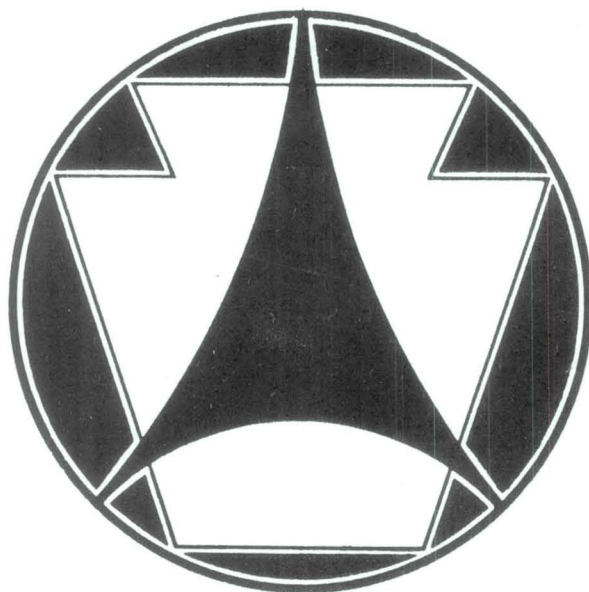


COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL HANDBOOK



1971

REPLACES 1970 PRINTING

Revised Edition
December 1971

TRAFFIC SIGNAL HANDBOOK

This Handbook Supplements

Section 711 of Department of Transportation REGULATIONS

Governing The Design, Location And Operation
Of All Official Traffic Signs, Signals And
Markings On And Along Highways Within
The Commonwealth of Pennsylvania

Prepared By

Pennsylvania Department of Transportation
Bureau of Traffic Engineering
Harrisburg, Pennsylvania

TABLE OF CONTENTS

SUBJECT	PAGE
1.0 GENERAL	1
1.1 Traffic Signals	1
1.2 Flashing Beacon	1
1.3 Pedestrian Signal	1
2.0 MEANING and APPLICATION of COLORS and INDICATIONS	2
2.1 Steady Red	2
2.2 Steady Circular Yellow	3
2.3 Steady Circular Green	3
2.4 Green Arrow	4
2.5 Yellow Arrow	5
2.6 Prohibition of Simultaneous Displays	6
2.7 Pedestrian Signals	6
3.0 FLASHING OPERATION	8
3.1 Traffic Signals	8
3.2 Intersection Control Beacon	10
3.3 Lamp Wattage	11
3.4 Miscellaneous	11
4.0 NUMBER of SIGNAL FACES	11
4.1 General	11
4.2 Third Approach Signal	11
4.3 Turn Signal	11
4.4 Pedestrian Signal	12
5.0 LOCATION of SIGNAL FACES	12
5.1 General	12
5.2 Distance from Stop Line	12
5.3 Lateral Placement	13
5.4 Height of Signal Faces	16
6.0 ARRANGEMENT of LENSES in SIGNAL FACES	17
6.1 Vertical Signal Face	17
6.2 Horizontal Signal Face	17
6.3 Signal Face Cluster	17
6.4 Typical Arrangements	17
7.0 SIZE of SIGNAL LENSES	17
7.1 Eight Inch (8") LENSES	17
7.2 Twelve Inch (12") LENSES	18
7.3 Pedestrian Signals	18
8.0 PAINTING of SIGNALS	18

SUBJECT	PAGE
9.0 VISIBILITY and SHIELDING OF SIGNAL	
FACES	18
9.1 General	18
9.2 Visors	19
9.3 Louvers	19
9.4 Backplates	19
9.5 Programmed Signal Lenses	19
10.0 TRAFFIC SIGNALS NEAR RAILROAD or TRANSIT GRADE CROSSINGS	20
11.0 PREEMPTED SIGNALS	20
12.0 USE of PAVEMENT MARKINGS and SUPPLEMENT SIGNS	20
12.1 Pavement Marking	20
12.2 Signs	21
12.3 Illuminated Signs	21
13.0 PERMITS	21
14.0 CONTRACT for INSTALLATION	22

APPENDIX A

Schematic Intersection Drawings and Color Sequence Diagrams

APPENDIX B

Tabulation of Signs Used at Signalized Intersections

APPENDIX C

PennDOT Financial Participation

APPENDIX D

Data Requirements for Signal Investigation and Permit

TRAFFIC SIGNAL HANDBOOK

1.0 GENERAL

This Handbook is to be used as a further guide on matters pertaining to Traffic Signal installation. As such, it will supplement the Regulations of the Commonwealth dated December 1, 1967, and its Amendments. Moreover, it will remain in effect after the release of the 1972 Regulations.

1.1 Traffic Signals

- a) Traffic signal shall operate continuously as "Stop and Go" or "Flashing".

All traffic signal installations shall be provided with electrical flashing mechanism supplementary to the signal timer. A manual switch, and/or where appropriate, automatic means shall be provided to actuate the flashing mechanism.

When used as a flashing signal (during emergencies or periods of low traffic flow), it shall flash red on the minor street(s) and yellow on the major street(s).

- b) Each signal face, except pedestrian signals, shall have at least three lenses, but not more than five. The minimum lenses shall be: circular red, yellow and green or circular red, yellow arrow and green arrow. An allowable exception to the above can be a single section right green arrow lens, when used alone to indicate a continuous movement.

1.2 Intersection Control Beacons

A flashing beacon is a section of a traffic signal head or a similar type device having a yellow or red lens. When used, the red shall flash 24 hours per day while the yellow may flash all day or during those hours when the hazard or need for caution exists.

1.3 Pedestrian Signals

Pedestrian signals shall be rectangular or square in shape and shall contain the lettered message "DON'T WALK" on the top, and "WALK" on the bottom if they are of the Two section Type. The "DON'T WALK" shall be Portland Orange and the "WALK" shall be Lunar White in color.

The pedestrian signals shall be illuminated during "Stop and Go" operation. They shall not be illuminated during Flashing operation. During periods of special preemption they shall generally be steady "Don't Walk".

2.0 MEANING AND APPLICATION OF COLORS AND INDICATIONS

2.1 Steady Red

2.1.1 Meaning

- a) Traffic, except pedestrians, facing a steady circular red signal along 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 proceed is shown (except as provided in 'b' below).
- b) When an official 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 provided in 'a' 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.
- c) Unless otherwise directed by a pedestrian signal, pedestrians facing a steady circular red signal alone shall not enter the roadway.

2.1.2 Application

- a) A steady circular red shall be given when it is intended to prohibit traffic from entering the intersection or other controlled area.
- b) A steady circular red should be displayed with the appropriate green arrow indications when it is intended to permit traffic to make a specified turn or turns, and to prohibit traffic from proceeding straight ahead through the controlled area.
- c) A steady circular red shall be given when it is intended to prohibit all traffic, except pedestrians directed by a pedestrian signal, from entering the intersection or other controlled area.

2.2 Steady Circular Yellow

2.2.1 Meaning

a) Traffic, except pedestrians, facing a steady circular yellow 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.

b) Pedestrians facing a steady circular yellow 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.

2.2.2 Application

a) A steady circular yellow shall be given following a circular green indication in the same signal face.

b) A steady circular yellow is an optional alternative to a yellow arrow indication following a green arrow indication in a separate signal face used exclusively to control a single directional movement.

2.3 Steady Circular Green

2.3.1 Meaning

a) Traffic, except pedestrians, facing a circular green 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.

b) Pedestrians facing a circular green may proceed across the roadway in any marked or unmarked crosswalk unless directed otherwise by an official sign or by pedestrians signals.

2.3.2 Application

A steady circular green indication shall be given only when it is intended to permit traffic to proceed in any direction which is lawful and practical.

2.4 Green Arrow

2.4.1 General

- a) The green arrow shall be reserved to indicate those vehicular movement(s) which are protected by the delay or restriction of opposing or conflicting vehicular and/or pedestrian movement(s) across or into the path of that vehicular movement indicated by the green arrow.
- b) Traffic directed by a green arrow, or combination of circular green or green arrow or combination of green arrows, shall yield the right-of-way to pedestrians within the intersection of adjacent crosswalk and to vehicles lawfully within the intersection at the time such signal is exhibited.
- c) Green arrows for turn indications shall necessitate separate signal indications for the pedestrian or the prohibition of the pedestrian conflict. Turn arrows shall not be used in conflict with the WALK indication.

2.4.2 Straight-Through Green Arrow

- a) Vehicular traffic facing the straight-through arrow may proceed through, but shall not turn right or left.
- b) A straight-through green arrow on any approach may be shown alone, or with a circular steady yellow, but never with a circular steady red.

2.4.3 Left Green Arrow

- a) Vehicular traffic facing a left green arrow may proceed to the left, but shall not turn right or go straight through unless a steady circular green is presented and illuminated.
- b) A left green arrow shall be shown with a steady circular red when through movements are stopped on that approach.
- c) A left green arrow may be shown alone over an exclusive left turn lane, either so designed or signed, when accompanied by through movements on that approach.
- d) A left green arrow may be used with a steady circular green, or steady circular red.

e) Left green arrows shall not be used in a right approach signal.

2.4.4 Right Green Arrow

a) Vehicular traffic facing a right green arrow may proceed to the right, but shall not turn left or go straight through unless a circular green is present and illuminated.

b) A right green arrow shall be shown with a steady circular red when through movements are stopped on that approach.

c) A right green arrow may be shown alone over an exclusive right turn lane, either so designed or signed when accompanied by through movements on that approach.

d) A right green arrow may be used with a steady circular yellow, yellow arrow or steady circular red.

e) Right green arrows shall not be used in a left approach signal.

2.5 Yellow Arrow

2.5.1 Meaning

a) Traffic, except pedestrians, facing a steady 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.

b) Pedestrians facing a steady 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.

2.5.2 Application

a) A steady yellow turn arrow indication shall be used following a green arrow indication which has been displayed simultaneously with a circular red indication in the same signal face.

b) A steady yellow arrow indication may be used in a separate signal face following a green arrow indication, when that face is used exclusively to control a single directional movement.

c) A steady yellow arrow indication may be used to indicate the clearance interval following the termination of a green arrow indication when displayed simultaneously with a continuing circular green indication in the same signal face.

2.6 Prohibition of Simultaneous Displays

The following combinations of signal indications shall not be simultaneously displayed on any one signal face, and shall not be simultaneously displayed in different signal faces on any one approach to an intersection unless the signal faces are shielded, hooded, louvered, positioned or designed so that none of these prohibited combinations of signal is readily visible to drivers:

- a) CIRCULAR GREEN with CIRCULAR YELLOW.
- b) Straight-through GREEN ARROW with CIRCULAR RED.
- c) CIRCULAR RED with CIRCULAR YELLOW.
- d) CIRCULAR GREEN with CIRCULAR RED.
- e) CIRCULAR GREEN with RED ARROW.

2.7 Pedestrian Signals

2.7.1 DONT WALK, Flashing

While the DONT WALK indication is flashing, no pedestrian shall start to cross the roadway in the direction of the indication, but any pedestrian who has partly completed his crossing during the WALK indication shall proceed to a sidewalk, or to a safety island.

2.7.2 DONT WALK, Steady

While the DONT WALK indication is steady, no pedestrian shall cross the roadway in the direction of the indication.

2.7.3 WALK, Flashing

While a WALK signal is flashing, pedestrians facing the signal indications may proceed across the roadway in the direction of the signal indication realizing that the motoring traffic also

has a FULL Green signal indication for the parallel street. (Such operation is no different than the pedestrian using the same full green signal as the motorist, but does provide for better location of signal heads for pedestrian and vehicular use and ALSO allows for a separate and longer pedestrian clearance interval to better meet their needs.)

2.7.4 WALK, Steady

While the WALK indication is steadily illuminated, pedestrians facing the signal indications may proceed across the roadway in the direction of the signal indication and shall be given exclusive right-of-way by all vehicles. (Vehicles will not be permitted to enter or turn across these pedestrian crosswalks thereby providing the pedestrian with an exclusive movement.)

2.7.5 Application of Pedestrian Signal Indications

Pedestrian signal indications shall be installed in conjunction with vehicular traffic signals already meeting one or more of the traffic signal warrants set forth in Section 711-1 of the regulations under any of the following conditions:

- a) When a traffic signal is installed under the pedestrian volume or school crossing warrant.
- b) When an exclusive interval or phase is provided or made available for pedestrian movement in one or more crosswalks with all conflicting vehicular movements being stopped for those crosswalks.
- c) When vehicular indications are not visible to pedestrians or when the vehicular indications are in a position which would not adequately serve pedestrians.
- d) At established school crossings (as promulgated by the school and municipal traffic officials responsible for school pedestrian safety) at intersections signalized under any warrant.

Pedestrian signal indications should also be installed under any of the following conditions:

- a) When any volume of pedestrian activity requires use of a pedestrian clearance interval to minimize vehicle-pedestrian conflicts or to assist pedestrians in making a safe crossing.
- b) When multi-phase or split-phase timing would tend to confuse pedestrians guided only by vehicle signal indications and any volume of pedestrian activity is present.
- c) When pedestrians cross part of the street, to or from an island, during a particular interval where they should not be permitted to cross another part of that street during any part of the same interval.

3.0 FLASHING OPERATION

3.1 Traffic Signals

3.1.1 Meaning

- a) Flashing red (stop signal) - When a red lens is illuminated with rapid intermittent flashes, drivers of vehicles 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 at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before entering the intersection, and the right to proceed shall be subject to the rules applicable after making a stop at a STOP sign.
- b) Flashing yellow (caution signal) - When a yellow lens is illuminated with rapid intermittent flashes, drivers of vehicles may proceed through the intersection or past such signal only with caution.

3.1.2 Application

When a traffic control signal is put on flashing operation, normally a yellow indication should be used for the major street and a red indication for the other approaches. Yellow indications shall not be used for all approaches. The following applications shall apply whenever signals are placed in flashing operation:

- a) Yellow arrows shall not be flashed. A signal face with a yellow arrow indication and no circular yellow lens shall not be illuminated during flashing operation.
- b) A circular yellow indication shall be flashed instead of any yellow arrow indication which may be included in that signal face.
- c) No circular green or green arrow indication or flashing yellow indication shall be terminated and immediately followed by a steady red or flashing red indication without the display of the steady yellow change indication; however, transition may be made directly from a circular green or green arrow indication to a flashing yellow indication.
- d) Stop signs shall not be used with flashing signals.

3.1.3 Operation

- a) The illuminating element in a flashing signal shall be flashed continuously at a rate of not less than 50 nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total flash cycle.
- b) When traffic control signals are put on flashing operation, the signal indication given to the several streets shall be as specified in Section 1.1.
- c) Automatic changes from flashing to stop-and-go operation shall be made at the beginning of the major street green interval, preferably at the beginning of the common major street green interval, (i.e., when a green indication is shown in both directions on the major street). Automatic changes from stop-and-go to flashing operation shall be made at the end of the common major street red interval, (i.e., when a red indication is shown in both directions on the major street).
- d) The change from the flashing to stop-and-go operation, or from stop-and-go to flashing operation by manual switch may be made at any time.
- e) Where there is no common major street green interval, the automatic change from flashing to

stop-and-go operation shall be made at the beginning of the green interval for the major traffic movement on the major street. It may be necessary to provide a short, steady all-red interval for the other approaches before changing from flashing yellow or flashing red to green on the major approach.

3.2 Intersection Control Beacon

3.2.1 General

- a) An intersection control beacon is a section of a standard traffic signal head, having flashing circular yellow and/or flashing circular red indications.
- b) Two separate sections should be installed on each approach and they are used only at intersections to control two or more directions of travel.
- c) Intersection control beacons are intended for use at intersections where traffic or physical conditions do not justify conventional traffic signals but where high accident rates indicate a special hazard.

3.2.2 Meaning

The meaning of the flashing circular yellow and circular red indications are as set forth in Section 3.1.1.

3.2.3 Application

- a) Yellow on one route, normally the major roadway and red for the remaining approaches.
- b) Flashing yellow indications shall not face conflicting vehicular approaches.
- c) A stop sign must be used with a flashing red, intersection control beacon.

3.2.4 Operation

Intersection control 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.

3.3 Lamp Wattage

If a 150 watt lamp is used in 12 inch flashing yellow lens, in Intersection control beacons or flashing signals, and the light output is so bright as to cause excess glare during hours of darkness and/or inclement weather, an automatic dimming device should be used to reduce the brilliance during night operation.

3.4 Miscellaneous

- a) Flashing operation of either signals or beacons shall be such that the indications for each approach shall have a simultaneous ON and OFF period.
- b) A flashing red beacon may be used with a steady right turn green arrow, to emphasize the condition "Stop, - except when turning Right".

4.0 NUMBER of SIGNAL FACES

4.1 General

There shall be a minimum of two vehicular signals for the through movement at each approach to an intersection.

4.2 Third Approach Signal

A third signal for through traffic shall be considered when:

- a) The nearest signal face is more than 120 feet beyond the stop line;
- b) The desired visibility is not available due to the approach grades or angularity;
- c) Conditions of sunlight, background lighting or glare behind the signal impairs visibility;
- d) Other unusual conditions dictate.

4.3 Turn Signal

A single signal face is permissible for the control of an exclusive turning lane. Such signal shall be in addition to the two signals for the through-movement.

When the left or right turning movement is terminated at a time other than the through movement for that approach, a separate signal face shall be displayed for the turning movement in addition to the two (2) signal faces for the

through movement and a sign "Left Turn Signal" or "Right Turn Signal" (R 18-2(L) or R 18-2(R)) shall be located close to the turning signal.

When the left or right turn movement is followed by the circular green, the left or right green arrow may be displayed with the approach signal. The left arrow with the signal to the left, the right arrow with the signal to the right of that approach.

4.4 Pedestrian Signals

Where used, there shall be a minimum of two (2) pedestrian signals visible for each crosswalk (one in each direction) so that there is a signal in the line of vision of pedestrians crossing in any direction.

5.0 LOCATION of SIGNAL FACES

5.1 General

Approach signals are required for intersection control unless exclusive left and/or right turn signals are provided and the need for lane control has been demonstrated as an area basis. The minimum horizontal distance between signal faces for the same approach shall be 8 feet.

5.2 Distance from Stop Line

5.2.1 Overhead Signals

a) It is desirable to keep both overhead signals between 40 and 60 feet from the stop line. However, when the nearest signal face is more than 120 feet beyond the stop line, a supplemental near side signal indication shall be provided. This near side signal should be located as close as practicable to the stop line for that approach.

b) The nearer of the two primary signals for the through movement should not be less than 40 feet from the stop line. It may, however, be less than 40 feet, upon review and approval of written justification, but in no case nearer than the center line of the intersecting street or roadway.

c) The further primary signal shall be at least 40 feet beyond the stop line.

5.2.2 Post Mount Signals

a) Where both of the signal faces are to be

post mounted, they shall both be on the far side of the intersection (at least two (2) feet beyond the far curb line or shoulder line extended) with one signal on the right and one on the left or on the median island if practical.

5.2.3 Mid-Block Signals

At signalized mid-block crosswalks, there shall be at least one signal face over the traveled roadway for each approach. The other signal should be side mounted if physical conditions permit.

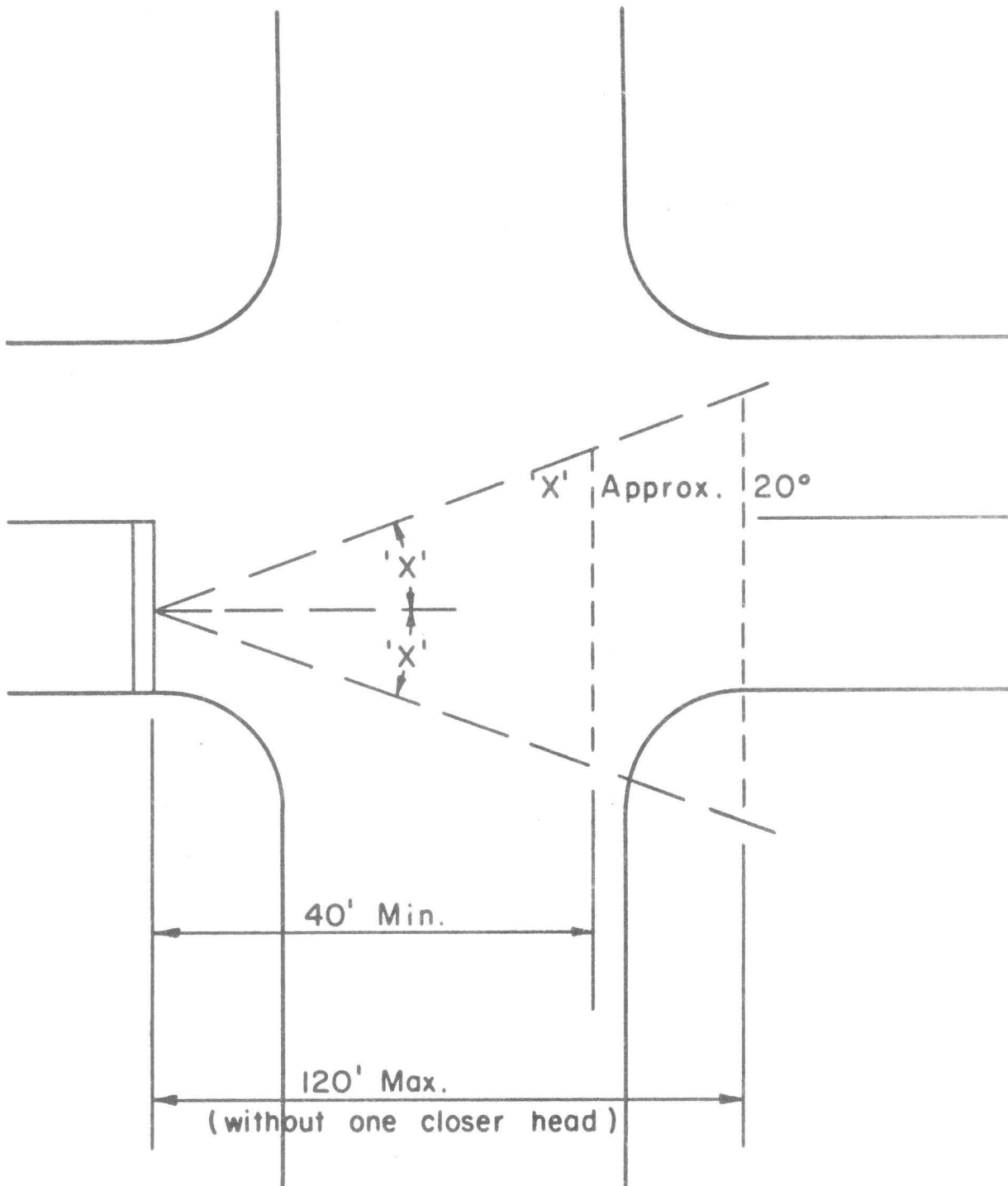
5.3 Lateral Placement

5.3.1 General

A minimum of two signal faces for through traffic shall be provided and should be continuously visible from a point at least the following distances in advance of and to the stop line, unless physical obstruction of their visibility exists:

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

Except where the width of the intersecting street or other conditions make it physically impractical, at least one and preferably both of the 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 approximately 20 degrees to the right of the center of the approach extended, and the other making an angle of approximately 20 degrees to the left of the center of the approach extended.



5.3.2 Overhead Signals

- a) It is desirable to keep a minimum distance of six (6) feet horizontally between any overhead signal and the edge of pavement or curb line (or median when an exclusive Left Turn Signal is installed in addition to the two (2) primary signals).
- b) The left approach signal, except when an exclusive left turn signal is installed, should be located to the left of the center line of that approach. However, care must be taken so that signals do not block the visibility of indications from the other direction.
- c) Lane control signals shall be avoided except when exclusive left and/or right turns are to be signalized on the same approach.
- d) An exclusive left turn signal shall be located in an area not greater than five (5) feet to the left or right of the center line of the left turn lane being signalized.
- e) An exclusive right turn signal shall be located at or to the right of the center line of the right turn lane being signalized, but in no case should it be more than five (5) feet to the right of the right edge of that lane or shoulder.

5.3.3 Post-mount

- a) A far right post-mounted signal shall have a minimum horizontal clearance of two (2) feet to the right of the curb line or edge of shoulder line of that approach extended, but not more than five (5) feet unless approved after written justification.
- b) A far left post-mounted signal shall have a minimum horizontal clearance of two (2) feet to the left of the curb line or edge of shoulder line of that approach extended, but not more than five (5) feet unless approved after written justification.
- c) Median-mount

Post-mounted signals on pedestals or poles of yielding, bread-away or fangible design may be installed on curbed medians of four (4) feet or more in width or on mountable curb six (6) feet or more in width.

A median-mounted signal may serve as a far left signal, or as an exclusive left turn signal.

If it is to serve as an exclusive left turn signal, Section 4.3 must be fulfilled.

d) Near - Right Post-Mount

When a supplemental near right indication is used, it should be located as near as practical to the stop line, or to where the stop line would normally be, but never in advance of the stop line. Its location relative to the curb or pavement edge shall be as set forth in 5.3.3(a). (This location may suffice for the supplemental signal in Section 5.2.1).

5.4 Height of Signal Faces

a) Vehicular Signals

The bottom of the housing of a signal face, not mounted over a roadway, shall not be less than 8 feet nor more than 15 feet above the sidewalk or, if none, above the pavement grade at the center of the highway. (If the side mounted signal face is less than 40' from to stop line the bottom of the housing shall not be more than 12 feet above the sidewalk or pavement grade).

The bottom of the housing of a signal face suspended over a roadway shall not be less than 15 feet nor 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.

b) Pedestrian Signals

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.

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

Pedestrian signal heads 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.

6.0 ARRANGEMENT OF LENSES IN SIGNAL FACES

6.1 Vertical Signal Face

In a vertical signal face, the relative positions of lenses from top to bottom shall be:

Circular Red
Circular Yellow
Straight-through Green Arrow
Circular Green
Left turn Yellow Arrow
Left turn Green Arrow
Right turn Yellow Arrow
Right turn Green Arrow

6.2 Horizontal Signal Face From Left to Right

Circular Red
Circular Yellow
Left turn Yellow Arrow
Left turn Green Arrow
Circular Green
Straight-through Green Arrow
Right turn Yellow Arrow
Right turn Green Arrow

6.3 Signal Face Cluster

In a cluster, identical signal indications may be repeated in adjacent or horizontal locations within the same signal face.

6.4 Typical Arrangement

Typical Design Arrangements for use in the Commonwealth of Pennsylvania are shown in Figure 1, Appendix A of this Handbook.

7.0 SIZE OF SIGNAL LENSES

7.1 Eight Inch (8") Lenses

The eight inch (8") lens is the standard size for vehicular traffic and should be used at most signalized intersections.

7.2 Twelve Inch (12") Lenses

The twelve inch (12") lens provides an important increase in the target value of the signal at locations where signal indications tend to be overlooked, such as:

- (a) Rural intersections with 85 percentile approach speeds exceeding 45 MPH.
- (b) Isolated intersections where signalization might be unexpected.
- (c) Ramp terminals of high speed expressways.
- (d) Special problem locations.
- (e) Where an arrow is used a 12" lens is mandatory.

7.3 Pedestrian Signals

In the Gas-filled tubing type the message shall consist of cut-out letters illuminated by gas-filled tubing.

In the Incandescent type the WALK and DONT WALK indications shall be in separate signal sections. The WALK lens shall be white glass with all but the letters obscured by an opaque material. The DONT WALK lens shall be orange glass with all except the letters obscured by an opaque material.

The letters "WALK" and "DONT WALK" shall be at least three (3) inches high for a crossing where the distance from the near curb to the signal indication is 60 feet or less. For distances over 60 feet the letters shall be $4\frac{1}{2}$ inches high.

8.0 PAINTING OF SIGNALS

Signal heads shall be painted highway yellow.

The insides of visors (hoods) and the entire surface of louvers, and fins, and the front surface of backplates shall have a dull black finish to minimize light reflection to the side of the signals.

9.0 VISIBILITY AND SHIELDING of SIGNAL FACES

9.1 General

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

approaching driver located a distance from the stop line equal to the distance traversed while stopping. This distance should include that distance covered while reacting to the signal as well as that covered while bringing the vehicle to a stop from an average approach speed.

9.2 Visors

There are three types of visors: standard, tunnel and full circle visors.

A visor shall be used on all signal faces to:

- a) aid in directing the signal indication specifically to approaching traffic.
- b) shade the signal lenses from sun, sky and other conditions which tend to make a lens look illuminated when it is not.
- c) shield the lens from motorists on other approaches who might be confused where they to see the lens.

9.3 Louvers

Louvers are full circle visors with one or more built in fins that provide a highly directional beam of light.

Louvers are used to decrease the possibility of motorists seeing signals which are not intended for them, especially at intersections where roads come together at acute angles.

Louvers shall be considered for other special applications such as to shield left or right turn signal indications from through traffic.

9.4 Backplates

Backplates improve the visibility of signals otherwise impaired by background lighting, sun light, or glare behind the signal face.

9.5 Programmed Signal Lenses

At locations where the visible color display of a signal face or faces must be confined to exact limits, a traffic signal face with optically programmed lenses should be used. The visibility of the color display of this traffic signal can be controlled to exact lateral and longitudinal limits and is available with twelve (12) inch lens and as a conversion kit for any standard eight (8) inch signal face.

All such traffic signal faces, when used, should be placed on a rigid mounting to assure that they are properly aimed.

10.0 TRAFFIC SIGNALS NEAR RAILROAD OR TRANSIT GRADE CROSSING

At some street and highway intersections, railroad tracks pass within or near the intersection area, and at such intersections, it is essential that the control of the vehicular traffic signal be pre-empted by an approaching train, or by some other means, to avoid the conflicting aspects of traffic signals and the red flashing train approach signal. Such control of traffic must assure clearance of the tracks by all vehicular traffic.

It is important to remember that train approach signals come under the jurisdiction of the Public Utility Commission at Harrisburg, Pennsylvania, and any application or request for such controls must be presented to the Commission. (In view of the Public Utility Commission's jurisdiction over train approach signals, all vehicular signals to be located within 300 feet of a railroad grade crossing must be reviewed by the Commission before a permit for vehicular traffic signals may be issued by the Secretary of Transportation.)

11.0 PREEMPTED SIGNALS

Systems in which traffic control signals are preempted by emergency vehicles shall be designed and installed so as to provide an indication to the driver of any emergency vehicle approaching an intersection when the equipment fails to preempt the traffic signal at that intersection. This indication shall be designed to be given whether the failure results from a prior preemption by an emergency vehicle on the cross street, by a railroad preemption, from equipment malfunction, or from any other cause.

Traffic signals operating in congested areas during emergency conditions should be operated in a manner designed to keep traffic moving. Prolonged all-red or flashing signal sequences are to be avoided.

12.0 USE OF PAVEMENT MARKINGS AND SUPPLEMENTAL SIGNS

12.1 Pavement Markings

All necessary pavement markings (such as center lane, channelizing, stop lines, crosswalk lines and lane control markers including curb markings for parking restrictions) as may be required to properly direct and control the flow of vehicular and pedestrian traffic through the proposed signalization shall be indicated and required on the condition diagram and become a part of the Traffic Signal Permit when issued.

12.2 Signs

All necessary signs (such as turn prohibition, lane control, one-way, parking restrictions, pedestrian control and others) as may be required to properly direct and control the flow of vehicular and pedestrian traffic through the proposed signalization shall be indicated and required on the condition diagram and become a part of the Traffic Signal Permit when issued.

12.3 Illuminated Signs

Illuminated signs should be required where an engineering study shows that official, reflectorized signs will not give effective performance and where extraneous light makes it impossible or difficult to read officila signs.

The traffic control signal shall be given dominant position and brightness to assure its target priority in the overall display.

Illuminated changeable message signs shall be installed under conditions, such as:

- a) Where the Left Turn is not denied following the Advance Dual Left Turn. (In this case the dual message would be "Left Turn Signal" and "Turn With Care").
- b) Where turns are prohibited during certain times of the day.

13.0 PERMITS

The Secretary of Transportation with reference to State highways and local authorities in counties, cities, boroughs, incorporated towns, and townships with reference to highways under their jurisdiction are authorized to erect and maintain traffic signals.

Before local authorities, except as hereinafter provided for cities, shall erect or cause to be erected traffic signals, they must first obtain the approval of the Secretary of Transportation.

- a). Cities of the first and second class may, on streets other than State highways within such cities, erect, maintain and operate traffic signals, without prior approval of the Secretary of Transportation, but such signals must be of a type approved by the Secretary as provided in Regulation 711 (a) and must follow the lighting sequence in accordance with the provisions of Regulation 711-1 (a) (2).

- b). Cities of the third class may, on streets other than State highways within such cities, erect, maintain and operate traffic signals without prior approval of the Secretary of Transportation as to hours of operation and type of control. Approval of the Secretary must be obtained as to location and all other requirements of these regulations. The type of control must be one approved by the Secretary in accordance with Regulation 711 (a) and must follow the lighting sequence in accordance with the provisions of Regulation 711-1 (a) (2).

14.0 CONTRACTS FOR INSTALLATION

General instructions, specifications, standard drawings and typical examples of Condition Diagrams for traffic signal installations are available from the

BUREAU OF TRAFFIC ENGINEERING
PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
Harrisburg, Pennsylvania 17120

APPENDIX 'A'

Schematic Intersection Drawings

and

Color Sequence Diagrams

APPENDIX A

The following Figures are provided as a tool for better understanding the text and as a further guide in establishing policies and procedures.

Figure 1. SIGNAL INDICATIONS

2. SYMBOLS
3. ACCEPTABLE PLACEMENT AND LOCATION
4. ONE-WAY; END ONE-WAY and 'T' INTERSECTIONS
5. PRE-TIMED TWO PHASE
 - a) Walk On Circular Green
 - b) Walk With Flashing Walk
6. NO PEDESTRIAN CROSSING
 - a) Semi-Actuated
 - b) Full-Actuated
7. SEMI-ACTUATED WITH ACTUATED PEDESTRIAN MOVEMENT
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk
8. FULL-ACTUATED WITH ACTUATED PEDESTRIAN MOVEMENT
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk
9. TWO PHASE OPERATION WITH CONTINUING RIGHT TURN
 - a) Right Turn On Red After Stop
 - b) Right Turn On Right Green Arrow
10. TWO PHASE PRE-TIMED WITH ADVANCE LEFT TURN
 - a) Walk With Circular Green
 - b) Walk With Flashing Green
11. TWO PHASE FULL ACTUATED WITH ADVANCE LEFT TURN
 - a) Walk With Circular Green
 - b) Walk With Flashing Green
12. TWO PHASE PRE-TIMED ADVANCE LEFT AND CONTINUING RIGHT TURN
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk
13. TWO PHASE FULL ACTUATED ADVANCE LEFT AND CONTINUING RIGHT TURN
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk

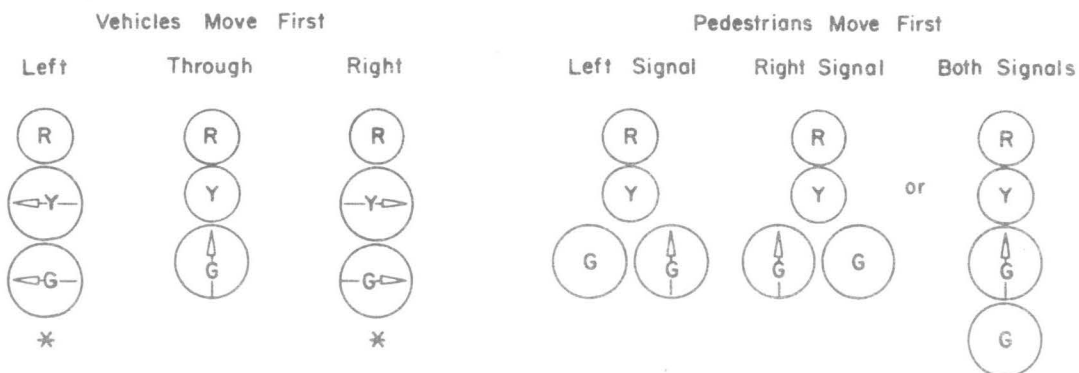
14. THREE PHASE OPERATION (SEMI) EXCLUSIVE LEFT AND CONTINUING RIGHT TURN
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk
15. THREE PHASE OPERATION (FULL) EXCLUSIVE LEFT AND CONTINUING RIGHT TURN
 - a) Walk On Circular Green
 - b) Walk On Flashing Walk
16. THREE PHASE WITH MINOR MOVEMENTS
Pedestrians Walk With Circular Green
17. MULTI-PHASE OPERATION (FULL) WITH EXCLUSIVE DUAL LEFT AND OVERLAPPING RIGHT TURN
Pedestrians Walk With Circular Green
18. MULTI-PHASE FULL QUAD LEFT TURN
Pedestrians Walk With Green
19. EXCLUSIVE ADVANCE DUAL LEFT TURN LEFT
LEFT TURN NOT DENIED
20. ADVANCE AND LAGGING LEFT TURN
(Lagging Must Be Avoided)
21. PEDESTRIAN FULL EXCLUSIVE PHASE
- 22a. PEDESTRIAN - EXCLUSIVE INTERVAL
One-Way Street Intersecting a Two-Way Street
(Pedestrians move first - then vehicular turns)
- 22b. PEDESTRIAN - EXCLUSIVE INTERVAL
One-Way Street Intersecting a Two-Way Street
(Vehicles turn first - then pedestrian movement)
- 22c. PEDESTRIAN - EXCLUSIVE INTERVAL
Intersection of Two, One Way Streets
(Pedestrians move first - then vehicular movement)
- 22d. PEDESTRIAN - EXCLUSIVE INTERVAL
Intersection of Two, One Way Streets
(Vehicles turn first - then pedestrian movement)
- 23a. PEDESTRIAN - EXCLUSIVE and COMBINED INTERVAL
ONE-WAY STREET Intersecting a Two-Way Street
- 23b. PEDESTRIAN - EXCLUSIVE and COMBINED INTERVAL
Intersection of Two, One-Way Streets
24. HOURLY MOVEMENT CHART

Figure 1

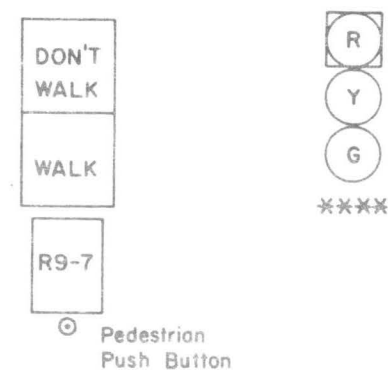
Signal Indications



Split Phase Operation



Pedestrian Signals



* 12" Tunnel Visors and Signing (R18-2) are Minimum Requirements.

Louvers or Programmed Signals may be Justified by an Engineering Study.

** Right Turn Signal - When Turn Arrow Terminates Other Than With Circular Green.

*** Right Signal When Right Turn Is Continuous.

**** Use Far Left For Pedestrian When Advance or Exclusive Left Turn Signal is Used - Unless Pedestrians Are Prohibited or WALK-DON'T WALK is Used. Circular Red Shall be Louvered or Programmed, Yellow And Green May Require Louvers or be Programmed.

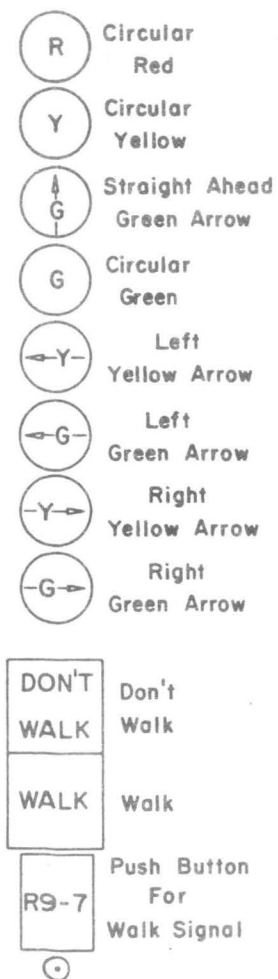
○ May be 8" or 12" lenses

○ Shall be 12" lenses

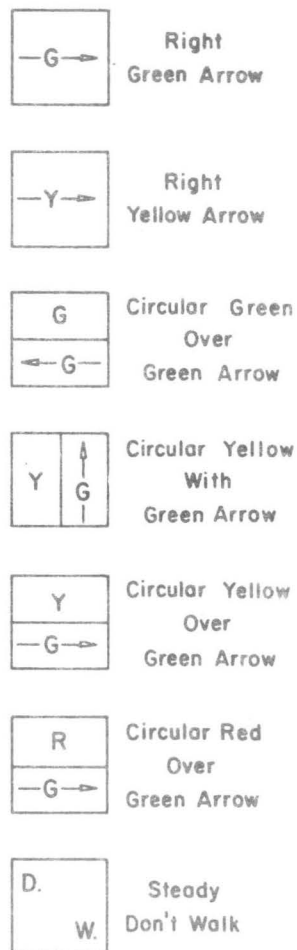
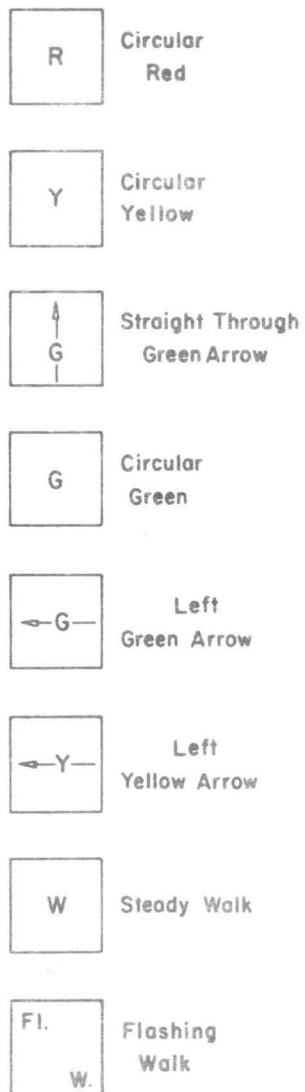
Figure 2

Symbols

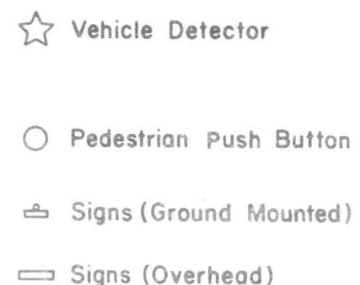
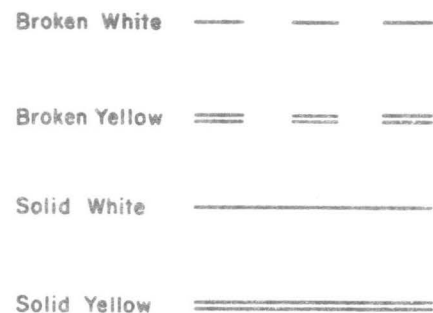
Signal Lenses



Color Sequence Chart



Traffic Lines



Color Sequence Chart (Cont.)

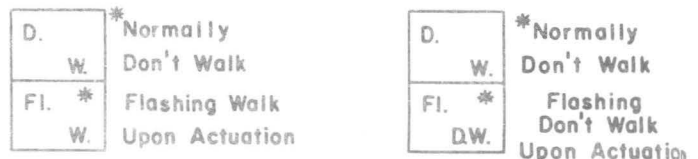
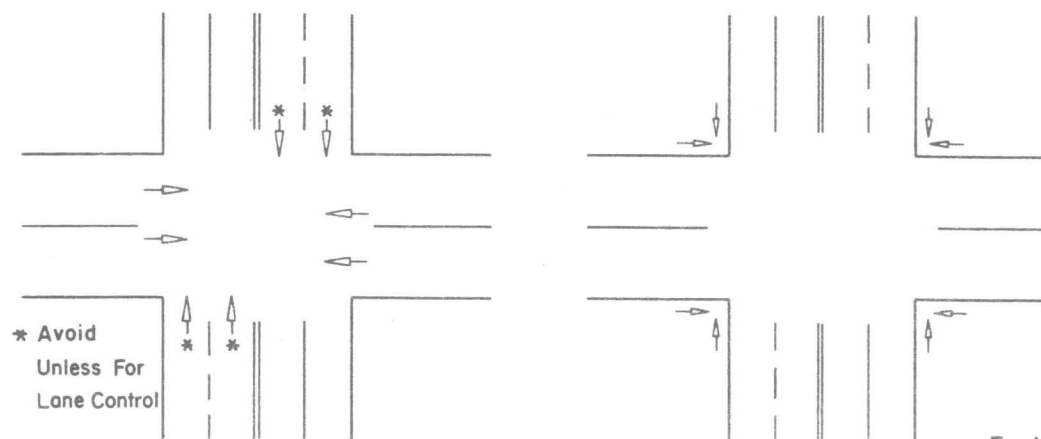
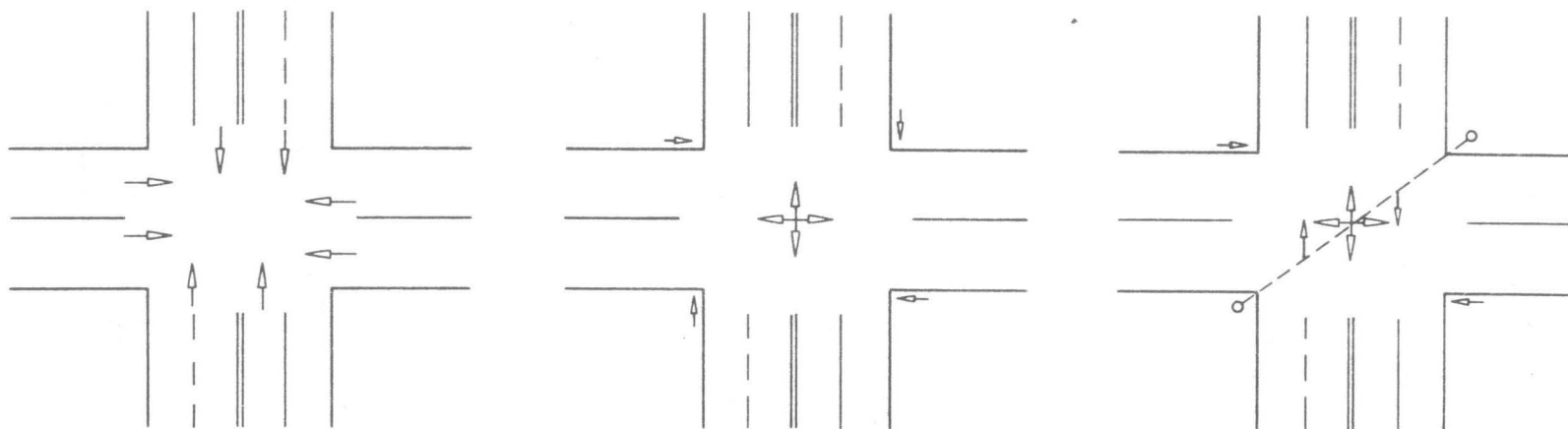


Figure 3

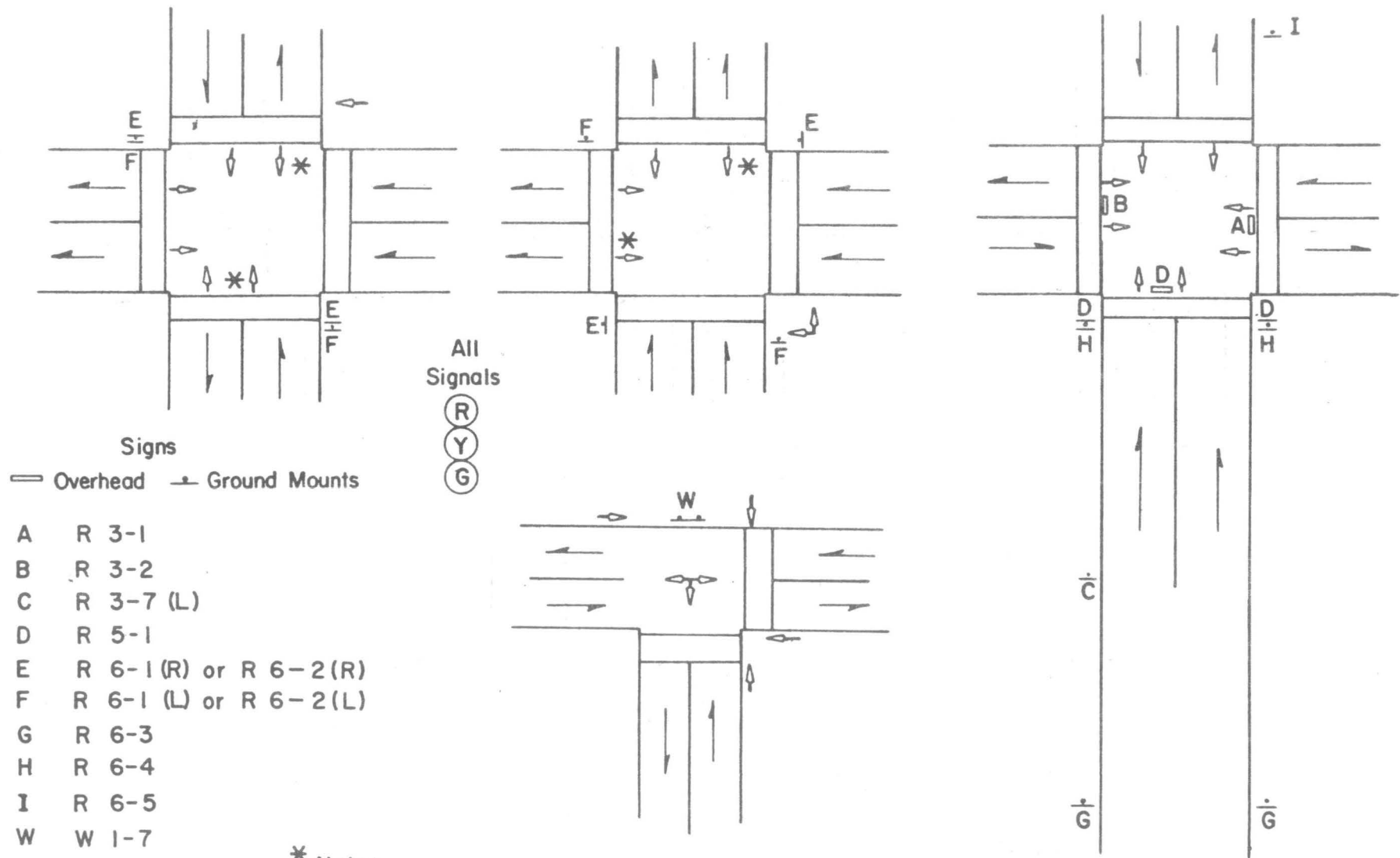
Acceptable Signal Placement
Pedestrian Movements May Require Additional Signals



Exclusive Side Mounts to be Used
On Low Speed Highway Only

Fig. 4

One-Way; End One-Way; 'T' Intersection Minimum Signals and Signing



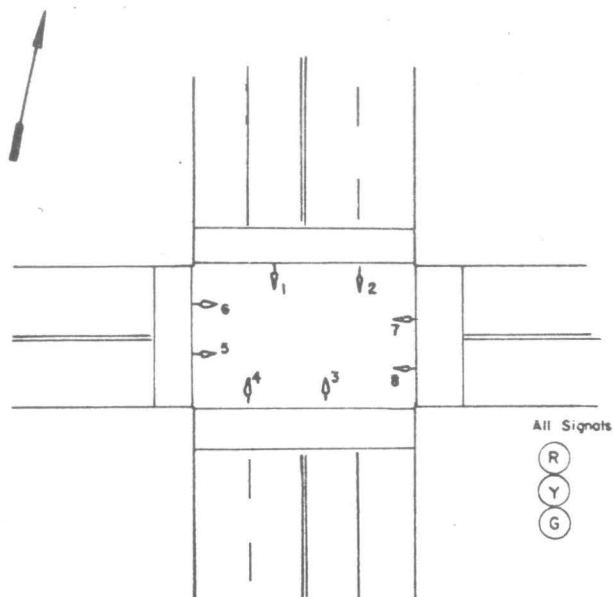
* Note:

One Way Signs should be Mounted Overhead by Signal Indication

Fig. 5

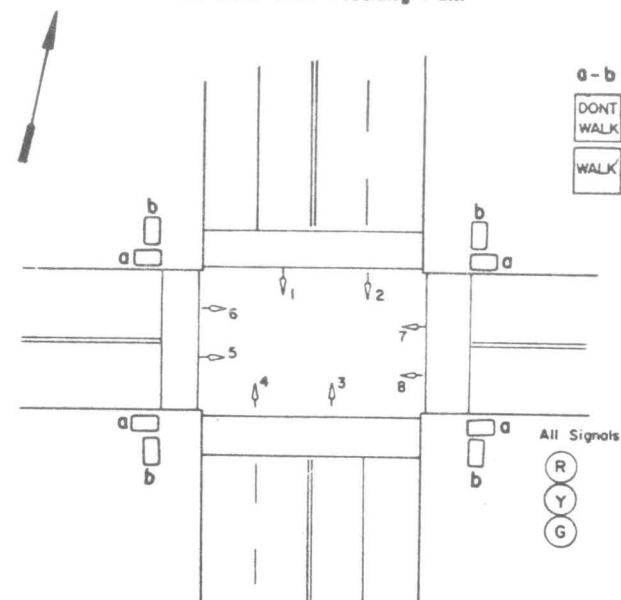
Pre-Timed Two Phase

A. Walk On Circular Green



Phase	A			B			Flashing
Interval Signal	1	2	3	4	5	6	
1-2	G	Y	R	R	R	R	Y
3-4	G	Y	R	R	R	R	Y
5-6	R	R	R	G	Y	R	R
7-8	R	R	R	G	Y	R	R
Time	31.2	3.0	1.8	19.2	3.0	1.8	60
% Cycle	52.0	5.0	3.0	32.0	5.0	3.0	100
Dial Setting	52	57	60	92	97	00	

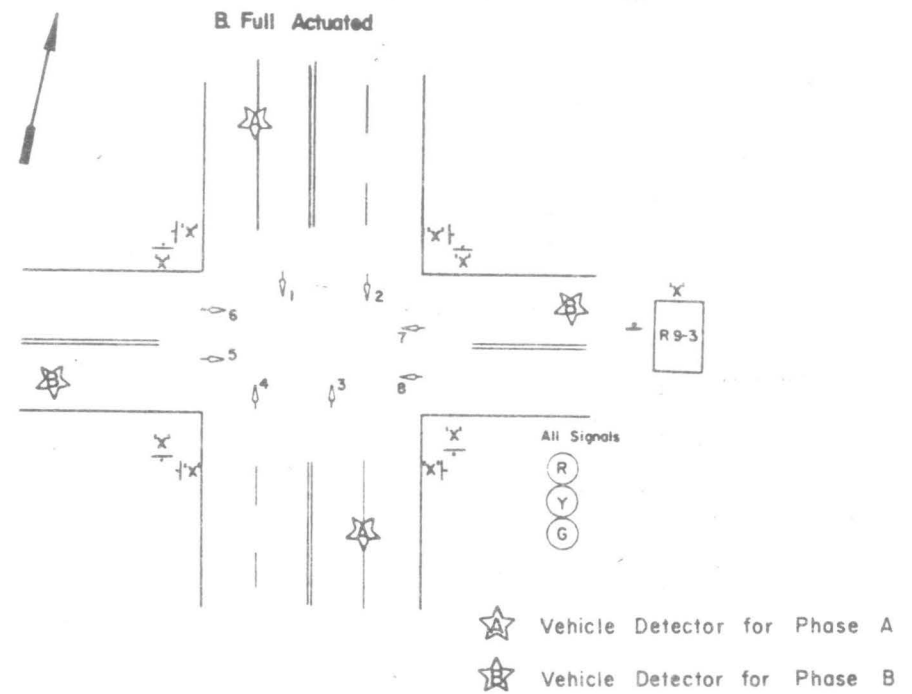
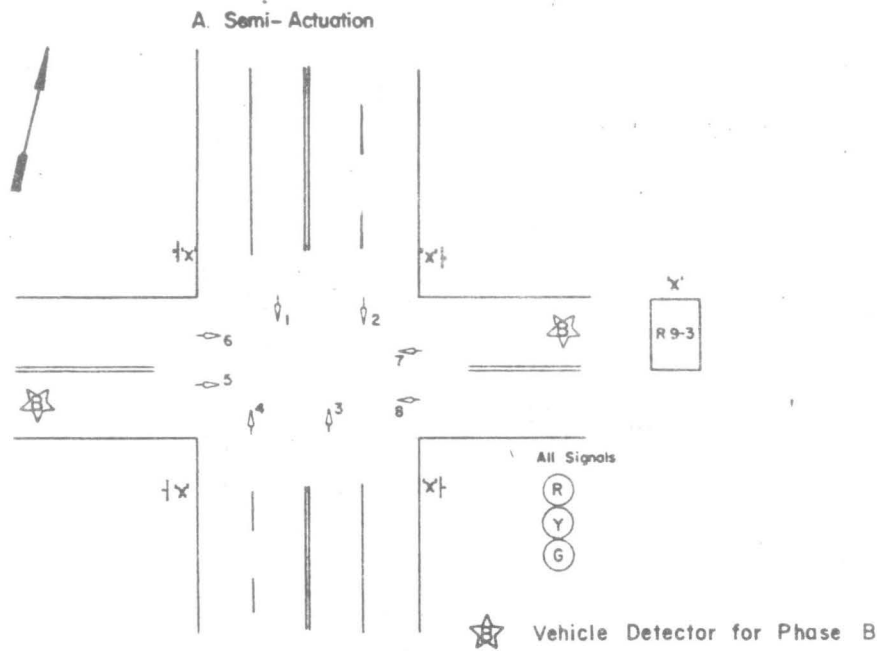
B. Walk With Flashing Walk



Phase	A					B					Flashing
Interval Signal	1	2	3	4	5	6	7	8	9	10	
1-2	G	G	G	Y	R	R	R	R	R	R	Y
3-4	G	G	G	Y	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	G	G	Y	R	R
7-8	R	R	R	R	R	G	G	G	Y	R	R
a	FL	FL	D	D	D	D	D	D	D	D	out
b	D	D	D	D	D	FL	FL	D	D	D	out
Time	7.8	8.4	15.0	3.0	1.8	7.8	8.4	3.0	3.0	1.8	60
% Cycle	13.0	14.0	25.0	5.0	3.0	13.0	14.0	5.0	5.0	3.0	100
Dial Setting	13	27	52	57	60	73	87	92	97	00	

Fig. 6

No Pedestrian Crossing



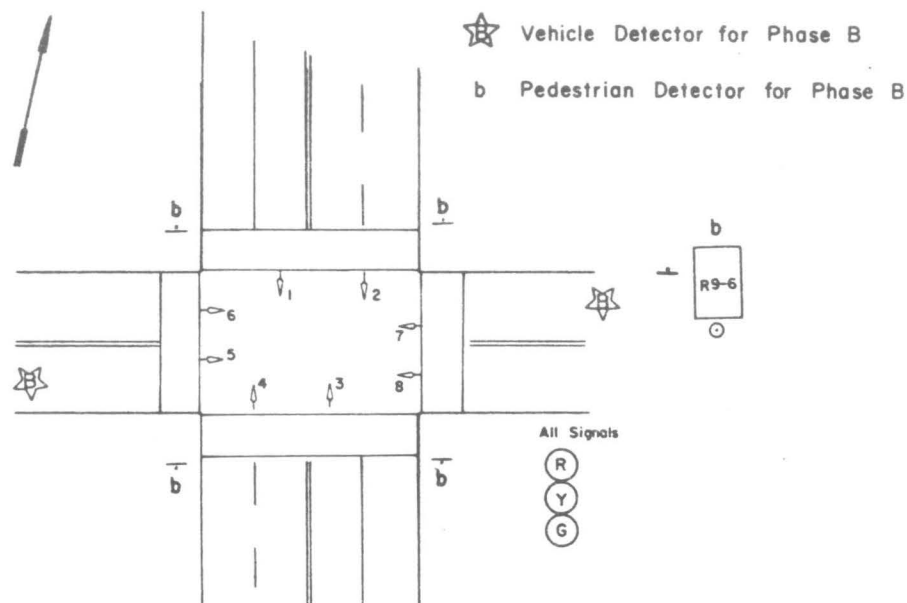
Phase	A			B			Flashing
Interval	1	2	3	4	5	6	
Signal							
1-2	G	Y	R	R	R	R	Y
3-4	G	Y	R	R	R	R	Y
5-6	R	R	R	G	Y	R	R
7-8	R	R	R	G	Y	R	R
Fixed	30	3	2		3	2	
Initial Interval				5			
Vehicle Interval				2			
Maximum				20			

Phase	A			B			Flashing
Interval	1	2	3	4	5	6	
Signal							
1-2	G	Y	R	R	R	R	Y
3-4	G	Y	R	R	R	R	Y
5-6	R	R	R	G	Y	R	R
7-8	R	R	R	G	Y	R	R
Fixed		3	2		3	2	
Initial Interval	5			5			
Vehicle Interval	2			2			
Maximum	30			30			

Fig. 7

Semi-Actuated with Actuated Pedestrian Movement

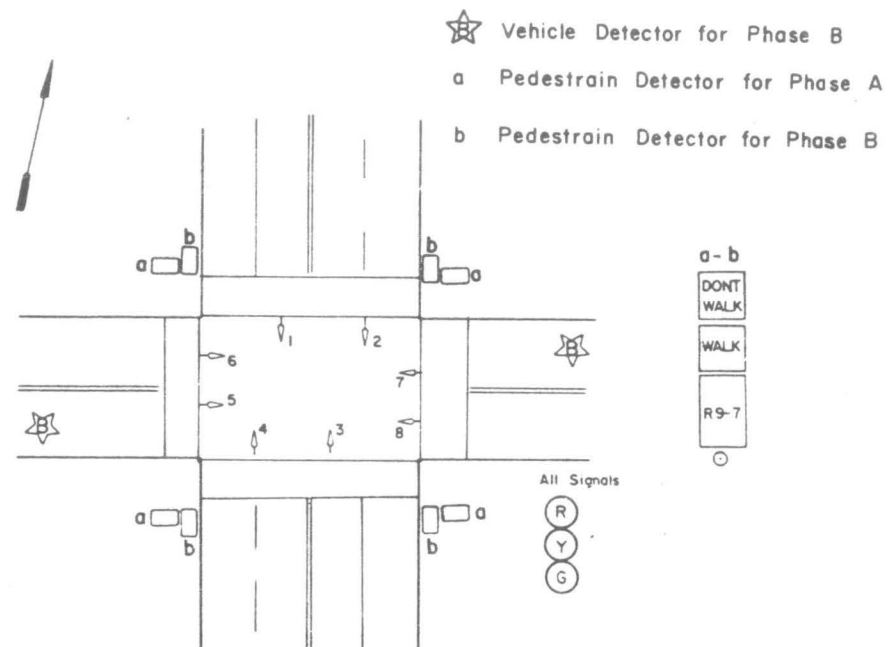
A. Walk On Circular Green



Phase	A					B					Emerg. Flash
Interval Signal	1	2	3	4	5	6	7	8	9	10	
1-2	G	G	G	Y	R	R	R	R	R	R	Y
3-4	G	G	G	Y	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	G	G	Y	R	R
7-8	R	R	R	R	R	G	G	G	Y	R	R
Fixed	30			3	2				3	2	
Initial Interval						5					
Vehicle Interval						2					
Maximum						20					
Pedestrian * Timer						15					

* Upon Pedestrian Actuation Only

B. Walk On Flashing Walk



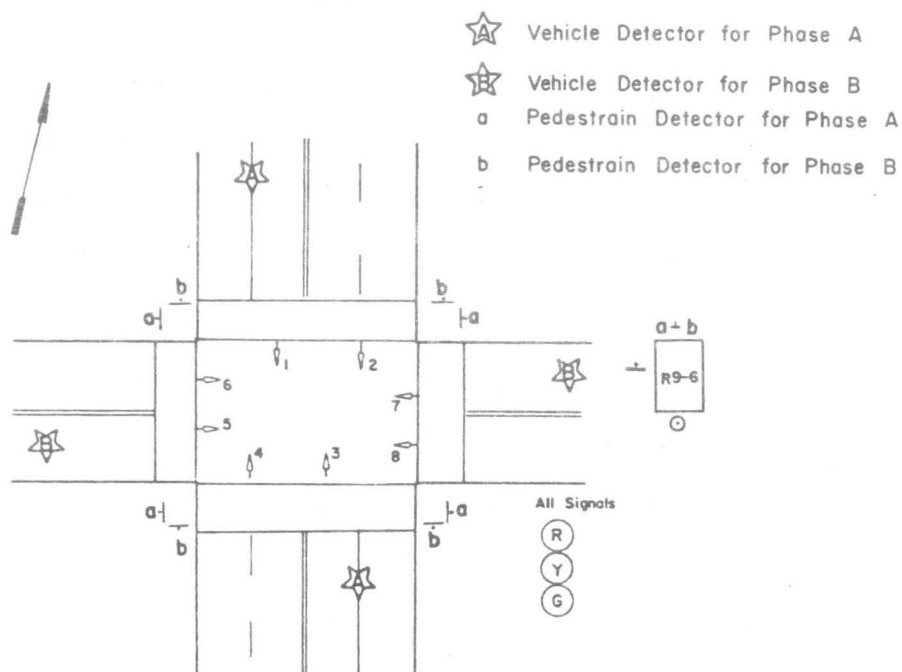
Phase	A					B					Emerg. Flash
Interval Signal	1	2	3	4	5	6	7	8	9	10	
1-2	G	G	G	Y	R	R	R	R	R	R	Y
3-4	G	G	G	Y	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	G	G	Y	R	R
7-8	R	R	R	R	R	G	G	G	Y	R	R
a	DW *FI W	DW *FI W	D	D	D	D	D	D	D	D	out
b	D	D	D	D	D	DW *FI W	DW *FI W	D	D	D	out
Fixed	30			3	2						
Initial Interval						5					
Vehicle Interval						2					
Maximum						20					
Pedestrian * Timer	7	8				7	8				

* Upon Pedestrian Actuation Only

Fig 8

Full Actuated with Actuated Pedestrian Movement

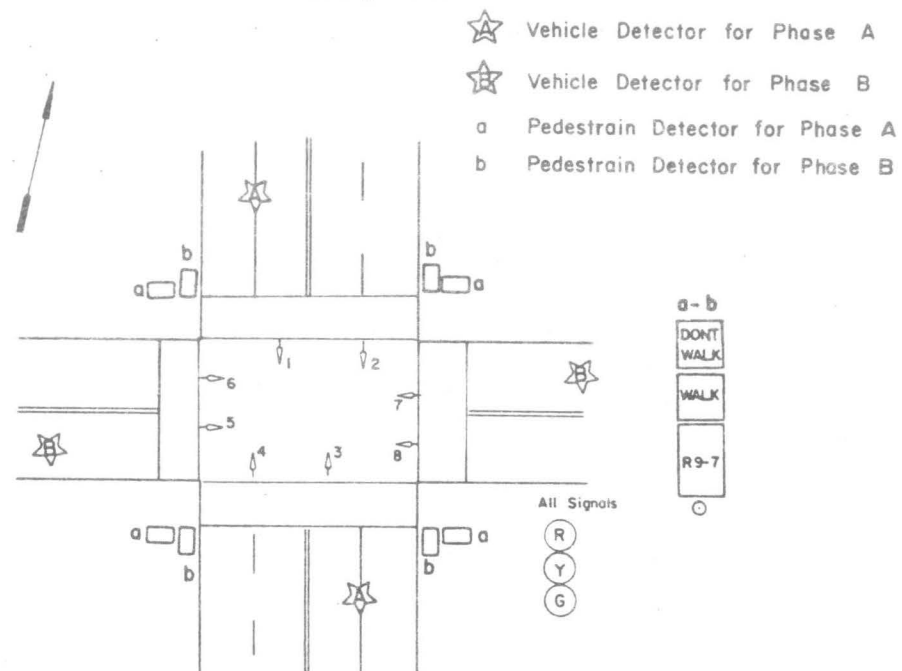
A. Walk On Circular Green



Phase	A					B					Emerg. Flash
Interval Signal	1	2	3	4	5	6	7	8	9	10	
1-2	G	G	G	Y	R	R	R	R	R	R	Y
3-4	G	G	G	Y	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	G	G	Y	R	R
7-8	R	R	R	R	R	G	G	G	Y	R	R
Fixed				3	2				3	2	
Initial Interval	5					5					
Vehicle Interval	2					2					
Maximum Pedestrian Timer	30					30					
	15					15					

* Upon Pedestrian Actuation Only

B. Walk On Flashing Walk



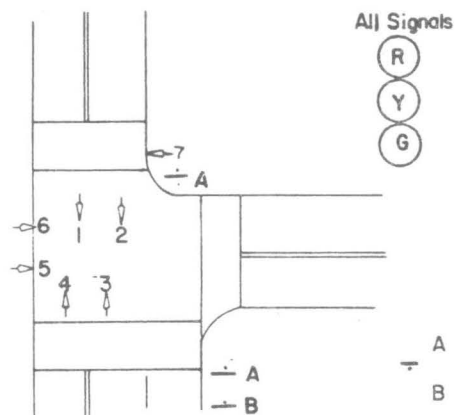
Phase	A					B					Emerg. Flash
Interval Signal	1	2	3	4	5	6	7	8	9	10	
1-2	G	G	G	Y	R	R	R	R	R	R	Y
3-4	G	G	G	Y	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	G	G	Y	R	R
7-8	R	R	R	R	R	G	G	G	Y	R	R
a	DW *FI W	DW *FI W	D	D	D	D	D	D	D	D	out
b	D	D	D	D	D	DW *FI W	DW *FI W	D	D	D	out
Fixed				3	2				3	2	
Initial Interval	5					5					
Vehicle Interval	2					2					
Maximum Pedestrian Timer	30					20					
	7	6				7	8				

* Upon Pedestrian Actuation Only

Fig. 9

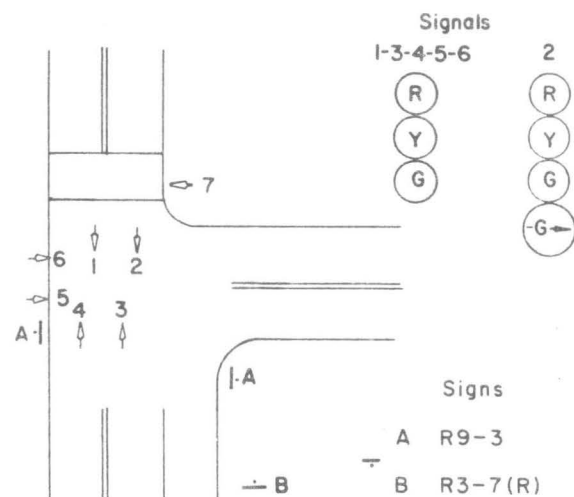
Two Phase Operation With Continuing Right Turn

Right Turn
A. On Red After Stop



Phase	A						B						Flashing
Interval	1	2	3	4	5	6							
Signals													
1-2	G	Y	R	R	R	R							Y
3-4	G	Y	R	R	R	R							Y
5-6	R	R	R	G	Y	R							R
7	R	R	R	G	Y	R							R
Time	31.8	3.0	1.2	1.98	3.0	1.2	60						
% Cycle	53	5	2	33	5	2	100						
Dial Setting	53	58	60	93	98	00							

Right Turn
B. On Right Green Arrow

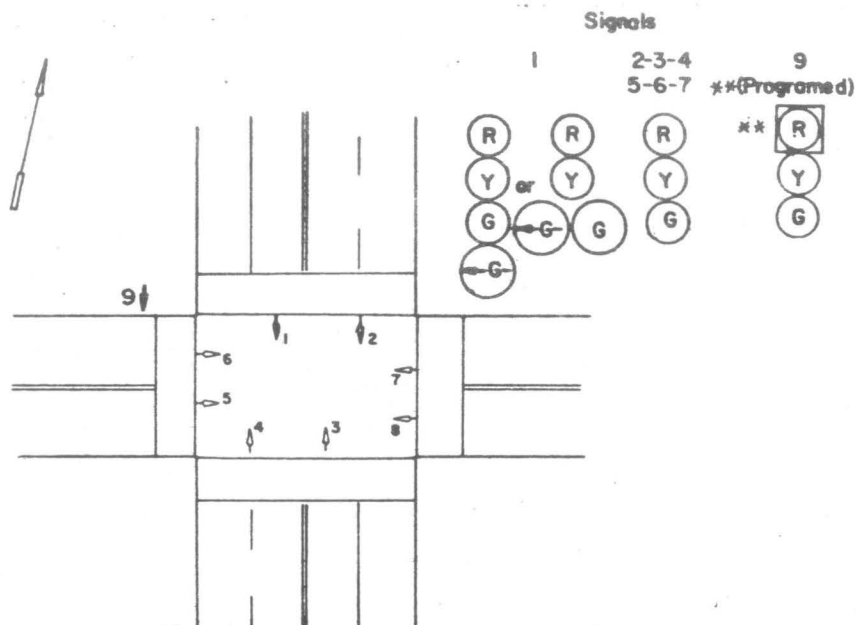


Phase	A						B						Flashing
Interval	1	2	3	4	5	6							
Signals													
1	G	Y	R	R	R	R							Y
2	G	G	G	G	G	G							Y
3-4	G	Y	R	R	R	R							Y
5-6-7	R	R	R	G	Y	R							R
Time	31.8	3.0	1.2	1.98	3.0	1.2	60						
% Cycle	53	5	2	33	5	2	100						
Dial Setting	53	58	60	93	98	00							

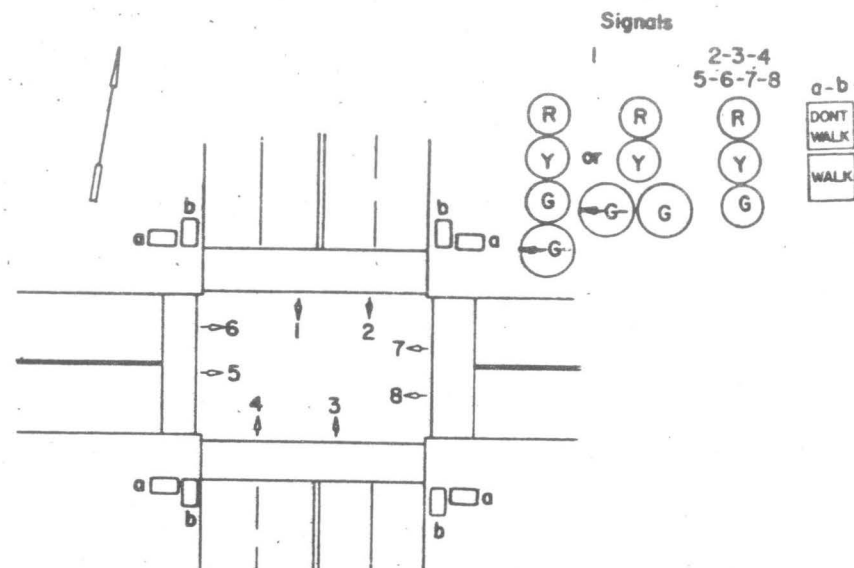
Fig. 10

Two Phase Pre-Timed with Advance Left Turn

A. Walk with Circular Green



B. Walk with Flashing Walk

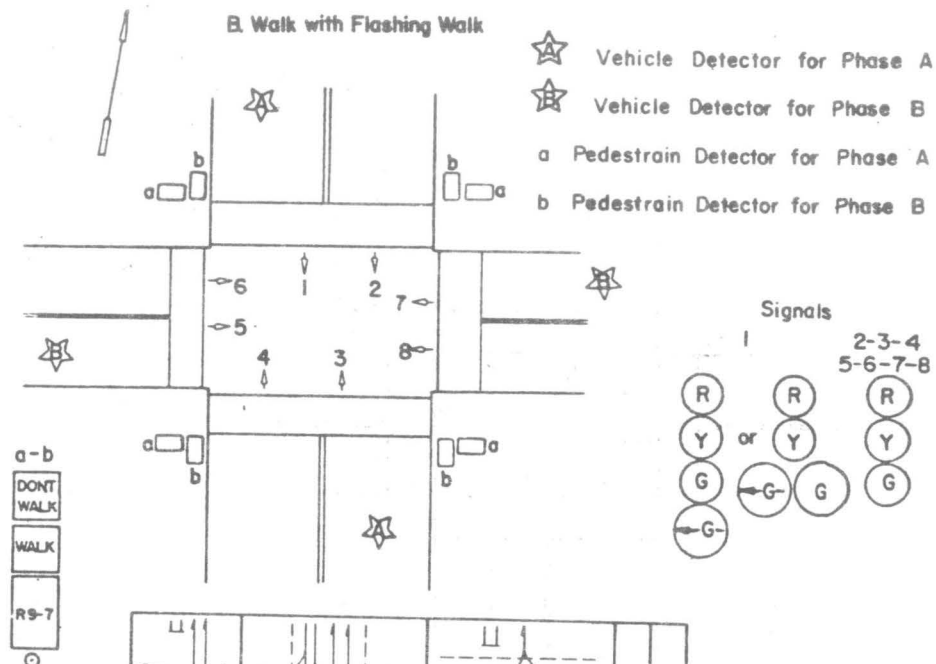
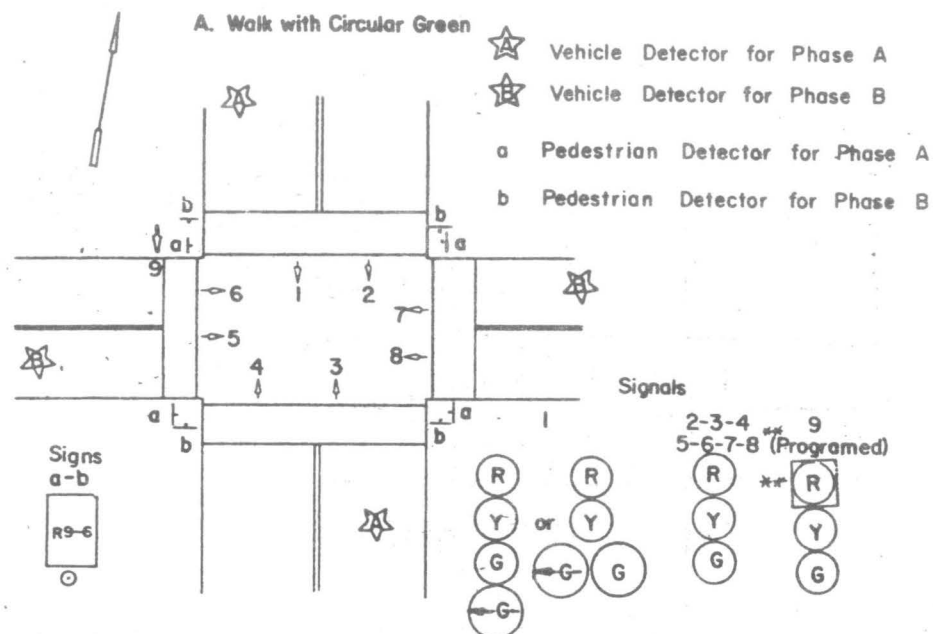


Phase	Advance A	A	B	Flashing
Interval Signals	1 2	3 4 5	6 7 8	
1	G G	G Y R	R R R	Y
2	G G	G Y R	R R R	Y
3-4	R R	G Y R	R R R	Y
5-6	R R	R R R	G Y R	R
7-8	R R	R R R	G Y R	R
9	R R	G Y R	R R R	Y
Fixed	7.2 3.0	24.0 3.0 1.8	16.2 3.0 1.8	60
% Cycle	12 5	40 5 3	27 5 3	100
Dial Setting	12 17	57 62	65 92 97 00	

Phase	Advance A	A	B	Flashing
Interval Signals	1 2	3 4 5 6 7 8 9 10 11 12		
1	G G	G G G Y R R R R R R R	Y	
2	G G	G G G Y R R R R R R R	Y	
3-4	R R	G G G Y R R R R R R R	Y	
5-6	R R	R R R R R G G G Y R	R	
7-8	R R	R R R R R G G G Y R	R	
a	D W D W	D W D W D W D W D W D W D W D W	off	
b	D W D W	FL FL D W D W D W D W D W D W D W	off	
Fixed	7.2 3.0	7.2 9.0 4.8 3.0 1.8 7.2 9.0 3.0 3.0 1.8		
% Cycle	12 5	12 15 8 5 3 12 15 5 5 3		
Dial Setting	12 17	29 44 52 57 60 72 87 92 97 00		

Fig. 11

Two Phase Full Actuated with Advance Left Turn



Phase	Advance A	A				B				Flashing
Interval	1 2	3 4 5 6 7 8 9 10 11 12								
Signals	G G	G G G Y R R R R R R								
1	G G	G G G Y R R R R R R								Y
2	G G	G G G Y R R R R R R								Y
3-4	R R	G G G Y R R R R R R								Y
5-6	R R	R R R R R G G G Y R								R
7-8	R R	R R R R R G G G Y R								R
9	R R	G G G Y R R R R R R								Y
Fixed	7 3		3 2				3 2			
Initial Interval		5				5				
Vehicle Interval		2				2				
Pedestrian Timer		15				15				
Maximum		30				20				

* Upon Pedestrian Actuation Only

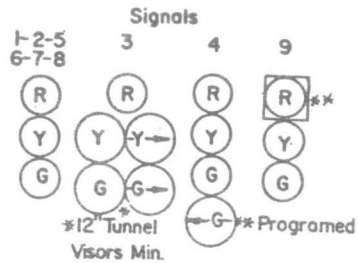
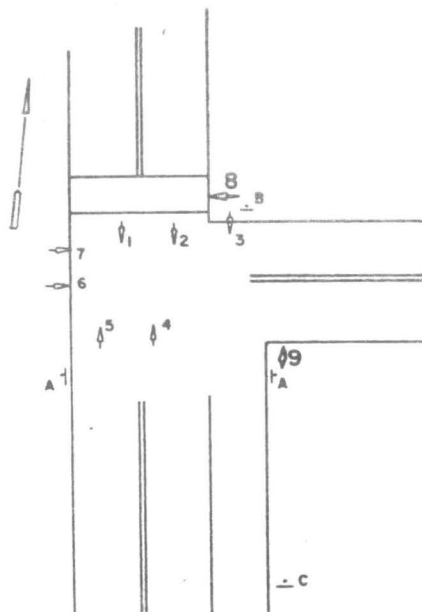
Phase	Advance A	A				B				Emerg. Flash
Interval	1 2	3 4 5 6 7 8 9 10 11 12								
Signals	G G	G G G Y R R R R R R								
1	G G	G G G Y R R R R R R								Y
2	G G	G G G Y R R R R R R								Y
3-4	R R	G G G Y R R R R R R								Y
5-6	R R	R R R R R G G G Y R								R
7-8	R R	R R R R R G G G Y R								R
a	D D	DW DW	D D D D D D D D							
b	D D	DW DW	D D D D D D D D							
Fixed	7 3		3 2				3 2			
Initial Interval		5				5				
Vehicle Interval		2				2				
Pedestrian Timer		15				15				
Maximum		30				20				

* Upon Pedestrian Actuation Only

Fig. 12

Two Phase Pre-Timed Advance Left and Continuing Right Turn

A. Walk on Circular Green



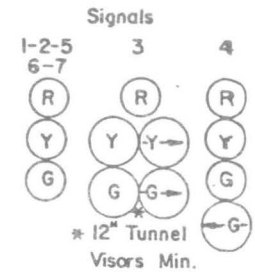
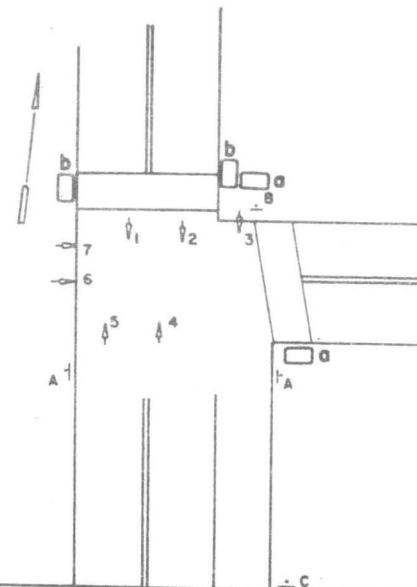
Signs

AR 9-3

BR 18-2 (R)

CR 3-7 (R)

B. Walk on Flashing Walk



Signs

AR 9-3

BR 18-2 (R)

CR 3-7 (R)

a-b

DONT
WALK

WALK

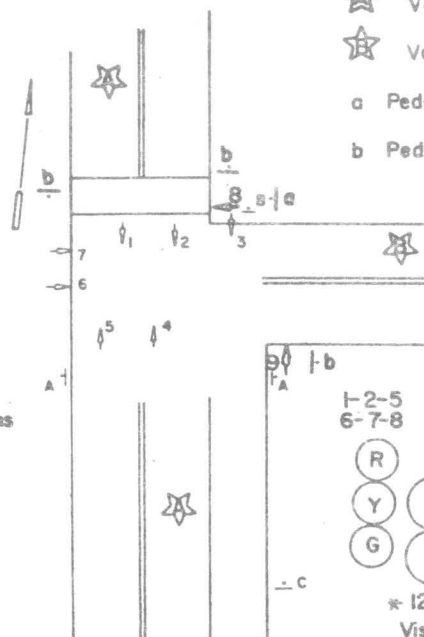
Phase	Advance A	A	B	Flashing
Interval Signals	1 2	3 4 5	6 7 8	
1-2	R R	G Y R	R R R	Y
3	R R	G Y R	R Y R	Y
4	G G	G Y R	R R R	Y
5	G R	G Y R	R R R	Y
6-7-8	R R	R R R	G Y R	R
9	R R	G R R	R R R	Y
Fixed	7.2 3.0	222 3.0 1.8	18.0 3.0 1.8	60
% Cycle	12 5	37 5 3	30 5 3	100
Dial Setting	12 17	54 59 62	92 97 00	

Phase	Advance A	A	B	Flashing
Interval Signals	1 2	3 4 5 6	7 8 9 10	
1-2	R R	G G Y R	R R R R	Y
3	R R	G G Y R	R R Y R	Y
4	G G	G G Y R	R R R R	Y
5	G G	G G Y R	R R R R	Y
6-7	R R	R R R R	G G Y R	R
a	D W D W	FL W DW DW DW	D W D W D W D W	off
b	D W D W	D W D W D W D W	FL W DW D W D W	off
Fixed	7.2 3.0	90 132 3.0 1.8	72 108 3.0 1.8	60
% Cycle	12 5	15 22 5 3	12 18 5 3	100
Dial Setting	12 17	32 54 59 62	74 92 97 00	

Fig. 13

Two Phase Full-Actuated Advance Left and Continuing Right Turn

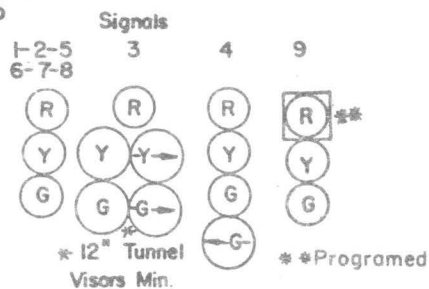
A. Walk on Circular Green



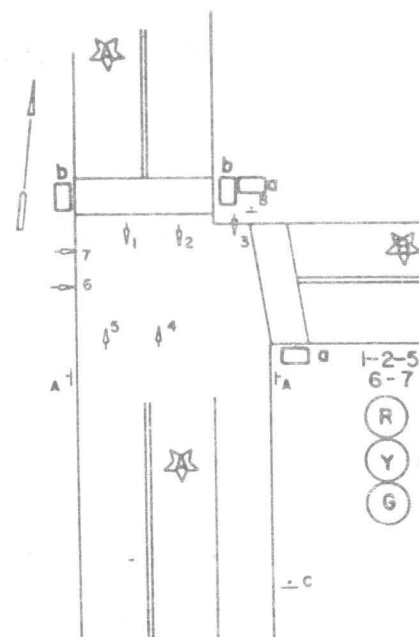
- ☆ Vehicle Detector for Phase A
- ☆ Vehicle Detector for Phase B
- a Pedestrian Detector for Phase A
- b Pedestrian Detector for Phase B

Mandatory Signs

- A R 9-3
- B R 18-2 (R)
- C R 3-7(R)

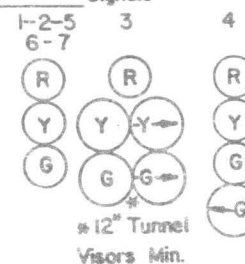


B. Walk on Flashing Walk



- ☆ Vehicle Detector for Phase A
- ☆ Vehicle Detector for Phase B
- a Pedestrian Detector for Phase A
- b Pedestrian Detector for Phase B

Signals



Mandatory Signs

- A R 9-3
- B R 18-2 (R)
- C R 3-7(R)



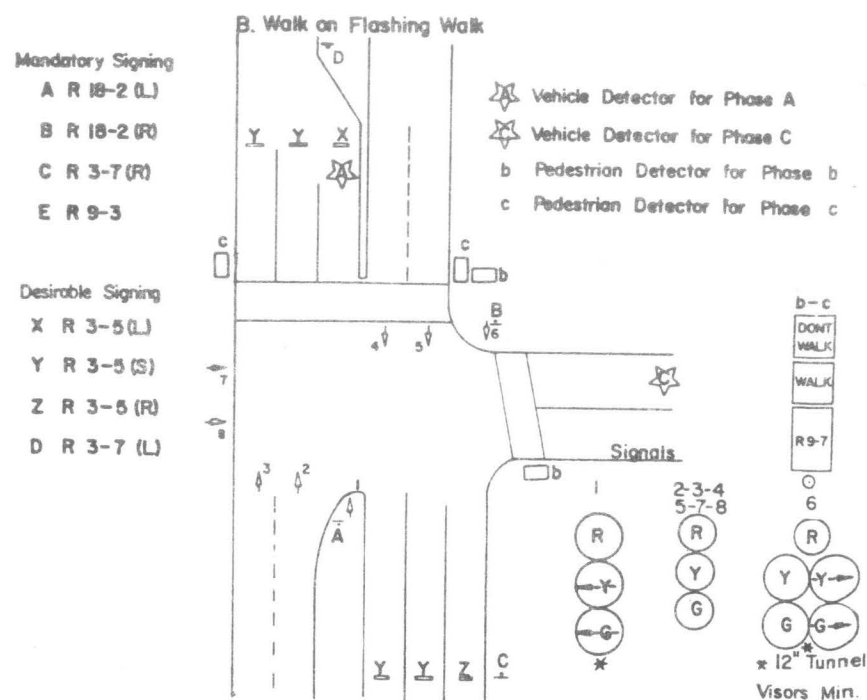
Phase	Advance A	Phase A	Phase B	Emerg. Flash
Interval Signals	1 2	3 4 5 6 7 8 9 10 11 12		
1-2	R R	G G G Y R R R R R R R	Y	Y
3	R R	G G G Y R R R R R Y R	Y	Y
4	G G	G G G Y R R R R R R R	Y	Y
5	G G	G G G Y R R R R R R R	Y	Y
6-7-8	R R	R R R R R R R R R R R	R	R
9	R R	G G G Y R G G G Y R	Y	Y
Fixed	7.2 3.0	3.0 2.0	3.0 2.0	
Initial Interval		5	5	
Vehicle Interval		2	2	
Pedestrian Timer		15	15	
Maximum		30	30	

* Upon Pedestrian Actuation Only

Phase	Advance A	Phase A	Phase B	Emerg. Flash
Interval Signals	1 2	3 4 5 6 7 8 9 10 11 12		
1-2	R R	G G G Y R R R R R R R	Y	Y
3	R R	G G G Y R R R R R R R	Y	Y
4	G G	G G G Y R R R R R Y R	Y	Y
5	G G	G G G Y R R R R R R R	Y	Y
6-7	R R	R R R R R R G G G Y R	R	R
a	D D W W	DW DW FI W DW	D D D D D D D D D D	off
b	D D W W	D D D D D D DW DW FI W DW	D D D D D D D D D D	off
Fixed	7 3	3 2	3 2	
Initial Interval		5	5	
Vehicle Interval		2	2	
Pedestrian Timer		7 8	7 8	
Maximum		20	20	

* Upon Pedestrian Actuation Only

Three Phase Operation (Semi)-Exclusive Left and Continuing Right Turns



Phase	Phase A				Phase B				Phase C						
Motorist Signal	1	2	3	4	5	6	7	8	9	10	11	12	13		
I	G	Y	R	R	R	R	R	R	R	R	R	R	R		off
2-3	G	G	G	G	G	G	Y	R	R	R	R	R	R		Y
4-5	R	R	R	G	G	G	Y	R	R	R	R	R	R		Y
6	R	R	R	G	G	G	Y	R	R	R	R	R	R		Y
7-8	R	R	R	R	R	R	R	R	G	G	G	Y	R		R
b	D	D	D	DW	DW	D	D	D	D	D	D	D	D		off
	W	W	W	*FI	*FI	W	W	W	W	W	W	W	W		
c	D	D	D	D	D	D	D	D	DW	DW	D	D	D		off
	W	W	W	W	W	W	W	W	*FI	*FI	W	W	W		
Fixed		3	2				3	2				3	2		
Initial Interval	2														
Vehicle Interval	2														
Maximum Pedestrian Timer	15			30					20						
				7	8				7	8					

* Upon Pedestrian Actuation Only

Fig. 15

Three Phase Operation (Full)-Exclusive Left and Continuing Right Turns

A. Walk on Circular Green

Mandatory Signs

A R 18-2 (L)

B R 18-2 (R)

C R 3-7 (R)

E R 9-3

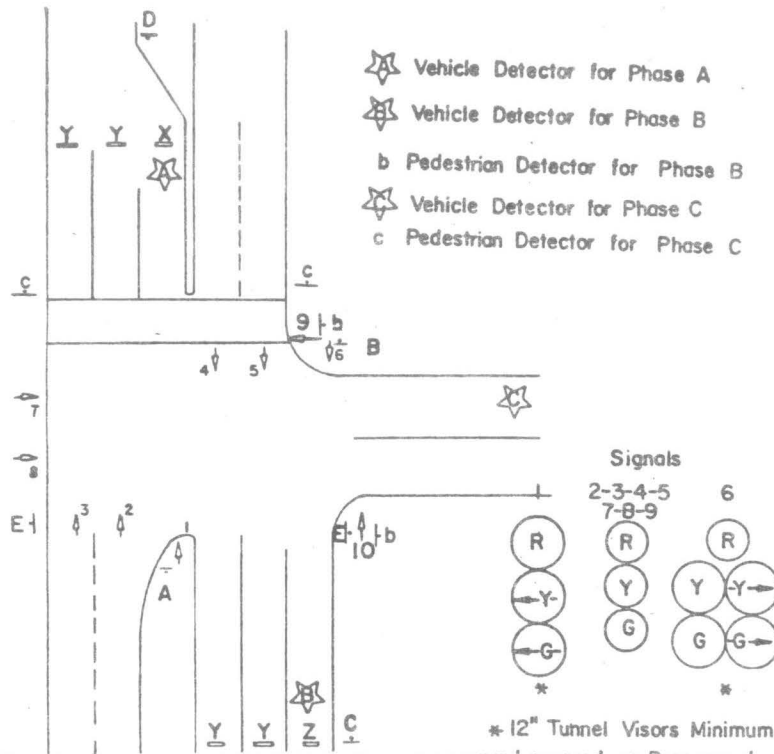
Desirable Signing

X R 3-5 (L)

Y R 3-5 (S)

Z R 3-5 (R)

D R 3-7 (L)



B. Walk on Flashing Walk

Mandatory Signing

A R 18-2 (L)

B R 18-2 (R)

C R 3-7 (R)

E R 9-3

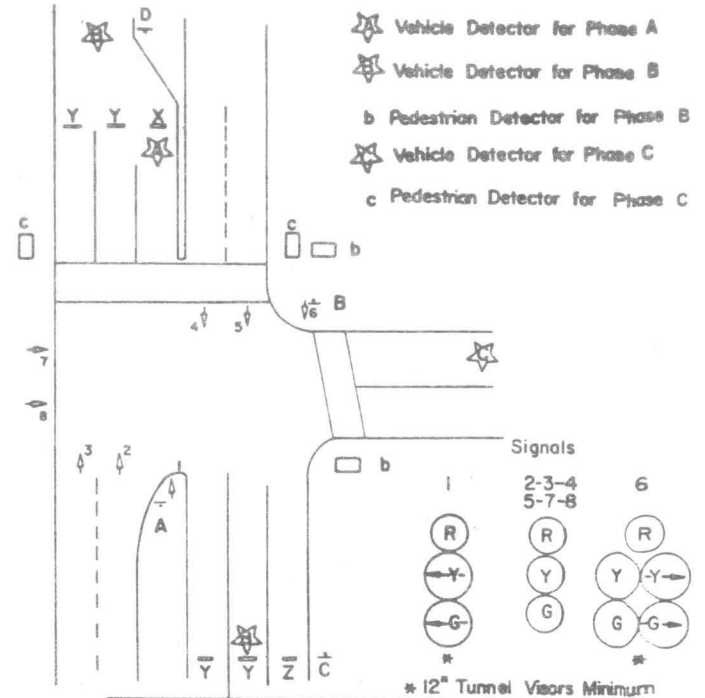
Desirable Signing

X R 3-5 (L)

Y R 3-5 (S)

Z R 3-5 (R)

D R 3-7 (L)

Sign
b-c
R 9-6Signs
b-c
DON'T
WALK
WALK
R 9-7

Phase	Phase A	Phase B	Phase C	Flashing
1	G	Y	R	off
2-3	G	G	G	Y
4-5	R	R	R	Y
6	R	R	R	Y
7-8	R	R	R	R
9	R	R	R	R
10	R	R	R	Y
Fixed	3	2	3	2
Initial Interval	2	2	2	
Vehicle Interval	2	2	2	
Maximum Pedestrian Timer	15	30	20	

Notes:

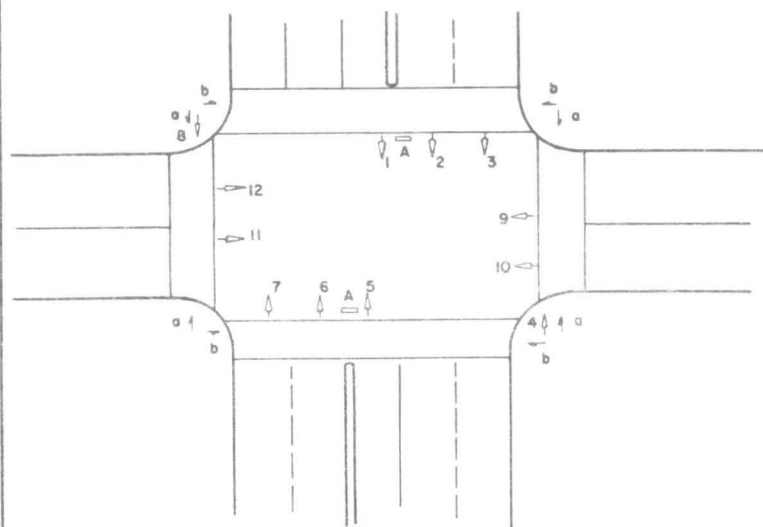
- ① Remains G if Phase C is skipped.
- ② Becomes Y only if Phase C is skipped.
- ③ Becomes R only if Phase C is skipped.
- ④ Remains R over Right Green Arrow if Phase A is skipped.

Phase	Phase A	Phase B	Phase C	Flashing
1	G	Y	R	off
2-3	G	G	G	Y
4-5	R	R	R	Y
6	R	R	R	Y
7-8	R	R	R	R
b	D	D	D	off
c	D	D	D	off
Fixed	3	2	3	2
Initial Interval	2	2	2	
Vehicle Interval	2	2	2	
Maximum Pedestrian Timer	15	30	20	

* Upon Pedestrian Actuation Only

Fig. 16

Three Phase with Minor Movements Pedestrians Walk with Circular Green



1-5

# 2-3-6-7
9-10-11-12

4-8

Shall be lowered or
Programed

* 12" Tunnel Visors minimum

Mandatory Signing

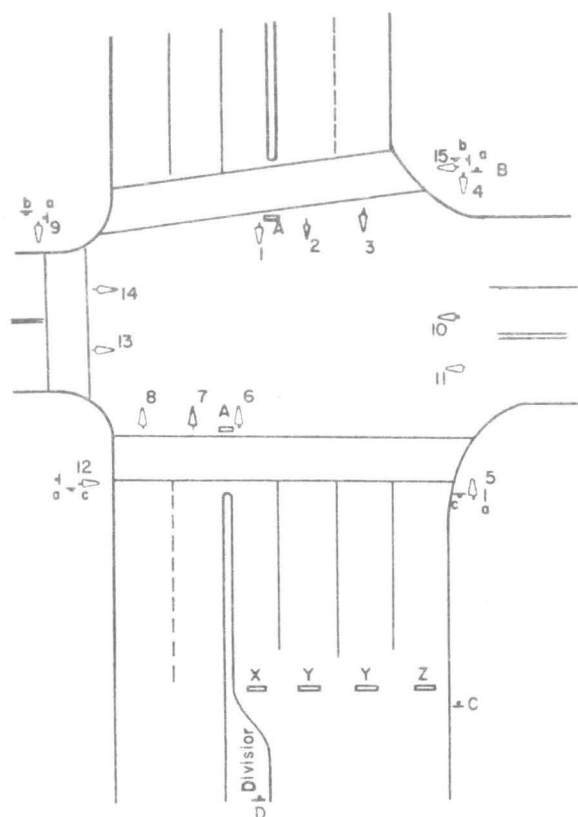
A R 18-2 (L)

a-b R 9-6 (8 required)

																				Emerg. Flash
Phase	AL1 + AL2			AL1 + AS1			AL2 + AS2			AS1 + AS2				B						
Interval Signal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	R →G	① Y→	① R	R	R	R	G→	Y→	R	R	R	R	R	R	R	R	R	R	R	Off
2-3	R	R	R	R	R	R	G→	④ Y→	④ R	G	G	G	⑤ Y→	⑤ R	R	R	R	R	R	Y
4	R	R	R	R	R	R	R	R	R	G	G	G	Y→	R	R	R	R	R	R	off
5	R →G	② Y→	② R	G→	Y→	R	R	R	R	R	R	R	R	R	R	R	R	R	R	off
6-7	R	R	R	G→	③ Y→	③ R	R	R	R	G	G	G	⑥ Y→	⑥ R	R	R	R	R	R	Y
8	R	R	R	R	R	R	R	R	R	G	G	G	Y→	R	R	R	R	R	R	off
9-10	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	G	Y→	R	R
11-12	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	G	Y→	R	R
Fixed		3	2		3	2		3	2				3	2				3	2	
Initial Interval	2			2			2			2										
Vehicle Interval	2			2			2			2										
Maximum	20			20			20			30					25					
Pedestrian										15					20					

1 Remains R over G Arrow when followed by AL₂ + AS₂2 Remains R over G Arrow when followed by AL₁ + AS₁3 Remains G when followed by AS₁ + AS₂4 Remains G when followed by AS₁ + AS₂5 Remains G when followed by AL₂ + AS₂6 Remains G when followed by AL₁ + AS₁

Fig. 17



Signals

1-6

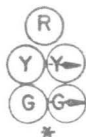


a-b-c

R 9-6

2-3
7-8
11-14

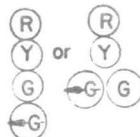
4

5-9
12-15

* 12" Tunnel Visors Minimum

** Shall be Louvered or Programmed

10-13



Mandatory Signing

A R 18-2 (L)

B R 18-2 (R)

C R 3-7 (R)

a-b-c R 9-6 (8 required)

Desirable Signing

X R 3-5 (L)

Y R 3-5 (S)

Z R 3-5 (R)

D R 3-7 (L)

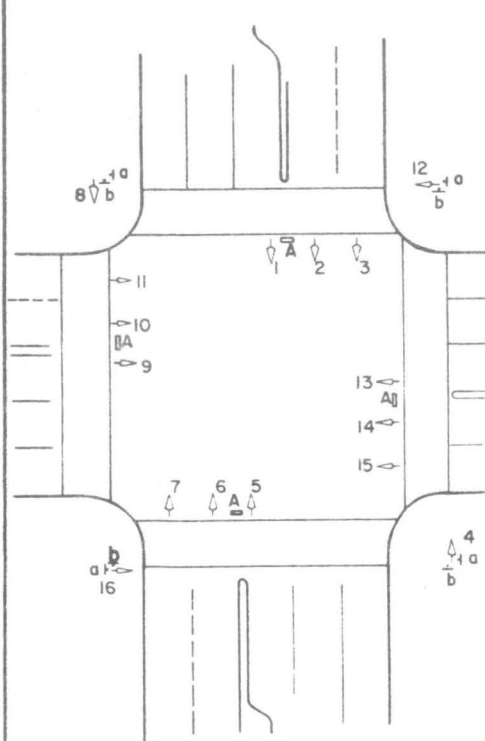
Multi-Phase Operation (Full) with Exclusive Dual Left and Overlapping Right Turn Pedestrians Walk with Circular Green

Phase	AL ₁ + AL ₂	AL ₁ + AS ₁	AL ₂ + AS ₂	AS ₁ + AS ₂	B	C	Emerg. Flash
Interval Signals							
1	R → G → Y	R	R	R	R	R	out
2-3	R	R	R	R	R	R	Y
4	R	R	R	R	R	R	Y
5	R	R	R	R	R	R	out
6	R	R	R	R	R	R	out
7-8	R	R	R	R	R	R	Y
9	R	R	R	R	R	R	out
10	R	R	R	R	R	R	R
11	R	R	R	R	R	R	R
12	R	R	R	R	R	R	out
13	R	R	R	R	R	R	R
14	R	R	R	R	R	R	R
15	R	R	R	R	R	R	out
Fixed	3	2	3	2	3	2	
Init Int							
Uch Int							
Maximum					30	25	
Pedestrian					19	22	

- 1 Remains R over G Arrow if followed by AL₂ + AS₂
- 2 Remains R over G Arrow if followed by AL₁ + AS₁
- 3 Remains G if followed by AS₁ + AS₂
- 4 Remains G if followed by AS₁ + AS₂
- 5 Remains G if followed by AL₂ + AS₂
- 6 Remains G if followed by AL₂ + AS₂
- 6 Becomes Y over G Arrow if followed by B
- 7 Becomes R over G Arrow if followed by B
- 7 Remains G if followed by AL₂ + AS₂
- 8 Remains G if followed by AL₁ + AS₁
- 9 Remains R over G Arrow if followed by AL₂ + AS₂ on AS₁ + AS₂

Fig. 18

Multi-Phase Full Quad Left Turn Pedestrians Walk with Green



1-5 2-3-6-7 4-8
9-13 10-11-14-15 12-16



* 12" Tunnel Visors Minimum

** Shall be Louvered or Programmed

Signs
A-R 18-2(L)

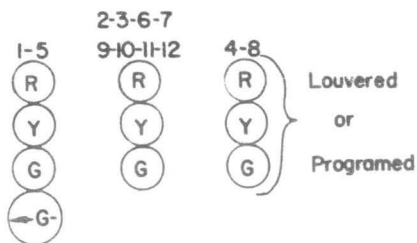
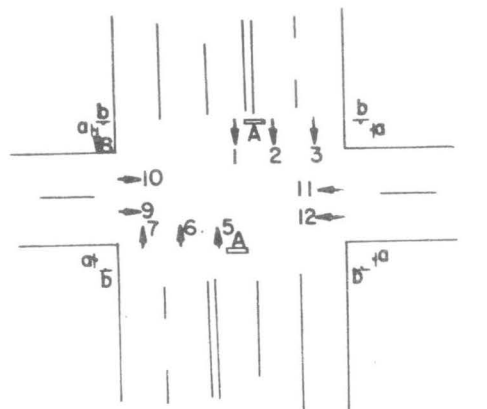


Signals	AL ₁ + AL ₂	AL ₁ + AS ₁	AL ₂ + AS ₂	AS ₁ + AS ₂	BL ₁ + BL ₂	BL ₁ + BS ₁	BL ₂ + BS ₂	BS ₁ + BS ₂	Emergency Flash
1	R ① G ②	R R R	R R R	R R R	R R R	R R R	R R R	R R R	out
2-3	R R R	R R R	G Y ④ R ⑤	G G G	R R R	R R R	R R R	R R R	Y
4	R R R	R R R	R R R	G G G	Y R R	R R R	R R R	R R R	out
5	R ② G ③	R ② Y ③	R R R	R R R	R R R	R R R	R R R	R R R	out
6-7	R R R	G Y ⑥ R ⑦	R R R	G G G	Y ⑥ R ⑦	R R R	R R R	R R R	Y
8	R R R	R R R	R R R	G G G	Y R R	R R R	R R R	R R R	out
9	R R R	R R R	R R R	R R R	R R R	R ⑧ G ⑨	R R R	R R R	out
10-11	R R R	R R R	R R R	R R R	R R R	R R R	G Y ⑩ R ⑪	R R R	R
12	R R R	R R R	R R R	R R R	R R R	R R R	R R R	G G G	out
13	R R R	R R R	R R R	R R R	R R R	R ⑧ G ⑨	R R R	R R R	out
14-15	R R R	R R R	R R R	R R R	R R R	R R R	G Y ⑩ R ⑪	R R R	R
16	R R R	R R R	R R R	R R R	R R R	R R R	R R R	G G G	out
Fixed	3	2	3	2	3	2	3	2	
Initial Interval	x		x		x		x		
Vehicle Interval	x		x		x		x		
Maximum	x		x		x		x		
Pedestrian									

- ① Remains R over Lt. G Arrow if followed by AL₂ + AS₂
- ② " R " Lt. G Arrow if followed by AL₁ + AS₁
- ③ " G if followed by AS₁ + AS₂
- ④ " G if followed by AS₁ + AS₂
- ⑤ " G if followed by AL₂ + AS₂
- ⑥ " G if followed by AL₁ + AS₁
- ⑦ R over Lt. G Arrow if followed by BL₁ + BS₁
- ⑧ " R " Lt. G Arrow if followed by BL₂ + BS₂
- ⑨ " G if followed by BS₁ + BS₂
- ⑩ " G if followed by BS₁ + BS₂
- ⑪ " G if followed by BL₁ + BS₁
- ⑫ " G if followed by BL₂ + BS₂

Fig. 19

Exclusive Advance Dual Left Turn Left Turn Not Denied



A Internally Illuminated Dual Message Sign
Message X and Y

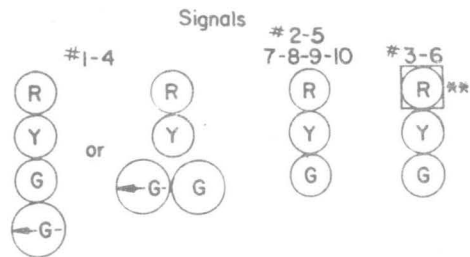
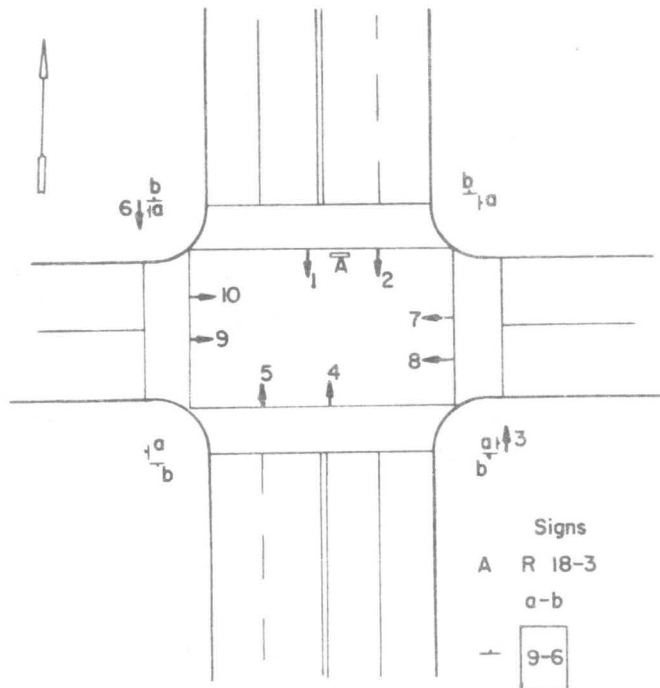


Phase Signals	AL ₁ + AL ₂				AS ₁ + AS ₂				A					B					
1	R ←G	Y	R	R					G	G	G	Y	R	R	R	R	R	R	Y
2-3	R	R	R	G					G	G	G	Y	R	R	R	R	R	R	Y
4	R	R	R	R					G	G	G	Y	R	R	R	R	R	R	out
5	R ←G	Y	R	R					G	G	G	Y	R	R	R	R	R	R	Y
6-7	R	R	R	G					G	G	G	Y	R	R	R	R	R	R	Y
8	R	R	R	R					G	G	G	Y	R	R	R	R	R	R	out
9-10	R	R	R	R					R	R	R	R	R	G	G	G	Y	R	R
11-12	R	R	R	R					R	R	R	R	R	G	G	G	Y	R	R
X	on	on	on	on					off	off	off	off	off	on	on	on	on	on	out
Y	off	off	off	off					on	on	on	on	on	off	off	off	off	off	out
Fixed		3	min. 3	min. 7							3	2					3	2	
Initial Interval	**								**					**					
Vehicle Interval	**								**					**					
Maximum	**								30					25					
* Pedestrian									15					22					

* Upon Actuation by Pedestrian Push Button ** As Required

Fig. 20

Advance and Lagging Left Turn (Lagging must be avoided)



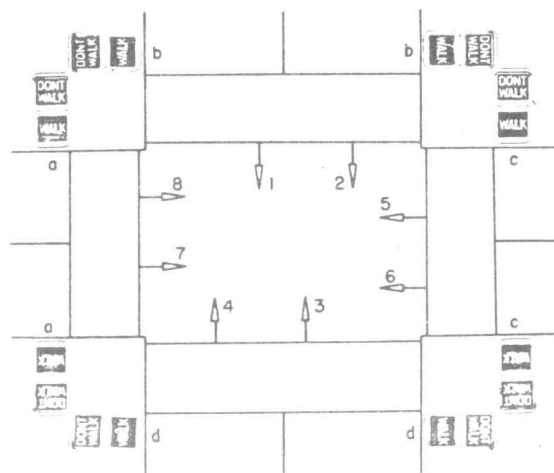
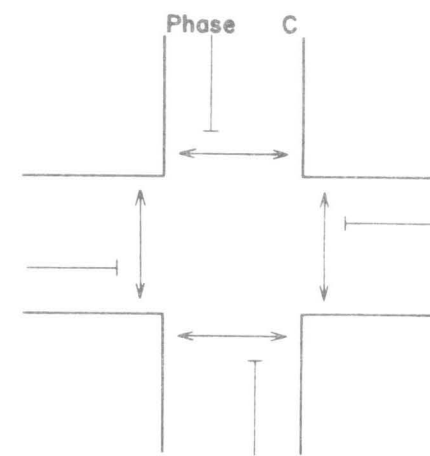
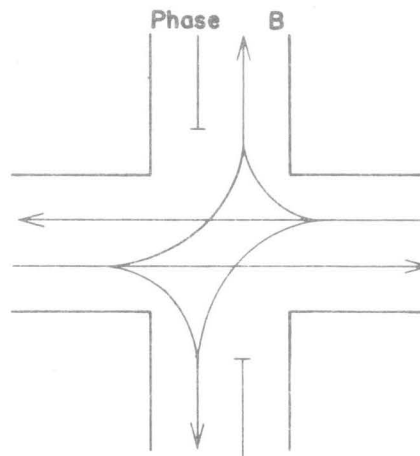
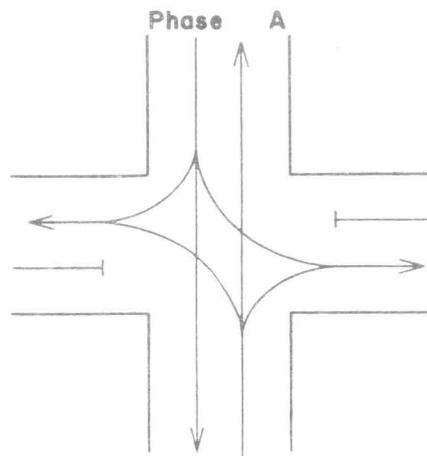
** Programed

																		Emergency Flashing	
Phase Signals		Advance A		A		Logging A		A				B							
1			G	G	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	Y
2			G	G	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	Y
3			R	R	G	G	G	Y	R	R	R	R	R	R	R	R	R	R	out
4			R	R	G	G	G	G	G		Y	R	R	R	R	R	R	R	Y
5			R	R	G	G	G	G	G	G	Y	R	R	R	R	R	R	R	Y
6			R	R	G	G	G	Y	R	R	R	R	R	R	R	R	R	R	out
7-8			R	R	R	R	R	R	R	R	R	R	G	G	G	Y	R	R	
9-10			R	R	R	R	R	R	R	R	R	R	G	G	G	Y	R	R	
Fixed		Min. 7	3					3	2	Min. 7	3	2				3	2		
Initial Interval					x														
Vehicle Interval					x														
Maximum					30								25						
* Pedestrian					15								20						

* Upon Actuation by Pedestrian Push Button

Fig. 21

Pedestrian - Full Exclusive Phase



Signals shown for
phasing identification
only.

All
Signals



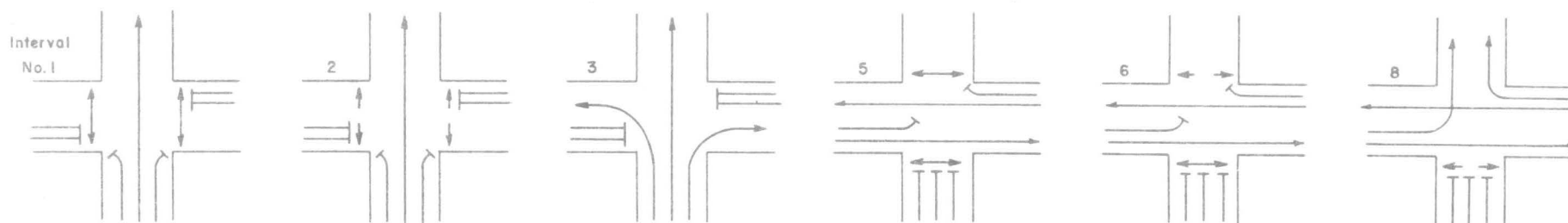
Signal	Phase A			Phase B			Phase C			F _{ash}
1-2	G	Y		R	R		R	R		Y
3-4	G	Y		R	R		R	R		Y
5-6	R	R		G	Y		R	R		R
7-8	R	R		G	Y		R	R		R
a-b c-d	D W	D W		D W	D W		W	Fl. DW		OUT
Time	31.5	3	+	21.0	3	+	7.5	9*		75
% Cycle	42	4		28	4		10	12		100%
Dial Setting	0	42	46	76	80		88	0		

+ Possible all red clearance

* Time for this interval based on length of Cross Walk

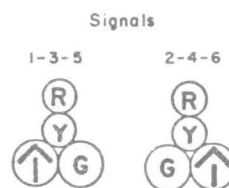
Fig. 22 (a)

Pedestrian - Exclusive Interval One-Way Street Intersecting a Two-Way Street (Pedestrians move first - than vehicular turns)

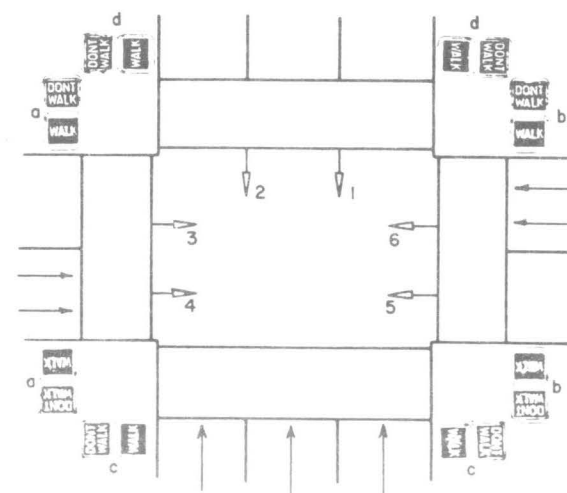


- Note 1. The one-way street must have a minimum of three approach lanes in advance of the intersection.
2. Two approach lanes must be established in advance of the intersection on the two way street.

Signals	1	2	3	4	5	6	7	8	9	Flash
1	↑ G	↑ G	G	Y	R	R	R	R	R	Y
2	↑ G	↑ G	G	Y	R	R	R	R	R	Y
3	R	R	R	R	↑ G	↑ G	G	G	Y	R
4	R	R	R	R	↑ G	↑ G	G	G	Y	R
5	R	R	R	R	↑ G	↑ G	G	G	Y	R
6	R	R	R	R	↑ G	↑ G	G	G	Y	R
a	W	Fl. D.W	D. W	D. W	D. W	D. W	D. W	D. W	D. W	OUT
b	W	Fl. D.W	D. W	D. W	D. W	D. W	D. W	D. W	D. W	OUT
c	D.	D.	D.	D.	W	W	W	W	Fl. (X) D.W	OUT
d	D.	D.	D.	D.	W	W	Fl. D.W	D. W	D. W	OUT
Time	7.5	9.75	18	3	7.5	9.75	9	7.5	3	75
% Cycle	10	13	24	4	10	13	12	10	4	100
Dial Setting	10	23	47	51	61	74	86	96	0	



Signals shown for phasing identification only.

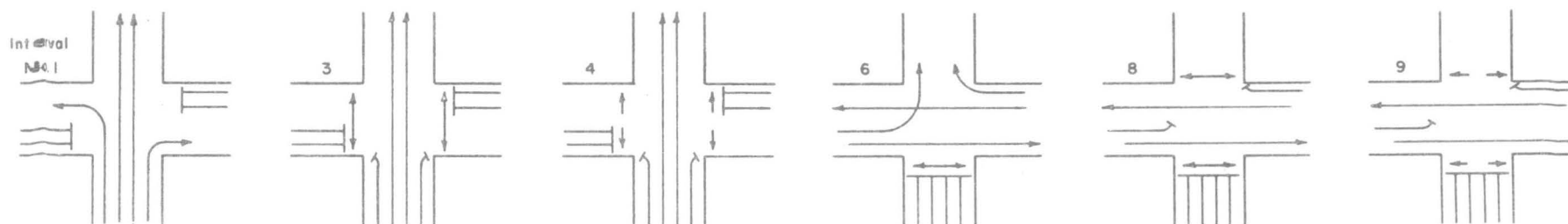


Signing one way streets see sheet #4

(X) - May be Flashing or Steady Don't Walk.
Flashing Don't Walk Time based on length of Cross Walk

Fig 22 (b)

Pedestrian - Exclusive Interval **One-Way Street Intersecting a Two-Way Street** (Vehicles turn first-then pedestrian movement)



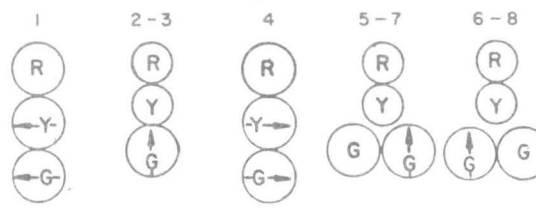
- Note 1. The one-way street must have a minimum of three approach lanes in advance of the intersection.
- Note 2. Two approach lanes must be established in advance of the intersection on the two way street.

Signals	1	2	3	4	5	6	7	8	9	10	Flash
1	G	Y	R	R	R	R	R	R	R	R	Y
2-3	G	G	G	G	Y	R	R	R	R	R	Y
4	G	Y	R	R	R	R	R	R	R	R	Y
5-6	R	R	R	R	R	G	Y	G	G	Y	R
7-8	R	R	R	R	R	G	Y	G	G	Y	R
a-a	D. W.	D. W.	W	FL. D.W.	FL. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	OFF
b-b	D. W.	D. W.	W	FL. D.W.	FL. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	OFF
c-c	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	W	FL. D.W.	FL. D.W.	OFF
d-d	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	W	FL. D.W.	FL. D.W.	OFF
Time	18	3	7.5	6	3	18	3	7.5	6	3	75
% Cycle	24	4	10	8	4	24	4	10	8	4	100%
Dial Setting	24	28	38	46	50	74	78	88	96	0	

⊗ - May be Flashing or Steady Don't Walk.

Flashing Don't Walk time should be long enough to allow

Signals

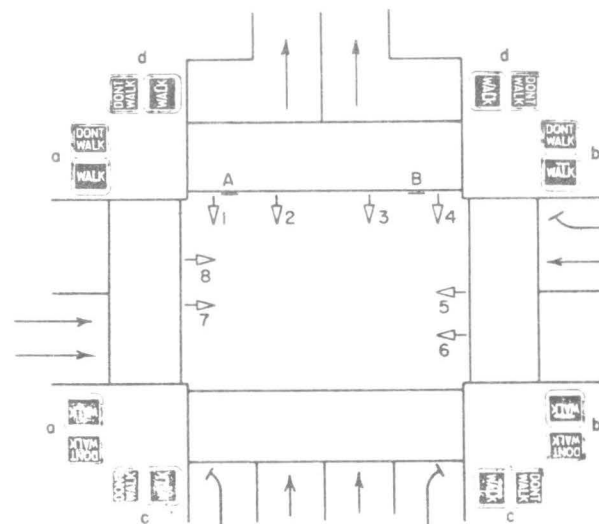


* 12" Tunnel Visors Mandatory



Signs

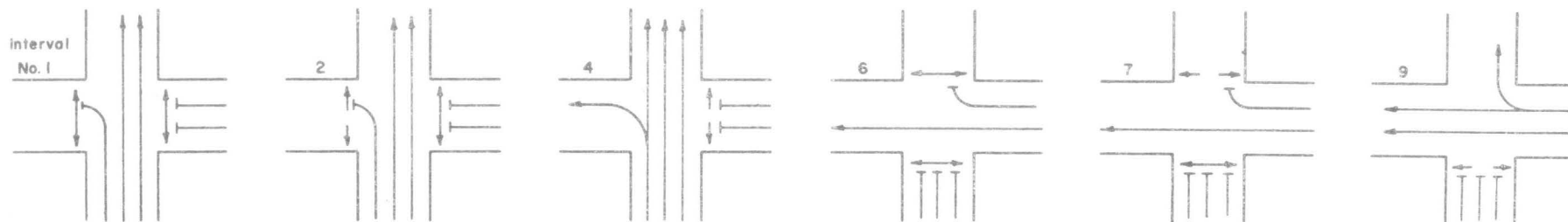
Signals shown for phasing identification only.



Signing one way streets see sheet # 4

Fig. 22 (c)

Pedestrian - Exclusive Interval **Intersection of Two, One Way Streets** **(Pedestrians move first-then vehicular turns)**

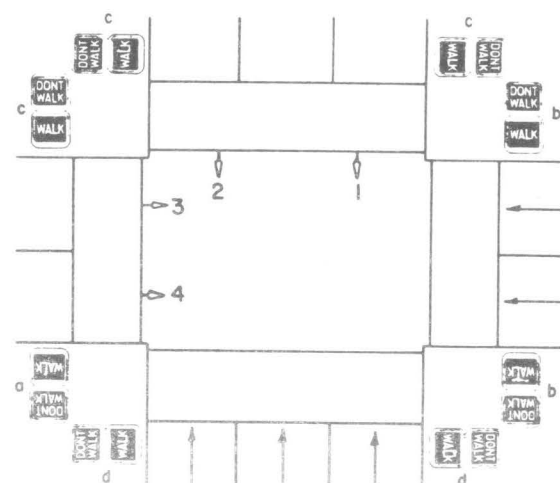
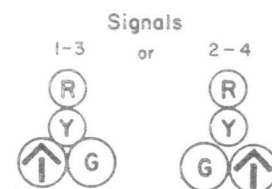


- Note 1. The one-way street must have a minimum of three approach lanes in advance of the intersection.
- Note 2. Two approach lanes must be established in advance of the intersection on the two way street.

Signals	1	2	3	4	5	6	7	8	9	10	Flash
1	↓	↓	G	G	Y	R	R	R	R	R	Y
2	↓	↓	G	G	Y	R	R	R	R	R	Y
3	R	R	R	R	R	↓	↓	G	G	Y	R
4	R	R	R	R	R	↓	↓	G	G	Y	R
a	W	Fl. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	
b	W	W	W	Fl. D.W.	Fl. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	
c	D. W.	D. W.	D. W.	D. W.	D. W.	W	Fl. D.W.	D. W.	D. W.	D. W.	
d	D. W.	D. W.	D. W.	D. W.	D. W.	W	W	W	Fl. D.W.	Fl. D.W.	
Time	7.5	9	10.5	7.5	3	7.5	9	10.5	7.5	3	75
% Cycle	10	12	14	10	4	10	12	14	10	4	100%
Dial Setting		10	22	36	46	50	60	72	86	96	0

⊗ - May be Flashing or Steady Don't Walk.

Flashing Don't Walk Time based on length of Cross Walk

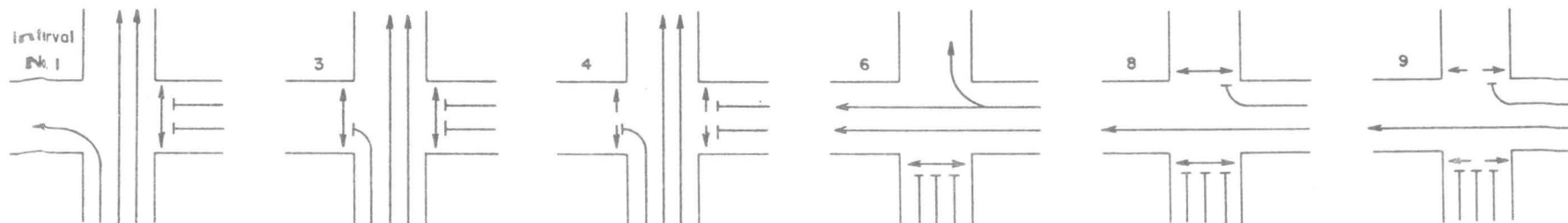


Signals shown for phasing identification only.

Signing one way streets see sheet #4

Fig - 22 (d)

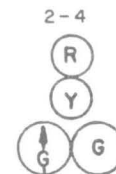
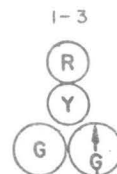
Pedestrian - Exclusive Interval **Intersection of Two, One Way Streets** (Vehicles turn first then pedestrian movement)



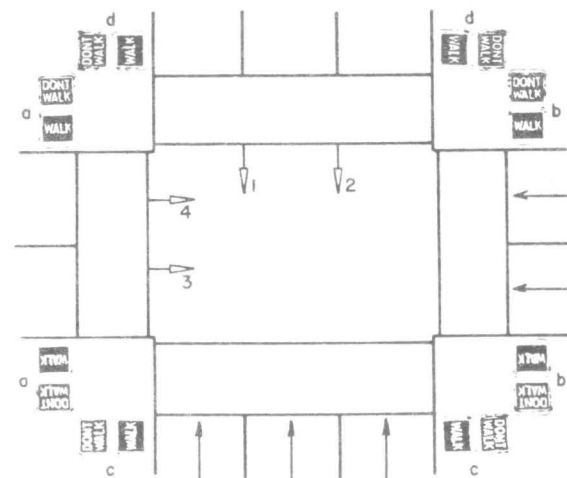
Note (1) The one-way approaches must have a minimum of two lanes.

Signals	1	2	3	4	5	6	7	8	9	10	Flash
1-2	G	Y ↓ G	↓ G	↓ G	Y	R	R	R	R	R	Y
3-4	R	R	R	R	R	G	Y ↓ G	↓ G	↓ G	Y	R
a	D. W.	D. W.	W	Fl. D.W.	Fl. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	OFF
b	W	W	W	Fl. D.W.	Fl. D.W.	D. W.	D. W.	D. W.	D. W.	D. W.	OFF
c	D. W.	D. W.	D. W.	D. W.	D. W.	W	W	W	W	Fl. D.W.	OFF
d	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	D. W.	W	Fl. D.W.	Fl. D.W.	OFF
Time	18	3	7.5	6	3	18	3	7.5	6	3	75
% Cycle	24	4	10	8	4	24	4	10	8	4	100%
Dial Setting	24	28	38	46	50	74	78	88	96	0	

Signals



Signals shown for phasing identification only.

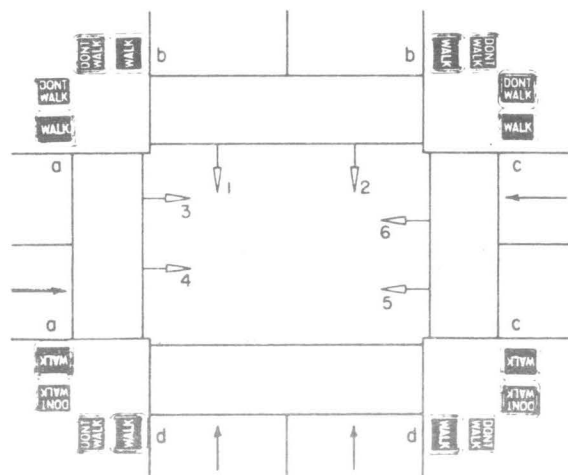
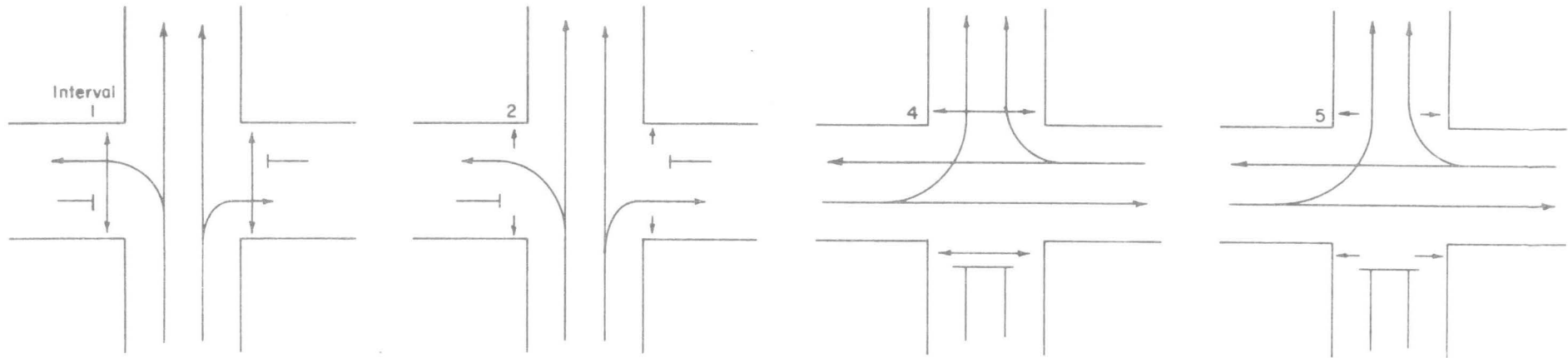


Signing one way street see sheet # 4

Flashing Don't Walk Preferred for Pedestrian Clearance
Flashing Don't Walk Time based on length of Cross Walk
⊗ May be Flashing or Steady Don't Walk.

Fig. 23 (a)

Pedestrian Exclusive and Combined Interval One-Way Street Intersecting a Two-Way Street



Signals shown for
phasing identification
only.

All
Signals



a-b-c-d



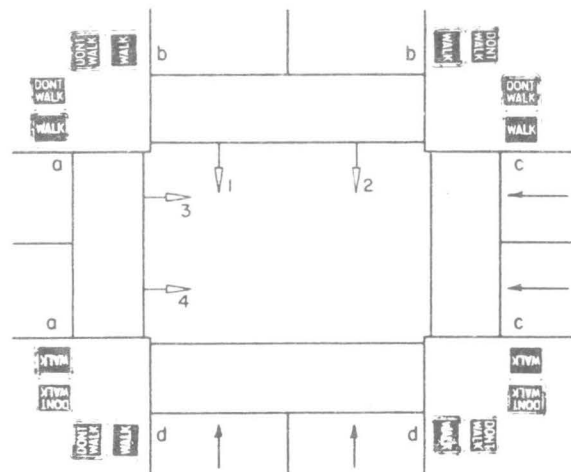
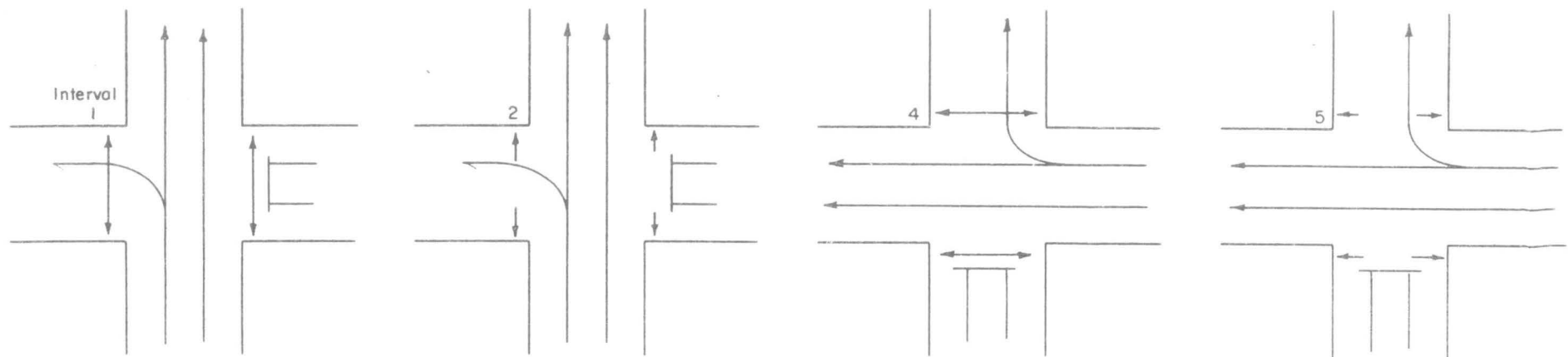
Signal	Phase A			Phase B			
	1	2	3	4	5	6	Flash
1-2	G	G	Y	R	R	R	Y
3-4	R	R	R	G	G	Y	R
5-6	R	R	R	G	G	Y	R
a	Fl.	Fl. D.	Fl. D.	D.	D.	D.	Off
b	D.	D.	D.	Fl.	Fl. D.	Fl. D.	Off
c	Fl.	Fl. D.	Fl. D.	D.	D.	D.	Off
d	D.	D.	D.	Fl.	Fl. D.	Fl. D.	Off
Time	27	*6	3	12	*9	3	60 Sec.
%Cycle	45	10	5	20	15	5	100%
Dial Setting	0	45	55	60	80	95	0

* Time for these intervals based on length of crosswalk.

⊗ May be Flashing or Steady Don't Walk.

Fig. 1

Pedestrian - Exclusive and Combined Interval Intersection of Two, One-Way Streets



Signals shown for
phasing identification
only.

All
Signals



a-b-c-d



Signal	Phase A			Phase B				
	1	2	3	4	5	6	Flash	
1-2	G	G	Y	R	R	R	Y	
3-4	R	R	R	G	G	Y	R	
a	Fl. W	Fl. D. W	Fl. D. W	D. W	D. W	D. W	Off	
b	D. W	D. W	D. W	Fl. D. W	Fl. D. W	Fl. D. W	Off	
c	W	Fl. D. W	Fl. D. W	D. W	D. W	D. W	Off	
d	D. W	D. W	D. W	Fl. D. W	Fl. D. W	Fl. D. W	Off	
Time	27	*6	3	12	*9	3	60	Sec.
%Cycle	45	10	5	20	15	5	100%	
Dial Setting	0	45	55	60	80	95	0	

* Time for these intervals based on length of crosswalk

⊗ May be Flashing or Steady Don't Walk.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
PLANNING AND TRAFFIC DIVISION

DIRECTIONAL TRAFFIC FLOW DIAGRAM
(4 WAY)

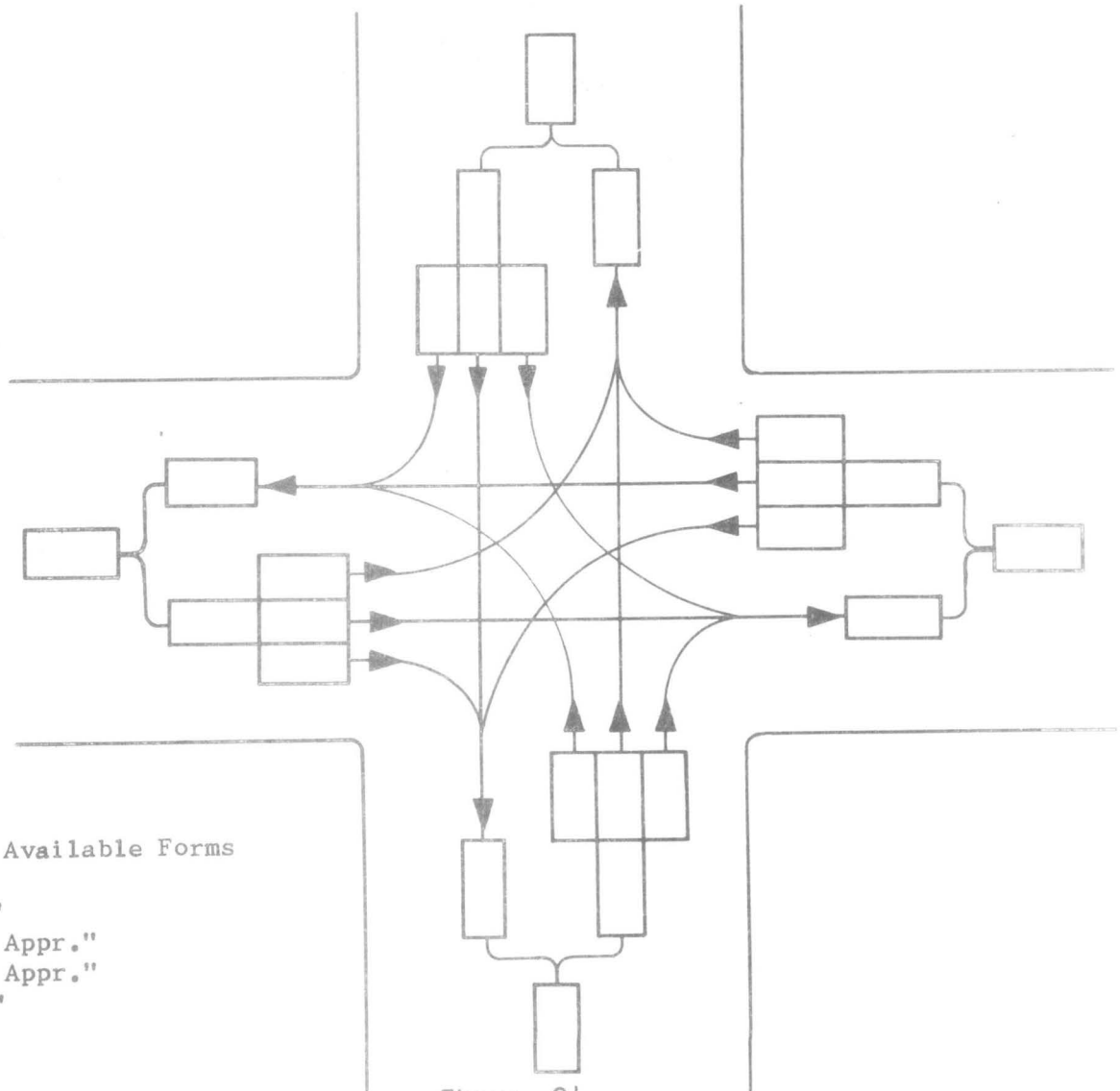
DATE _____

County _____ Township _____ Municipality _____

Intersection _____

Remarks _____

HOURLY MOVEMENT CHART
FOR
PHASING AND TIMING
OF
TRAFFIC SIGNAL



Other Available Forms

PS-1A	"T"
PS-1C	"5 Appr."
PS-1D	"6 Appr."
PS-1E	"Y"

Figure 24

APPENDIX 'B'

Tabulation of Signs Used

at

Signalized Intersections

APPENDIX B

Signs

The following Sign Standards are those frequently used at signalized intersections and referred to on the Drawings in Appendix A.

Standard	R3-1	No Right Turn
	R3-2	No Left Turn
	R3-3	No Turns
	R3-4	No U Turn
	R3-5(R)	Mandatory Right Turn
	R3-5(L)	Mandatory Left Turn
	R3-5(S)	Mandatory Straight Through
	R3-6(SR)	Optional Right Turn
	R3-6(LS)	Optional Left Turn
	R3-7(R)	Right Lane Must Turn Right
	R3-7(L)	Left Lane Must Turn Left
	R3-8(SRR)	(LLS) (SR) (LS) Lane Use Control Sign
	R3-10	Right Turn On Red After Stop
	R4-7(R)	Keep Right
	R5-1	Do No Enter
	R6-1(R)	Horizontal Right One-Way
	R6-1(L)	Horizontal Left One-Way
	R6-2(R)	Vertical Right One-Way
	R6-2(L)	Vertical Left One-Way
	R6-3	Two Way Traffic Ahead
	R6-4	End One Way
	R6-5	Two Way Traffic
	R7 Series	No Parking Signs
	R9-2	Cross On Green Light Only
	R9-3	No Pedestrian Crossing

R9-6	Push Button for Green Light
R9-7	Push Button for Walk Signal
R15-1(R)	Stop Here On Red
R15-1(L)	Stop Here On Red
R15-2	Do Not Block Intersection
R18-1	Wait for Green
R18-2(R)	Right Turn Signal
R18-2(L)	Left Turn Signal
R18-2-1	Turn With Care
R18-3	Opposing Traffic Has Extended Green
W1-7	Large Double Arrow
W3-3	Signal Ahead Sign
W13-2()	Traffic Signal Speed Sign

APPENDIX 'C'

PennDOT Financial Participation

APPENDIX C

The Pennsylvania Department of Transportation provides financial participation within the following programs.

- 1.0 TRAFFIC SIGNAL MODERNIZATION
(Existing Installations)
- 2.0 TRAFFIC SIGNAL CONSTRUCTION OR RECONSTRUCTION
(Department Construction Projects)
- 3.0 TOPICS PROGRAMS
(Traffic Operation Program to Increase Capacity and Safety)

1.0 PROGRAM: TRAFFIC SIGNAL MODERNIZATION (Existing Installation)

1.1 LEGAL AUTHORITY:

Vehicle Code, Act 360 of 1937, P.L. 905, as Amended

1.2 ADMINISTRATIVE AGENCY:

Department of Transportation
Bureau of Traffic Engineering

1.3 DESCRIPTION:

To aid in improving highway safety and to comply with the Federal government's desire for uniformity in traffic controls, the State is giving financial assistance to communities to help modernize existing traffic signals which are located on State highways.

- Specific Aspects:
- (1) The Federal government has notified all states that traffic signals must conform to latest standards established in the Manual on Uniform Traffic Control Devices.
 - (2) The Bureau has made a survey of traffic signals noting any deficiencies in existing traffic signals and determining the requirements for improvement.
 - (3) Each community has been notified of the results of this survey. However, the local government must request that the Department set aside the money which is to be utilized in the modernization of traffic signals.
 - (4) The grant provides for 50% of the cost of materials and equipment necessary to bring existing signals on State highways into compliance with uniform standards. This does not include cost of labor.

Related Technical Services: (See index headings - Police, Traffic Safety.)

Eligibility: All Cities, Boroughs, Townships

- Financial Data:
- (1) State Participation-Grant-50% of the costs of materials and equipment.
 - (2) Local Participation-50% of the cost of materials and equipment plus 100% of associated labor costs.

Technical Resources:

In Harrisburg - None

In the Field - At least 2 Traffic Engineers per District,
Approximately 25 Engineers

1.4 APPLICATION PROCESS:

- (1) Letter stating a desire to participate in the program should be sent to the District Office.
- (2) Upon receipt of the letter, the District Office makes a detailed study of the intersection, prepares detailed drawings and determines those costs of modernization for which the local government can be reimbursed.
- (3) Upon notification by the District Office, the municipality may begin the solicitation of bids.
- (4) All bids are reviewed by the District and are sent to the Bureau for final approval.
- (5) District prepares agreement for municipality's execution which, when countersigned by the Bureau, will authorize work to proceed.
- (6) Upon final inspection and acceptance, invoices are sent to the District for processing.
- (7) Applications should not outline more work than a municipality can afford in one year.

1.5 AGENCY ADDRESS:

Bureau of Traffic Engineering
Department of Transportation
Transportation and Safety Building
Commonwealth of Pennsylvania
Harrisburg, Pennsylvania 17120

1.6 FIELD OFFICES:

District Offices -

Franklin, Clearfield, Montoursville, Dunmore, Allentown,
St. David, Harrisburg, Hollidaysburg, Indiana, Pittsburgh,
Uniontown

2.0 PROGRAM: TRAFFIC SIGNAL CONSTRUCTION OR RECONSTRUCTION
(Department Construction Projects)

2.1 LEGAL AUTHORITY:

Administrative Policy

2.2 ADMINISTRATIVE AGENCY:

Department of Transportation
Bureau of Traffic Engineering

2.3 DESCRIPTION:

The Department of Transportation provides for full payment of traffic signal installation costs that are the result of the Departments highway construction.

- Specific Aspects:
- (1) Where construction of a highway involves the creation of a new intersection and the need for traffic signals is found warranted.
 - (2) Where reconstruction of a highway involves an existing traffic signal, of any variety, which is under permit issued by the Commonwealth, warrants replacement or modernization as a result of the Departments reconstruction.
 - (3) The need for new and/or replacement of existing traffic signals shall be determined by an engineering study.

Eligibility: All Cities, Boroughs, Townships

- Financial Data:
- (1) State Participation-Full cost of operation and maintenance.
 - (2) Local Participation-Cost of operation and maintenance.

Technical Resources:

In Harrisburg - None

In the Field - At least 2 Traffic Engineers per District,
Approximately 25 Engineers

2.4 APPLICATION PROCESS:

The District Engineer or his Representative will contact the municipality regarding the need for new traffic signals and when construction involves existing traffic signals.

The District will provide agreement for municipalities execution which when counter signed by the Department (or Commonwealth), will provide for the installation and its operation and maintenance.

2.5 AGENCY ADDRESS:

Bureau of Traffic Engineering
Department of Transportation
Transportation and Safety Building
Commonwealth of Pennsylvania
Harrisburg, Pennsylvania 17120

2.6 FIELD OFFICES:

District Offices -

Franklin, Clearfield, Montoursville, Dunmore, Allentown,
St. David, Harrisburg, Hollidaysburg, Indiana, Pittsburgh,
Uniontown

3.0 PROGRAM: TOPICS Program (Traffic Operation Program to Increase Capacity and Safety.)

3.1 LEGAL AUTHORITY:

1968 Federal Highway Act, PPM 21-18;
PennDOT Administrative Policy

3.2 ADMINISTRATIVE AGENCY:

Department of Transportation
Bureau of Traffic Engineering

3.3 DESCRIPTION:

The TOPICS Program was established by Congress as a result of their realization of the need for each State to have a continuing program, within the designated boundaries or urban areas, designed to reduce traffic congestion and to facilitate traffic flow. The Federal-aid Highway Act of 1968 authorized the expenditure of \$200 million specifically for TOPICS for each fiscal years 1970 and 1971 to be matched on a 50-50 basis with State and/or municipal funds; of this amount \$12.7 million has been allocated to the Commonwealth for each of the two (2) fiscal years.

TOPICS permits the use of Federal Funds to improve traffic capacity and safety on municipal streets and certain State Highways which previously could not be financed with limited available Federal-aid funds. Under TOPICS, streets on which traffic engineering improvements may be made include arterial highways and major streets not on either the Federal-aid primary or secondary systems, portions of the street grid in the downtown area, and a limited street grid in other areas having particularly high concentrations of traffic. The selection of a street system, designated as a Primary Type II Federal-Aid System, is to be made by the Department of Transportation in cooperation with local officials and is subject to approval by the Federal Highway Administration as in addition to the Federal-aid system of highways in urban areas.

In view of the limited amount of funds available, the Commonwealth is initially concentrating its efforts on TOPICS projects in those municipalities situated in comprehensive transportation planning areas and comprised of a population exceeding 25,000.

The initial requirement of a municipality interested in pursuing a TOPICS program is the execution of a resolution by the governing body authorizing the proper municipal officials to enter into an agreement for the undertaking of a TOPICS Study. The TOPICS study must be an areawide study covering at least a significant portion of the urban area. The study may be conducted by qualified municipal personnel, a planning group, or a consultant mutually agreed upon by the municipality and the Commonwealth. The funding for a TOPICS Study shall be on the basis of 50% Federal, 25% State and 25% Local.

3.3 DESCRIPTION (Con't.)

The implementation of approved projects will be financed 50% Federal and 50% State or local depending on whether the improvement is to be made on a State highway or on a municipal street. The following types of improvements, utilizing traffic engineering measures and techniques to improve traffic operations, are examples of projects eligible for Federal participation. Generally, these improvements will be accomplished within the existing right-of-way; however, additional right-of-way may be needed in specific instances in order to eliminate street jogs, street discontinuity, or to widen intersection approaches.

1. Addition and/or upgrading highway lighting
2. Addition and/or upgrading of traffic signals, signs and pavement markings
3. Channelization of intersections
4. Widening of traffic lanes
5. Providing additional traffic lanes on approaches to signalized intersections
6. Construction of off-street parking facilities
7. Modifications associated with restricting curb parking to increase capacity and safety
8. Establishment of traffic surveillance system
9. Short reconstruction or construction of highway sections to eliminate a jog in an otherwise continuous street or to create route continuity

Financial Data - See Attachment A

Eligibility: Initially concentrated in major metropolitan areas where population exceeds 50,000. As TOPICS program progresses a stepping down process by population will be utilized (25,000-50,000, 20,000-25,000, 10,000-20,000, 5,000-10,000).

Technical Resources:

- A) Bureau of Traffic Engineering - 3 Engineers
- B) District Offices - At least one Civil Engineer per District to administer program.

3.4 APPLICATION PROCESS

- (1) As additional Federal TOPICS monies are made available to Pennsylvania, PennDOT will utilize the step down process indicated in item 3.3, Eligibility. That is a letter will be forwarded to municipalities that fall in the category in question explaining what the TOPICS Program is about, the respective financial responsibilities, and requesting a statement from the municipality as to whether they wish

to participate in the program. PennDOT will initiate action to have TOPICS programs underway in municipalities which wish to participate.

3.5 AGENCY ADDRESS:

Bureau of Traffic Engineering
Department of Transportation
Transportation and Safety Building
Commonwealth of Pennsylvania
Harrisburg, Pennsylvania 17120

3.6 FIELD OFFICES:

District Offices -

Franklin, Clearfield, Montoursville, Dunmore, Allentown,
St. Davids, Harrisburg, Hollidaysburg, Indiana, Pittsburgh,
Uniontown

Attachment "A"

TOPICS
CONSTRUCTION COST ALLOCATION

	(%) <u>FEDERAL</u>	(%) <u>STATE</u>	(%) <u>LOCAL</u>
1. Widening and Reconstruction			
A. State Highways	50	50	--
B. Local Streets	50	--	50
2. Traffic Signals			
A. State Highways	50	50	--
B. State Highway and Local Street*	50	25	25
C. Local Streets	50	--	50
*If State highway is being reconstructed signal cost will be allocated in accordance with T-29 with 50% of total cost being reimbursed by Federal cost.			
3. Traffic Signal Interconnection	50	*	*
*State and local percentages to be determined based upon sum of intersection breakdown percentages			
4. Street Lighting	50	--	50
5. Channelization			
A. Exclusively on State Highways	50	50	--
B. On Local streets approaching state highways (major **)	50	--	50
C. On local streets approaching state highways (minor ***)	50	50	--
**Major channelization consists of construction of additional approach lanes and islands exclusively on local streets.			
***Minor channelization consists of radii improvements and adjustments necessary to meet horizontal and vertical modifications on the state highway.			
6. Curbing (Replacement)			
A. State Highway	50	50	--
B. Local Street	50	--	50
C. State Highway and local street (radii revisions)	50	50	--
7. Curbing (New)			
A. State Highway	50	--	50
B. Local Street	50	--	50
C. State Highway and Local Street	50	--	50

Attachment "A" (Con't.)

	(%) <u>FEDERAL</u>	(%) <u>STATE</u>	(%) <u>LOCAL</u>
--	-----------------------	---------------------	---------------------

8. Curb Gutter (New or Replacement)

A. State Highway*	50	50	--
B. Local Street	50	--	50
C. State Highway & Local Street*	50	50	--

*50% State only if required for drainage

9. Sidewalks

A. New	50	--	50
B. Replacement (in kind)			
i) State Highway	50	50	--
ii) Local Street	50	--	50

10. Signing

A. State Highway

- i) Parking Regulations
- ii) Speed Limits
- iii) Warning and Other Regulatory

Department furnishes materials
and local installs signs.

B. Local Street (Items i, ii, iii above)	50	--	50
---	----	----	----

C. Major Directional

i) State Highway	50	50	--
ii) Local Street	50	--	50

D. Minor Directional
(Street name signs)

i) State Highways	50	--	50
ii) Local Street	50	--	50

11. School Warning Devices	50	--	50
----------------------------	----	----	----

12. Pavement Markings

A. State Highways	50	50	--
B. Local Street	50	--	50

Attachment "A" (Cont.)

	(%) <u>FEDERAL</u>	(%) <u>STATE</u>	(%) <u>LOCAL</u>
13. Right of Way			
A. State Highways*	50	50	--
B. Local Streets	50	--	50

*50% State when full width is for moving traffic
(not for replacement of parking)

14. Utilities

A. State Highways	Governed by Design Manual Part 5 with 50% reimbursement by federal government for all eligible relocations
B. Local Streets	City responsibility with 50% fed- eral, government for all eligible locations

APPENDIX 'D'

Data Requirements

for

Signal Investigation and Permit

APPENDIX D

Information for District and Central Office Personnel

The following Figures indicate the material and data necessary for a traffic signal investigation and issuance of a permit.

Figure A	Letter of Transmittal (2 sheets)
B	Recorder Count Summary
C	Vehicular Volume Summary - (Manual Count as Specified in T-26)
D	Pedestrian County Recap Sheet - (When Required)
E	Flow Diagram
F	Evaluating Traffic Volumes (4 sheets)
G	Check List for Condition Diagram
H	Sample Condition Diagram
I	Notes for Condition Diagram with Movement Diagram and Color Sequence.
J	Railroad and Transit Grade Crossing Information
K	Collision Diagram
L	Form 952 Application

(Date)

SUBJECT: County - Township, Borough or City
Intersection
Traffic Signals

TO: Mr. J. R. Doughty, Director
Bureau of Traffic Engineering

FROM: District Engineer
Engineering District

A summary of our traffic signal investigation for the subject intersection is as follows:

1. Vehicular traffic entering the intersection from both approaches on the major street and the highest volume minor street approach during the eighth matching hour is ____ vehicles per hour.
2. Vehicular traffic entering the intersection from both approaches on the major () Street during the eighth matching hour is ____ vehicles per hour. (Manual ____). There is (are) ____ lane(s) on each approach.
3. Vehicular traffic entering the intersection from one approach on the minor () Street during the eighth matching hour is ____ vehicles per hour. (Manual ____). There is (are) ____ lane(s) on each approach.
4. Pedestrians crossing the major street average ____ per hour for each of the eight highest hours of vehicular traffic.
5. An accident report (is) or (is not) attached. There are ____ reported accidents for the last three (3) years. ____ of these would have been susceptible to correction by traffic signals.
6. At the present time there are or are not traffic signals operating here.
7. () Street (is) or (is not) posted for a ____ speed limit. The average speed is ____ miles per hour.
() Street (is) or (is not) posted for a ____ speed limit. The average speed is ____ miles per hour. There (is) or (is not) any effort on the part of the local authorities to enforce the speed limit zone on () Street.
8. Left turns from the major street are ____ during the peak hour and ____ during the eighth matching hour.
9. General Information:
 - (a) This is a (business) or (residential) district in a (rural) or (urban) area.
 - (b) The width of the roads (do) or (do not) present difficulty for the pedestrian crossing here.
 - (c) There (is) or (is not) special movements of aged or afflicted people across the intersection

- (d) This (is) or (is not) a major school crossing. The children (are) or (are not) controlled by a school patrol or crossing guard.
- (e) If railroad grade crossing is nearby, give details pertaining to same.

Section 10. We discussed the matter of placing signals here with the proper local officials on (Date). The officials contacted were (Names). The following is a report of that meeting.

Section 11. We (recommend) or (do not recommend) the issuance of the requested permit, for (Type) signals, as shown on the accompanying condition diagram. This recommendation is based on (give pertinent comments on your recommendation).

District Traffic Engineer

Approved:

District Engineer _____

Date _____

If a permit is not recommended, an alternate solution of the problem should be given which we may suggest along with our letter of rejection.

The above is the general information that should be included in all reports. Additional comments and recommendations should be included where needed.

A meeting with local officials (Section 10) should be held regardless of the results of the study and a report of the discussion should be included in this section.

Attachments:

24 HOUR RECORDER COUNT SUMMARY

COUNTY _____

DATE _____

LOCATION _____

DATES COUNTED _____

I-HOUR STARTING AT	MAJOR STREET		MINOR STREET		INTER- SECTION TOTAL	MAJOR TOTAL & MINOR HIGHEST ONE-WAY	NOTES
	TRAFFIC FROM THE	STREET TOTAL	TRAFFIC FROM THE	STREET TOTAL			
12							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
Noon 12							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
TOTAL							

A.
M.P.
M.

SUMMARY SHEET

Municipality _____

Figure C

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
PLANNING AND TRAFFIC DIVISION

DIRECTIONAL TRAFFIC FLOW DIAGRAM
(4 WAY)

DATE _____

County _____ Township _____ Municipality _____

Intersection _____

Remarks _____

Other Available Forms

PS-1A "T"
PS-1C "5 Appr."
PS-1D "6 Appr."
PS-1E "Y"

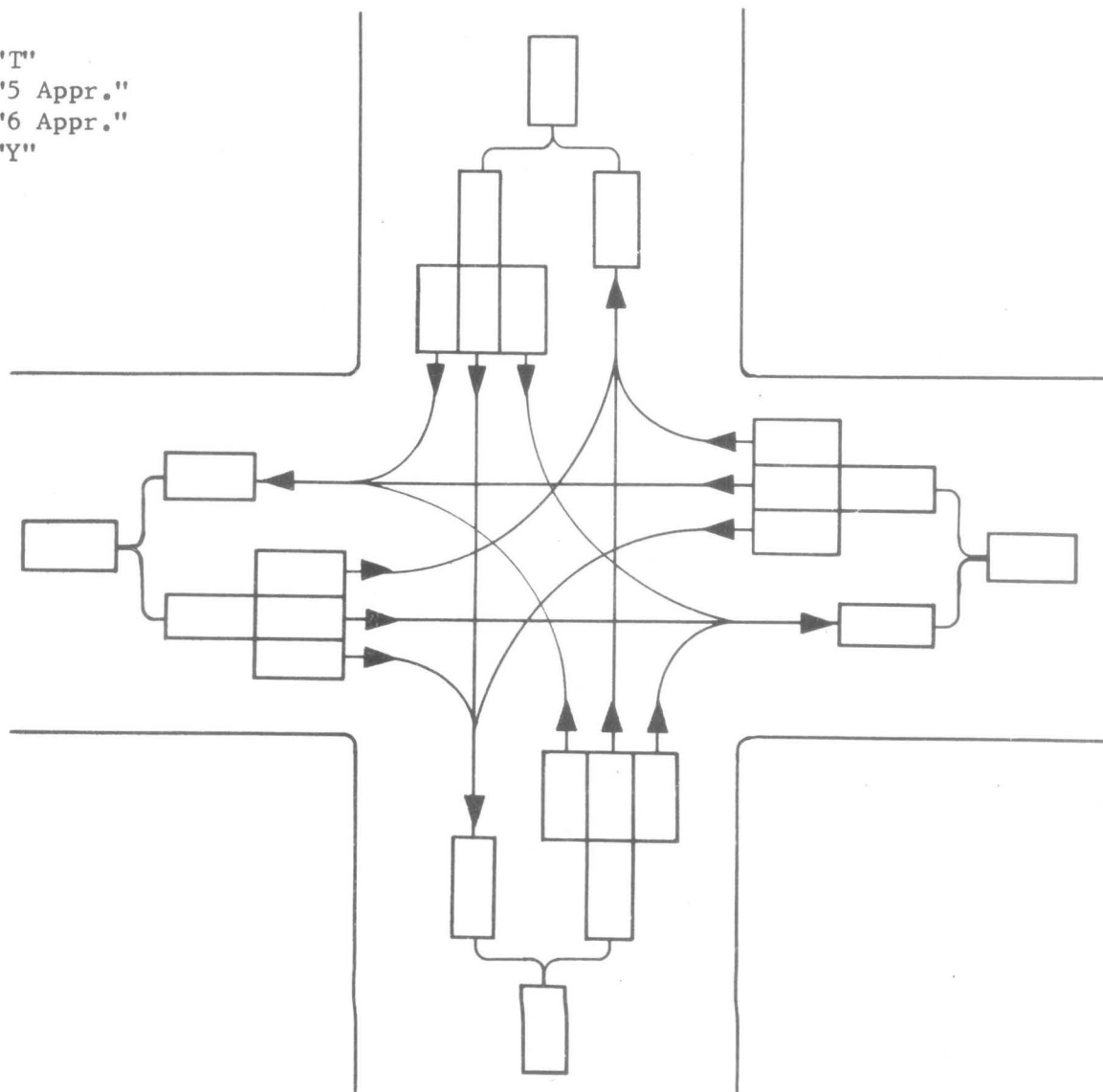


Figure E

COMMONWEALTH OF PENNSYLVANIA
Department of Highways
Harrisburg

Subject: Evaluating Traffic Volumes
Traffic Volume Warrants

November 14, 1968

To: District Engineer, Dist. 1
District Engineer, Dist. 2
District Engineer, Dist. 3
District Engineer, Dist. 4
District Engineer, Dist. 5
District Engineer, Dist. 6
District Engineer, Dist. 8
District Engineer, Dist. 9
District Engineer, Dist. 10
District Engineer, Dist. 11
District Engineer, Dist. 12

From: J. R. Doughty, Director
Bureau of Traffic Engineering *AKS*

At the last traffic signal school held in Harrisburg Mr. John Geisel of the Central Office presented a session concerning the evaluation of traffic volumes in order to determine if the volume warrants were met for the installation of a traffic signal.

It is our recommendation that the volume of traffic entering the intersection from the higher volume minor street approach be used as the controlling factor in determining the high ten or more hours and that this traffic volume then be compared with the volume on the major street during THE SAME HOUR. Always compare the minor street volume with the volume on the major street for the same hour.

Attached you will find two examples of the above for an urban area with one travel lane in each direction on both streets. You will note that the "Top Ten Hours" have been selected on the basis of the traffic volume on the higher hourly volume minor street approach. In this example, the volume for each of the first eight hours on the higher volume approach of the minor street and the corresponding hourly volume on the major street exceeds the required minimum volume warrant; therefore, a traffic signal is warranted.

In example two, the "Top Ten Hours" have been selected as above. You will note that the traffic volume for each of the first seven hours on both streets equal or exceed the required minimum volume warrants but the volume on the major street for

cc:

- more -

Dist. Traffic Engr., Dist. 1
Dist. Traffic Engr., Dist. 2
Dist. Traffic Engr., Dist. 3
Dist. Traffic Engr., Dist. 4
Dist. Traffic Engr., Dist. 5
Dist. Traffic Engr., Dist. 6

Dist. Traffic Engr., Dist. 8
Dist. Traffic Engr., Dist. 9
Dist. Traffic Engr., Dist. 10
Dist. Traffic Engr., Dist. 11
Dist. Traffic Engr., Dist. 12

COMMONWEALTH OF PENNSYLVANIA
Department of Highways
Harrisburg

Subject: Evaluating Traffic Volumes
Traffic Volume Warrants

November 14, 1968

To: District Engineer, Dist. 1
District Engineer, Dist. 2
District Engineer, Dist. 3
District Engineer, Dist. 4
District Engineer, Dist. 5
District Engineer, Dist. 6

District Engineer, Dist. 8
District Engineer, Dist. 9
District Engineer, Dist. 10
District Engineer, Dist. 11
District Engineer, Dist. 12

From: J. R. Doughty, Director
Bureau of Traffic Engineering

the eighth hour is less than the required minimum volume; however, the volume on both the minor street approach and the major street for the ninth hour equals or exceeds the minimum required volume. Therefore, eight hours meet or exceed the volume warrants and a traffic signal is warranted.

There may be instances when more than the "Top Ten Hours" will have to be selected in order to determine if the required volume warrants are met; however, these cases are not common. A guide for this would be to look at the volumes on the major street and determine which volume warrant should be used and then select the hours where the volume on the higher volume minor street approach equals or exceeds the minimum required volume for the specific warrant.

450/AKS/elh

cc: H. S. Ponroy

Dist. Traffic Engr., Dist. 1
Dist. Traffic Engr., Dist. 2
Dist. Traffic Engr., Dist. 3
Dist. Traffic Engr., Dist. 4
Dist. Traffic Engr., Dist. 5
Dist. Traffic Engr., Dist. 6

J. W. Geisel

Dist. Traffic Engr., Dist. 8
Dist. Traffic Engr., Dist. 9
Dist. Traffic Engr., Dist. 10
Dist. Traffic Engr., Dist. 11
Dist. Traffic Engr., Dist. 12

24 HOUR RECORDER COUNT SUMMARY

TE 6126

COUNTY _____
LOCATION URBAN 1 LANE

DATE _____

DATES COUNTED _____

I-HOUR STARTING AT	MAJOR STREET			MINOR STREET			TOP TEN HOURS		NOTES
	TRAFFIC THE	FROM	STREET TOTAL	TRAFFIC THE	FROM	STREET TOTAL	MAJOR TOTAL	MINOR HIGHEST ONE-WAY	
12									
1									
2									
3									
4									
5									
6									
7			610	175	210 ⁽²⁾		610	210 ⁽²⁾	
8			630	220 ⁽¹⁾	212		630	220 ⁽¹⁾	
9			580	165	180 ⁽⁵⁾		580	180	
10									
11									
Noon									
12			520	175 ⁽⁶⁾	140		520	175	
1			530	170 ⁽⁷⁾	142		530	170	
2			510	136	150 ⁽⁹⁾		510	150	
3									
4									
5			590	135	190 ⁽⁴⁾		590	190 ⁽⁴⁾	
6			600	200 ⁽³⁾	185		600	200 ⁽³⁾	
7			480	155	160 ⁽⁸⁾		480	160	
8			390	110	130 ⁽¹⁰⁾		390	130	
9									
10									
11									
TOTAL									

1st 7 hours above min. warrant
8th hour below on major street
However, 9th hour on minor & major exceeds warrant.
Therefore, 8 hours are above warrants & signal is ok.

24 HOUR RECORDER COUNT SUMMARY

COUNTY _____

DATE _____

LOCATION URBAN / LANE

DATES COUNTED _____

I-HOUR STARTING AT	MAJOR STREET			MINOR STREET			INTER- SECTION TOTAL	MAJOR TOTAL & MINOR HIGHEST ONE-WAY	NOTES
	TRAFFIC THE	FROM	STREET TOTAL	TRAFFIC THE	FROM	STREET TOTAL			
12									
1									
2									
3									
4									
5									
6									
7			610	175	210 ⁽²⁾		610	210	
8			630	220 ⁽¹⁾	212		630	220	
9			580	165	180 ⁽⁵⁾		580	180	
10									
11									
Noon 12			520	175 ⁽⁶⁾	140		520	175	
1			530	170 ⁽⁷⁾	142		530	170	
2			490	136	150 ⁽⁹⁾		490	150	
3									
4									
5			590	135	190 ⁽⁴⁾		590	190	
6			600	200 ⁽³⁾	185		600	200	
7			510	155	160 ⁽⁸⁾		510	160	
8			390	110	130 ⁽¹⁰⁾		390	130	
9									
10	Note: Always compare Minor Street volumes with volumes on the Major Street AT THE SAME								
11									
TOTAL	HOUR (ie 160 at 7 P.M. with 510 on Major.)								

} Signal Warranted
 8th highest hour
 160 150 min. warrant
 510 500 " "

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HIGHWAYS
BUREAU OF TRAFFIC ENGINEERING
TRAFFIC SIGNALS SECTION
CHECK LIST FOR CONDITION DIAGRAM

1. Plan of intersection extending 150 ft. on each approach. Scale 1" = 20 ft. or 1" = 25 ft. Show street names, legislative route numbers, if any. Maximum size of plan shall be 22" by 17" (additional sheets may be used if necessary).
2. Show north arrow.
3. Show pavement, lane and shoulder widths, all pavement markings, right-of-way and property lines, approximate grades, drainage pipes and inlets, curbing radii (curbed or uncurbed, driveways and barriers).
4. Show utility poles, street lighting, traffic islands, traffic signal poles, vehicular detectors, signal heads and controller, if any.
5. Locate no parking and restricted parking zones, hours etc., bus stops, and direction of one-way streets, if any. Show all traffic control signs and the speed limits on each approach.
6. Show existing buildings and locate any obstruction to sight distance for the driver approaching the intersection. This will include trees, shrubbery, fences, billboards, walls, etc.
7. Show location of any railroad or rail transit grade crossings within 300 feet of the intersection. Give name of the railroad or transit company, indicate existing protection and whether siding, mainline, etc.
8. Indicate distance to nearest existing traffic signal on each approach, if one mile or less. Show municipal boundaries, if within the area of the plan and identify the municipality.
9. A reproducible tracing or transparency of the Condition Diagram is to be submitted with the application for a traffic signal permit. Tracings on transparencies shall never be folded, they shall be rolled and mailed in mailing tube.

The following information shall be placed on the condition diagram by the District Traffic Engineering Unit conducting the Traffic Signal Investigation.

1. Legislative route number, if not shown, and station number for centerlines of each approach.
2. All proposed pavement markings, including cross walks, stop lines, words, symbols center and lanelines.
3. All proposed traffic signals and detectors.

4. All necessary signs for proper operation and control of the proposed signalized intersection. Decals should be used for sign and signal illustrations whenever possible.
5. The numerical designation of any signals having the same color sequence should be combined on one line of the Color Sequence and Movement Chart.
6. If traffic signals are not present within a mile, on any approach, so indicate on the condition diagram.
7. Hourly movement charts (see figure 22) for phasing and timing of Traffic Signals shall be placed on, or attached to, the condition diagram.

New Form No. TE 6167
or 6168

A rectangular white speed limit sign with a black border. The words "SPEED" and "LIMIT" are stacked vertically on the left in black capital letters. To the right of these words is the number "55" in a large, bold, black sans-serif font.

R/L

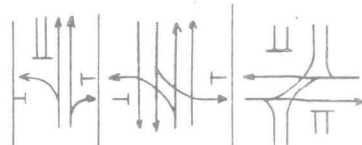
shoulder line

660' to
Signal at
"A" Street

Residence

NO
PARKING
HERE
TO
CORNER

Movement Diagram
Color Sequence
and
Timing



Phase →	Adv A			A		B				Flash
Interval →	1	2	3	4	5	6	7	8		
Signal	1	G	G	G	Y	R	R	R	Y	
	2	G	G	G	Y	R	R	R	Y	
	3	G	R	R	G	Y	R	R	Y	
	4	G	R	R	R	R	G	Y	R	
	5	G	R	R	R	R	G	Y	R	

#1 Dial

Time	6	3	24	3	12	19.2	3	6	60 sec
%	10	5	40	5	2	32	5	1	
Dia/Set	0	10	15	55	60	62	44	99	0

#2 Dial

Time	10.5	3.5	24.5	3.5	1.4	22.4	3.5	7	70.5
%	15	5	35	5	2	32	5	1	
Dial Set	0	15	20	55	60	62	94	99	2

Dial #2 7²⁰ P.M. to 9²⁰ P.M.
4²⁰ P.M. to 6²⁰ P.M.

* If actuated use this timing arrangement

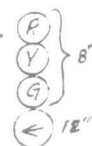
[illegible]

L.R 1 station 100+95
L.R 999 station 0+00

No signal
within one mile

Signals

All others



Detector locations, for actuated installations, shall be shown and located by dimensions measured from the intersecting roadways.

L.R. /
Doe Road

+ 10% Grade

Paved shoulder

780' to
Signal at
1st Street

Interconnected System along Doe Road

Offsets	Dial #1 average	Dial #2 Outbound	Dial #3 Inbound
'B' St	10 sec 17%	14 sec 20%	
'A' St (master)	0	0	
Boro St.	10 sec 17%	56 sec 80%	
1st St	20 sec 33%	42 sec 60%	

PENNSYLVANIA DEPARTMENT OF HIGHWAYS	
TRAFFIC DIVISION	
L.R. 1 TR 1 Doe Road	
L.R. 999 E. Boro Street	
COUNTY Penn	TWP. Penn
DRAWN BY	DATE
APPROVED	DATE
APPROVED Scale 1" = 20'	DATE
TRAFFIC UNIT NO.	

NOTES

Installation, operation and maintenance of these signals shall be in accordance with Pennsylvania Department of Highways Regulations governing the design, location and operation of signs, signals and markings.

All signs and markings indicated on this drawing are considered part of of the Permit and shall be installed accordingly.

Placing and maintaining of the limit lines is the responsibility of the municipality and shall be kept in an effective condition at all times.

All maintenance work necessary for proper visibility of the signals is the responsibility of the municipality.

No modifications of this installation are permitted unless prior approval is granted, in writing, by the Secretary of Highways.

Painted parts of this installation, except for signal heads, shall be highway yellow or green in color. Signal heads shall be highway yellow and the inside of the visors or hoods shall be a dull black.

Post mounted signals shall be installed with the signal heads a minimum of 2'(feet) behind the face of the curb or edge of the shoulder.

Signals erected over the roadway shall have a minimum clearance of 15'(feet) above the roadway. Post mounted signals shall be a minimum of 8'(feet) above the sidewalk or pavement grade.

The minimum horizontal distance between signals, measured at right angles to the approach, shall be 8' (feet).

Exact location of detectors shall be determined at the time of installation by a representative of the Department.

Number of Prints Required

3 when in a Single Municipality

1 additional for each additional Municipality

2 additional when a railroad or transit

crossing is involved.

[illegible]

PENNSYLVANIA DEPARTMENT OF HIGHWAYS
BUREAU OF TRAFFIC ENGINEERING

County

Municipality

Drawn By

DATE _____

Approved

DATE _____

Scale

C. Wilson

RAILROAD GRADE CROSSING INFORMATION

When there are railroad or transit crossings at grade within 300 feet of the intersection, in any direction, the following information shall be submitted for any traffic signal request.

1. The Name(s) of the Railroad or others using the crossing.
2. The Type of Crossing (freight, shifting, spur, etc.).
3. The number of crossings per day.
4. The approximate time of crossing(s), or number per hour in case of a Trolley crossing.
5. The average length of time it takes the train to clear the area of the intersection.
6. The Type of crossing protection presently in use.

(If Flashers, Gates, Bells or combinations of these are present, determine the time element (maximum - minimum) that they are in operation prior to the time a train or transit vehicle reaches the crossing. Example, fast train v.s. slow train, transit vehicle with a stop before reaching the crossing v.s. no stop).
7. The Speed Limit of the train over the crossing.
8. The Number and Position of the tracks should be shown on the condition diagram.

FORM 825 2-10
9-60

To Be Replaced By
FORM TE 825

24 HOUR TRAFFIC VOLUME

SKETCH LOCATION SIMILAR TO DRAWING AT LEFT
SHOW TOTAL 24 HOUR VOLUME INCLUDING TURNING MOVEMENTS

COLLISION SYMBOLS

←→→→ VEHICLE BACKING	↙ LEFT TURN
← MOTOR VEHICLE	↘ SIDE SWIPE
←--- PEDESTRIAN	↖ REAR END BACKING
▢ PARKED VEHICLE	↗ OUT OF CONTROL
▢ PARKING OR UNPARKING	- LIST OTHER SYMBOLS USED -
□ FIXED OBJECT	
←→ REAR END	
→→ HEAD ON	
↘ RIGHT ANGLE	
→● FATAL	
→○ INJURY	
→→ PROPERTY DAMAGE	
~~~~ SKIDDING	

PENNSYLVANIA DEPARTMENT OF HIGHWAYS  
TRAFFIC ENGINEERING BUREAU

### ACCIDENT COLLISION DIAGRAM

COUNTY

CITY BORO  
TOWNSHIP

LEG ROUTE

APPROVED DATE

DRAWN BY DATE

DRAWING NO. SCALE 1" = 20'

Figure K

APPLICATION FOR PERMIT  
TO INSTALL AND OPERATE  
TRAFFIC SIGNALS

DATE

WHEREAS, the _____ County  
(CITY, TOWNSHIP, BOROUGH)  
desires to erect, operate and maintain traffic signals at the intersection of

_____, and  
WHEREAS, The Vehicle Code requires the approval of the Secretary of Transportation before any  
traffic signals may be legally erected or reconstructed, and

WHEREAS, the Department of Transportation requires an engineering drawing of this intersection,  
the _____ will prepare such a drawing in conformance with  
the instructions provided by the Department.

NOW, THEREFORE, BE IT RESOLVED, that traffic signals be erected at the above mentioned  
location, subject to the approval of the Secretary of Transportation, and that his approval is hereby  
requested, and

BE IT FURTHER RESOLVED, that, in the event a traffic signal permit is approved after proper  
investigation by the Secretary of Transportation or his agent, the _____  
_____ will be bound by the following provisions:

The installation shall be made in accordance with the requirements of the Vehicle Code  
and the Regulations for Traffic Signs, Signals and Markings of the Department of Transportation,  
and

Should future highway or traffic conditions, or legal requirements, necessitate alterations  
of the construction or operation, or hours of operation, or removal of the traffic signals at the above  
mentioned intersection, they shall be altered or removed when and as directed by the Secretary of  
Transportation.

I, _____, Secretary of the _____  
do certify that the foregoing is a true and correct copy of the resolution legally adopted at the meet-  
ing held, _____ .  
(DATE)

(SEAL)

Signed _____  
SECRETARY