IOWA

CONSTRUCTION AND MAINTENANCE TRAFFIC CONTROL HANDBOOK

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A CONSTRUCTION AND MAINTENANCE TRAFFIC CONTROL HANDBOOK FOR THE STATE OF IOWA

Prepared for

IOWA DEPARTMENT OF TRANSPORTATION

AMES, IOWA

October 1976

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Introduction

Roadway construction and maintenance operations frequently present unusual or even hazardous driving conditions to the traveling public. These roadway conditions are not of the type that motorists normally encounter and in many instances cause confusion and increase the potential for accidents. In order to alleviate this situation and decrease the potential for accidents, proper traffic control in construction and maintenance areas is essential.

A major problem in handling traffic in construction and maintenance areas is the inability to convey proper messages to the traveling public. Presently, signing practices, as well as the erection of barricades and other traffic control devices lack uniformity. Although standards, procedures and guidelines have been adopted by many agencies, they are not uniform throughout the State of Iowa and their interpretation and application varies considerably.

The Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) published by the Iowa Department of Transportation provides a comprehensive treatment of the design and application of specific traffic control devices and Chapter VI specifically covers recommended traffic control applications for construction and maintenance areas. However, it offers only limited guidance on how these devices might be used in combination or how they might be adapted to specific situations.

This Handbook has been prepared by the Iowa DOT as a guide and supplement to the MUTCD. It provides in one document a large number of illustrations which can be easily adapted to specific conditions by field personnel. It is intended to supersede all previous non-conforming standards now being used throughout the state and to provide uniform guidelines for all agencies, public and private, who must conduct construction and maintenance activities on the streets and highways of the state. The illustrations contained herein serve as a quick reference for field personnel to follow, however, no amount of detailed instructions can adequately cover every situation. For this reason, sound judgement is required in using these illustrations to cover actual field conditions.

Chapter 1 HOW TO USE THIS HANDBOOK

This Handbook is intended to primarily serve as a convenient reference document for use at the job site. Accordingly, Chapter 4 has been organized into groups of Figures which show the majority of field operations which can be found for various roadway types and projects. The Figures have been arranged so the legend identifies first the Roadway Type such as, Rural Local Road, Two Lane Highway, Urban Multilane Street, etc. This identifies the area and roadway from rural to urban and Two Lane Road to Freeway. The second portion of the legend indicates the project type such as Roadside, Lane Closure, Road Closure, etc. This identifies the type of work in progress. The Title generally relates to a specific function or time of operation. A Glossary of Definitions of these terms are as follows.

GLOSSARY OF DEFINITIONS

Roadway Type	Definition
Rural Local Road	A lightly traveled paved or unpaved two lane rural roadway. (Generally includes most county roads.)
Two Lane Highway	A high type rural road having a moderate amount of traffic and moderate to high vehicle speeds.
Undivided Multilane Highway	A high type rural road having four or more lanes and moderate to high vehicle speeds and traffic volumes.

GLOSSARY OF DEFINITIONS (Continued)

Roadway Type	Definition
Urban Residential Street	A lightly traveled two lane roadway serving a residential area and having a low speed limit.
Urban Two Lane Street	A two lane urban roadway with moderate traffic volumes and speeds.
Urban Multilane Street	A highly traveled major roadway with considerable traffic and four or more travel lanes.
Divided Highway	A major, rural type roadway (including freeways) having four or more lanes of traffic; high traffic volumes, and moderate to high travel speeds.

****

Project Type	Definition
Removed from Roadway	Work area is more than ten feet (10') from roadway.
Roadside	Work area is within ten feet (10') of the roadway.
Lane Closure	Work area blocks one or more lanes of traffic.

GLOSSARY OF DEFINITIONS (Continued)

Project Type	Definition
Intersection	Work area is either within or adjacent to an intersection.
Road Closure	Work area requires that traffic be detoured.
Pedestrian	Work area blocks pedestrian traffic.

In order to simplify finding the Figure which shows the most appropriate traffic control application, the four step procedure shown below and illustrated in the flow chart on Page 4 should be followed.

Step 1 Determine the Roadway Type on which the work will be performed such as Rural Local Road, Two Lane Highway, Undivided Multilane Highway, etc.

Step 2 Determine the Project Type based on its relationship to the roadway such as Removed from Roadway, Lane Closure or Road Closure.

Step 3 Estimate the project time or how fast the work will be moving along the road or street. The length of time of a project can be defined as:

- Less than 15 Minutes
- 15 Minutes to 2 Hours
- More than 2 Hours

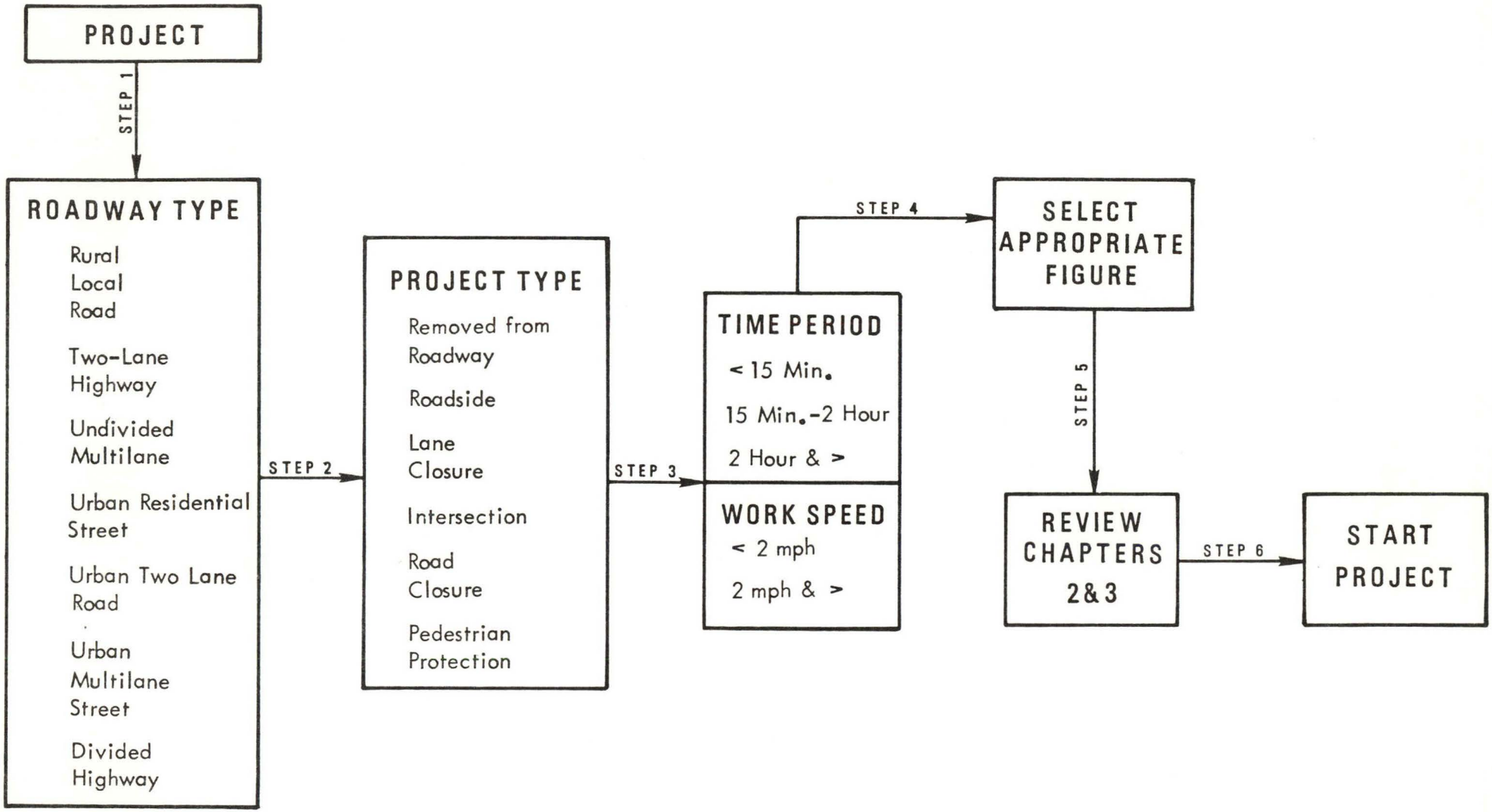
The speed of a project along a roadway can be defined as:

- Less than 2 Miles per Hour
- More than 2 Miles per Hour

Step 4 Select the Figure in Chapter 4 under the Roadway Type category which is most representative of the project or work area. Because there may be more than one Figure corresponding to a given Roadway Type, confirm the selected Figure by checking The "Typical Applications" listed and make sure that the field situation is reasonably illustrated in the selected figure. Refer to Chapter 2 for a discussion of the Types and Uses of traffic control devices.

The foregoing procedure has been summarized and a guide for the appropriate Figure is presented in Table 1 on Page 14 in Chapter 4.

HANDBOOK USAGE PROCEDURE



Chapter 2 TYPES AND USES OF TRAFFIC CONTROL DEVICES

A wide variety of devices are available to help keep traffic flowing smoothly and safely during construction and maintenance projects. The most commonly used traffic control devices include signs, barricades, delineators such as cones, high level warning lights, and flashers. These devices are generally used in combination with one another with each one having a particular purpose. Different projects have different traffic control needs. For example, situations where traffic volumes are high, speeds are high or visibility is restricted, require traffic controls having more attention-getting value. On the following page is illustrated how channelization can be successively upgraded to handle more difficult situations.

A. SIGNS

Signs used in construction and maintenance areas are the primary means of communicating with the traveling public. The message which they convey should be as clear and concise as possible. Therefore, their use, placement and legend is extremely important if traffic is to be properly handled. There are a variety of signs generally used for maintenance and construction area traffic control. These signs can be distinguished from permanent traffic signs by their orange background color. For purposes of illustration, a group of commonly used signs are shown on Page 7.

B. CONES AND POSTS

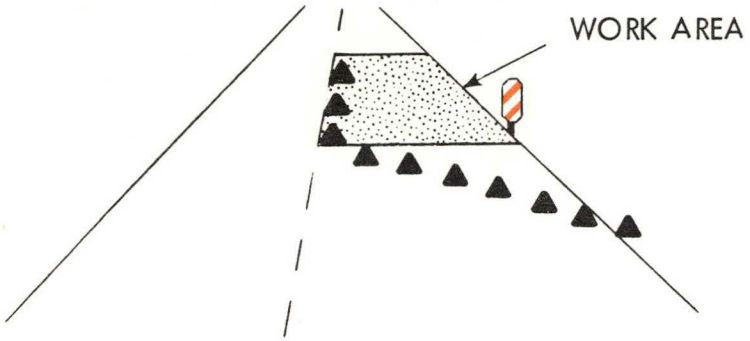
Most common of all delineators are traffic cones or posts made of rubber or plastic and when used at night they must be reflectorized or lighted. The posts may be considered as alternatives to cones wherever cones are specified. Any other devices which could be a hazard to vehicles or the workmen should not be used in place of cones or posts. Delineators should never be used without additional devices such as signs and high level warning devices.

With the exception of some moving or very short term operations, cones or posts are placed at close enough intervals when channelizing vehicles so that they present a well defined pathway to use. The important point to remember when placing channelization devices is that a sufficient number must be used so that the primary pathway is conspicuous to motorists approaching the worksite.

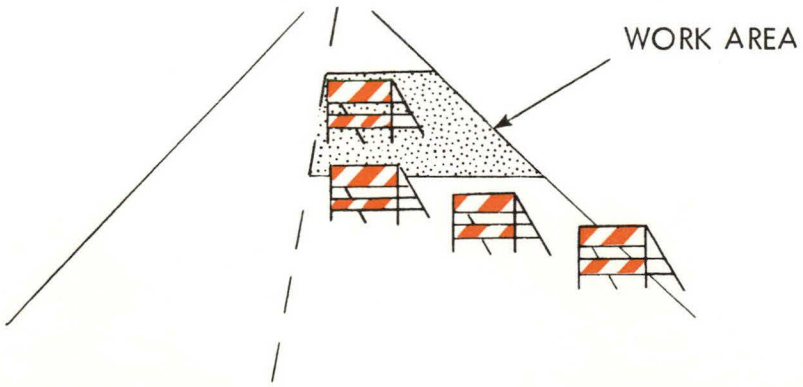
The length of taper used may vary depending on the location of the work area such as rural highway or urban streets. In many cases a good rule for determining the length of taper is vehicle speed times the distance traffic is moved sideways. As an example if ten feet of street or highway is to be barricaded and the average speed of vehicles is 40 miles per hour, the taper would be 10 x 40 = 400. In an urban area there would be many exceptions to this rule based on numerous circumstances. The Figures shown in Chapter 4 should be used for this purpose.

CHANNELIZING DEVICES FOR LANE CLOSURES

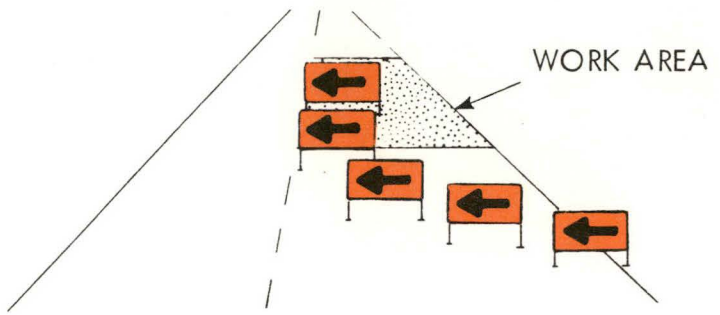
(a) Traffic Cones (Daytime Only)



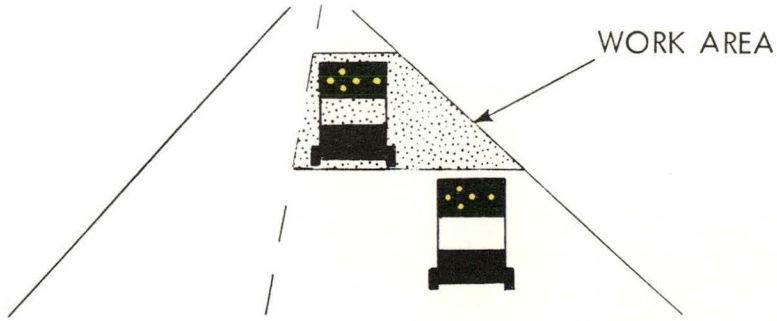
(b) Type II Barricades (Flashers Optional)



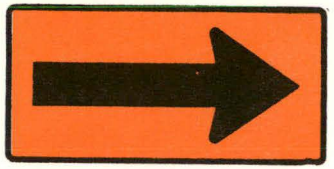
(c) W1-6 Arrow Boards on Skids

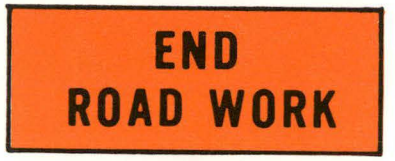


(d) High Level Flashing Arrow Boards



COMMONLY US CONSTRUCTION
AND MAINTENANCE AREA TRAFFIC SIGNS





C. BARRICADES

Barricades are commonly used at all construction or maintenance activities in or near the traveled way, with the possible exception of very short term maintenance operations when large cones and high level warning devices are more commonly used. Two types of lightweight portable barricades are available (Type I and Type II). The difference between the two is the number of rails; one or two. The most commonly used rail length is two or three feet. Rails shall be reflectorized, flashers are optional unless required in the plans or specifications.

D. LIGHTS

Flashing yellow lights should be used at night, normally on barricades to show locations of obstructions. However, where lights are needed to delineate the traveled way through and around obstructions in a construction or maintenance area, the delineation shall be accomplished by use of steady burning yellow lamps.

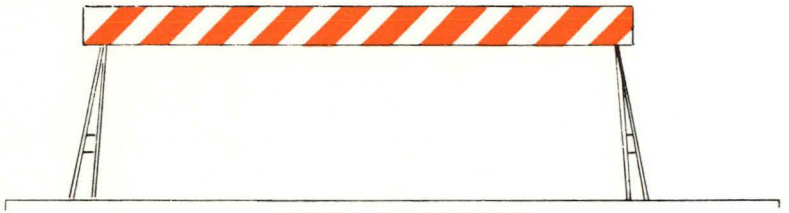
E. OTHER TRAFFIC CONTROLS

Some situations will require signs or other forms of traffic control not specifically discussed in this Handbook. In these cases, refer to the Iowa MUTCD for proper usage. In no instance should traffic controls be used that conflict with the criteria established in the Iowa MUTCD.

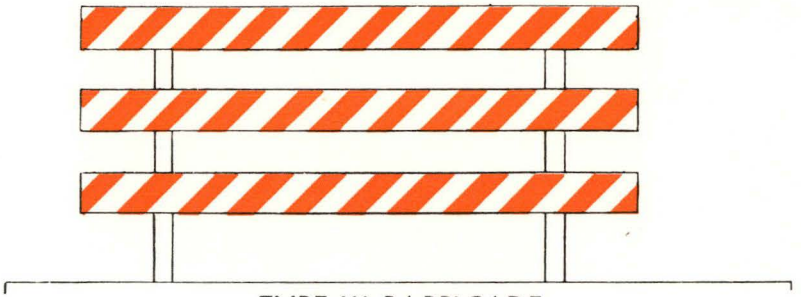
F. PAVEMENT MARKINGS

Markings not applicable which may create confusion in the minds of motorist shall be removed or obliterated. Temporary markings may be needed to guide the motorist.

CONE AND BARRICADES

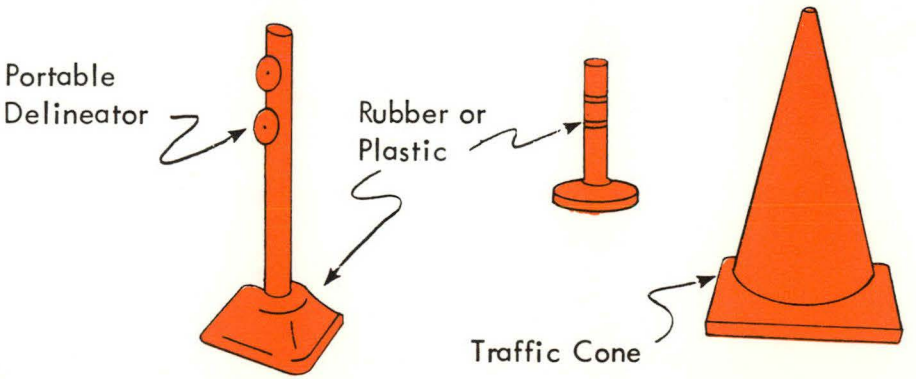


TYPE I BARRICADE



TYPE III BARRICADE

TYPE II BARRICADE



Chapter 3 GENERAL INSTRUCTIONS

A. PLANNING AND COORDINATION

Many problems can be avoided by planning the job well in advance of starting work. If the work affects traffic flow in another agency's jurisdiction, they should be so advised before the job begins. Generally, it is best that two or more worksites not be close together. If such conditions cannot be avoided, your project should be coordinated with others in the area. Extensive planning involving you, traffic engineers, police, project engineers, and others may be required for some major projects. If the engineers have developed traffic plans, be sure you have carefully reviewed them. If you feel something is not correct, find out what is needed before starting work. Even though the planning of traffic control needs for routine maintenance work is generally less involved than that needed for big projects, such planning can be just as important and possibly even more critical.

Permits are sometimes needed before work can begin. If so, an application should be submitted well in advance since it may take several days for review before it can be issued. Even though copies of permits are routinely forwarded to emergency vehicle operators and transit agencies, it is a good practice to check with them and utility companies before starting work.

B. PUBLIC INFORMATION PROGRAM

On many projects a public information program is essential. Complicated projects which inconvenience motorists and adjacent land owners require good public information. Other projects which involve lesser inconveniences still require some public information. You should be prepared to answer questions regarding how long it will take to complete the work, which driveways are likely to be closed, when or where parking might be restricted, and other requirements of the project. An extra few minutes of listening to concerns of residents, merchants, motorists, and pedestrians will go far in keeping complaints to a minimum, as well as keeping you informed of real needs.

C. PEDESTRIAN NEEDS

If the work will block pedestrian traffic, you will need to provide reasonable alternative walkways, (see Figure 38 in Chapter 4). Pedestrians must be separated from work areas and vehicles. Pedestrian needs should generally be given higher priority than that of automobiles when conditions are such that needs of both motorists and pedestrians cannot be met in the work area.

D. PLACEMENT, MAINTENANCE AND REMOVAL OF TRAFFIC CONTROLS

1. Placement

The first traffic control device to be installed when you begin the setup is the sign placed furthest in advance of the work. From this starting point you should set up the remaining signs, cones, barricades and other devices with the flow of traffic until the worksite is reached. Next, the worksite should be barricaded. If a major intersection is located between the first sign and the worksite, it may be helpful to install a duplicate sign just beyond the intersection.

Where hills, curves, buildings or landscaping block the motorists' view of the worksite, special care must be taken to be sure that motorists are given early warning. This might include adding extra advance warning signs and placing them further from the worksite. Existing traffic controls which do not apply for the duration of the project should be temporarily removed or covered. If unusual traffic congestion is experienced, extra signing should be placed well in advance of the traffic backup. After completion of the setup of traffic controls, an inspection of the entire installation should always be made.

2. Maintenance

For long-term projects, be sure to check the traffic control layout from time to time and make changes as needed. How often you check the traffic control devices will depend on the type of work.

3. Removal

At the completion of a project all temporary traffic controls used for construction and for maintenance work should be removed. On projects that require new setups each day, the traffic controls should be removed promptly starting at the work area and proceeding back toward the first control in place. A truck using a flashing beacon normally is the method of transportation. A flagman should be used if conditions warrant added protection. In cases where permanent traffic controls such as pavement markings and signs need to be erected such work should be finished prior to traffic using the new facility.

E. FLAGGING

Flagmen may be required where workmen or equipment intermittently block a traffic lane; where one lane is used for two directions of traffic; and at other locations where judgement and experience indicates

E. FLAGGING (Continued)

they are needed to warn, guide, or control traffic. Flagmen should stand far enough in advance of the work area so that they can slow or stop vehicles. They should be clearly visible to all approaching traffic. The use of orange clothing such as vest, shirt, or jacket shall be required for flagmen. They shall use a 24" or larger square red flag or a stop/slow paddle. The paddle should not be waved but held still for the motorist to read. Specific flagging procedures are discussed in Section 6E-4 of the Iowa MUTCD.

Chapter 4 TYPICAL TRAFFIC CONTROL APPLICATIONS

This chapter illustrates the application of typical traffic control measures to typical construction and maintenance work situations found in the State of Iowa. Figures 1-62 are based on the principles found in Chapter VI of the Iowa MUTCD. In order to simplify the contents of this Handbook, specific Iowa MUTCD design requirements (size, shape, color, etc.) are not duplicated herein.

It should be emphasized that each project is unique and traffic controls must fit the specific needs of each work site. For example, the recommended dimensions shown on the accompanying figures are approximate and common sense and experience should dictate the appropriate traffic control layout in the field.

TABLE 1

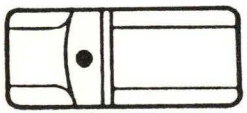
GUIDE FOR SELECTING TRAFFIC CONTROL FIGURES

Roadway Type	Stationary Work Area Project Time Period			Moving Work Area Speed	
	Less than 15 Minutes	15 Minutes to 2 Hours	More than 2 Hours	Less than 2 MPH	2 MPH or Faster
Rural Local Road	Figure 1	Figures 1, 2	Figures 2, 3, 8	Figures 4, 5, 6	Figure 7
Two Lane Highway	Figures 10, 11	Figures 10, 11	Figures 10, 12, 13, 20, 21, 22, 23	Figures 9, 10, 14, 15, 18, 19	Figures 16, 17
Undivided Multilane Highway	Figure 24	Figure 25	Figures 26, 27	Figures 28, 30	Figure 29
Urban Residential Street	Figure 31	Figure 31	Figure 31	---	---
Urban Two Lane Street	---	Figure 32	Figures 33, 34 36, 37, 38	---	Figure 35
Urban Multilane Street	Figure 39	Figure 39, 43 44, 45	Figures 39, 40 41, 42, 43, 44, 45, 46, 49	Figures 39, 47	Figure 48
Divided Highway	Figure 50	Figures 50, 51	Figures 50, 52, 53, 54, 60, 61, 62	Figures 50, 55, 57, 58	Figures 56, 59

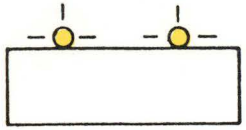
LIST OF SYMBOLS

TRAFFIC SIGN

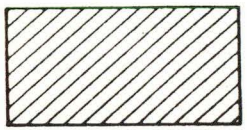
TRAFFIC SIGNAL



TRUCK WITH FLASHING BEACON



VEHICLE MOUNTED
TRAFFIC SIGN (LIGHTS OPTIONAL)



WORK AREA

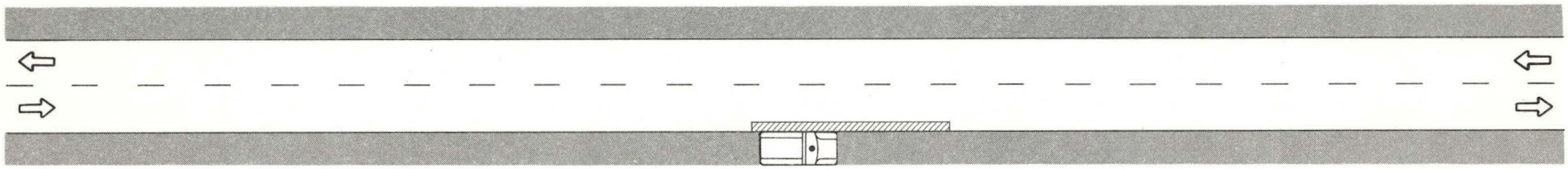
ARROW BOARD

BARRICADE

ELECTRIC ARROW SIGN

FLAGMAN

CHANNELIZING DEVICE



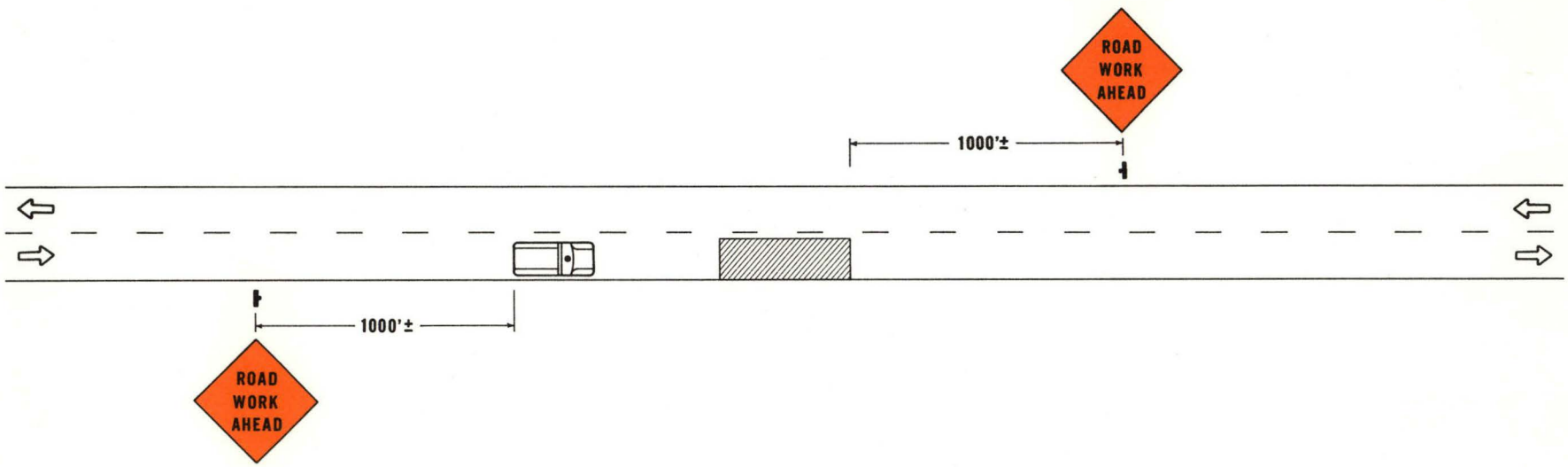
GENERAL NOTE

Flagman may be used under certain conditions.

TYPICAL APPLICATIONS

- Cleaning drainage structures
- Debris pick-up
- Sign installation and repair

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Roadside	Stationary Work Less than 15 Minutes	1



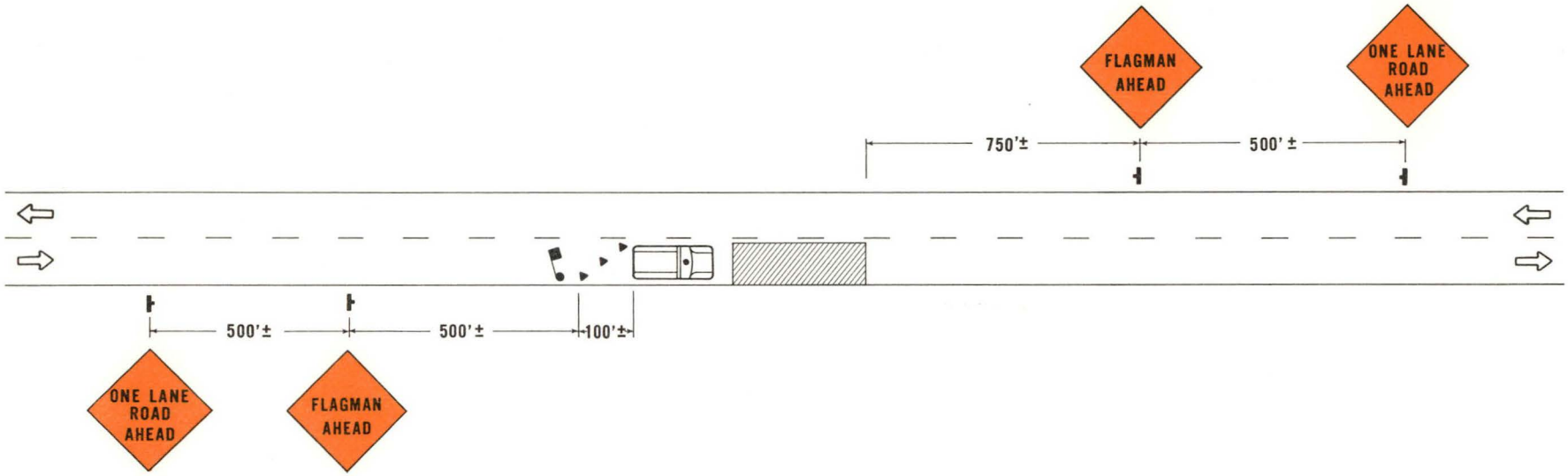
GENERAL NOTES

1. Advanced warning signs may not be required on roads having good visibility and low traffic volumes.
2. Type I or II Barricades should be utilized to delineate the work area if service vehicle with high level flashing lights is not present.

TYPICAL APPLICATION

- Temporary repair of blow-ups

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Stationary Work 15 Minutes-2 Hours	2



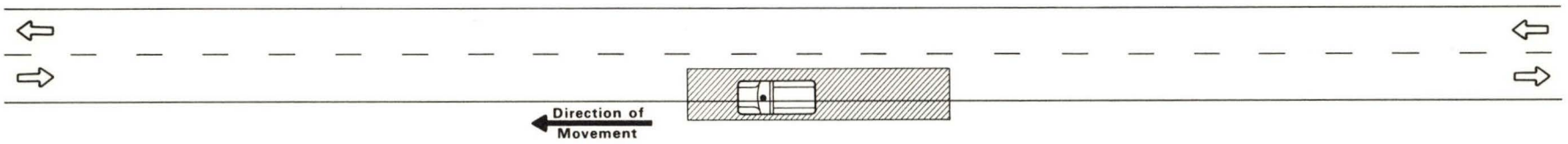
GENERAL NOTES

1. Flagman and Flagman Ahead sign may not be required on roads with good visibility and low traffic volumes.
2. If work area exceeds 100', two flagmen may be required
3. Taper on cones is minimum. Longer tapers should be considered with varying conditions.

TYPICAL APPLICATIONS

- Pavement patching
- Temporary repair of blow-ups

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Stationary Work Over 2 Hours	3



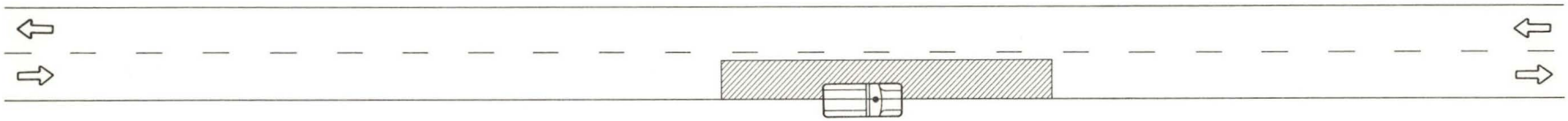
GENERAL NOTES

1. Flagman may be required in certain conditions.
2. Motorgraders with red flags and beacons may not require flagman.
3. Road Work Ahead Signs may be required for specific operations.

TYPICAL APPLICATIONS

- Edge rut repair
- Gravel replacement
- Ditch repair

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Slow Moving Work - Opposing Traffic Flow	4



GENERAL NOTE

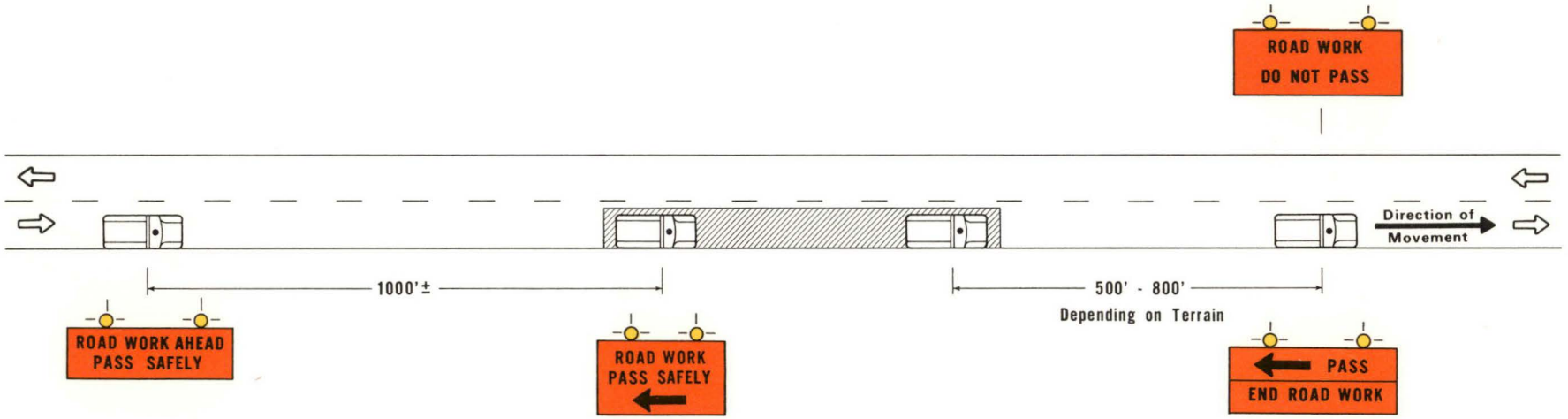
Road Grader shall have beacon above cab and appropriate red flags.

TYPICAL APPLICATIONS

- Blading gravel surface
- Ditch repair

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Fast Moving Work - Grader on Gravel Road	5

FRONT FACING SIGN



REAR FACING SIGNS

GENERAL NOTE

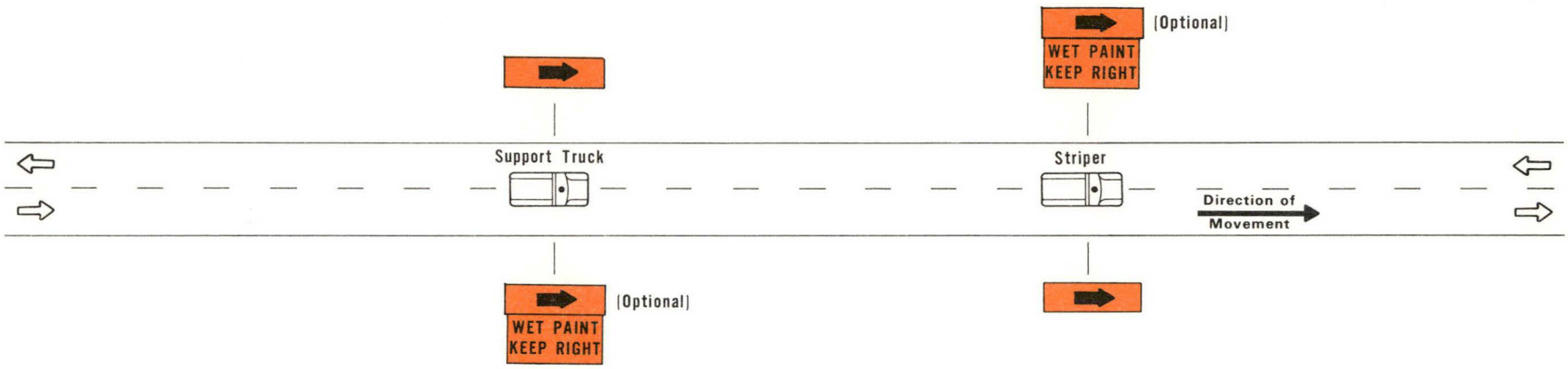
Front vehicle with signs may not be required where sight distance is good.

TYPICAL APPLICATION

- Edge rut filling

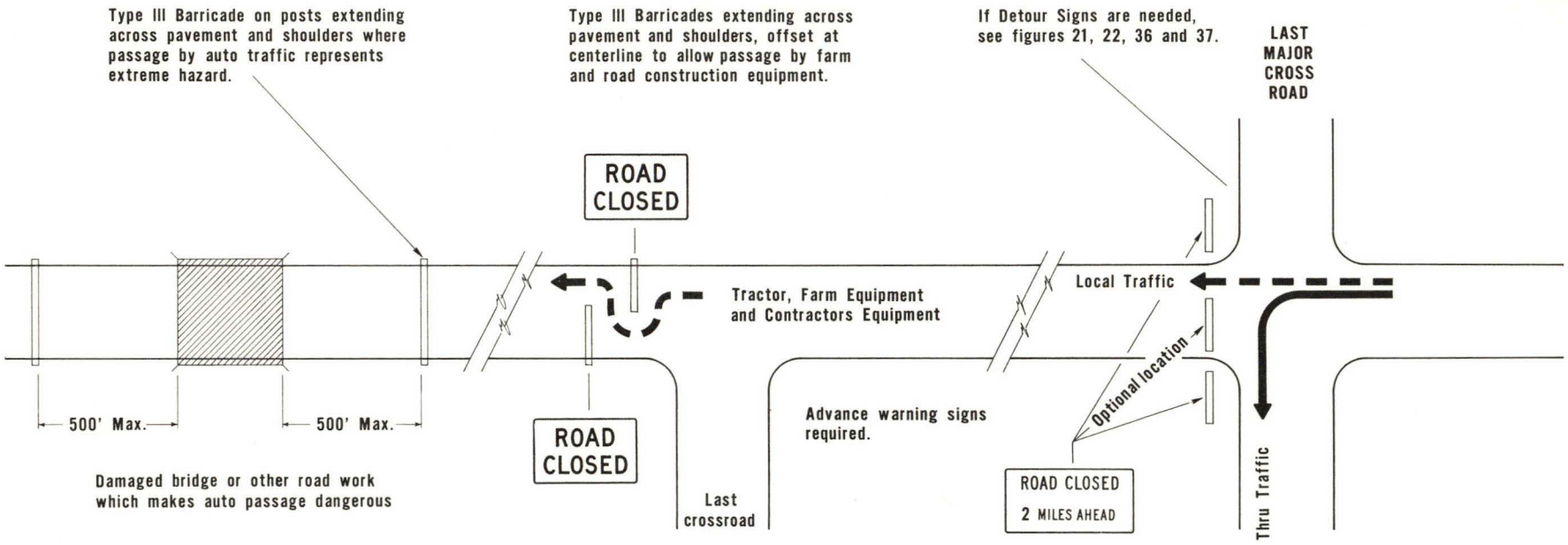
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Vehicle Convoy Work	6

FRONT FACING SIGNS



REAR FACING SIGNS

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Lane Closure	Fast Moving Work - Centerline Striping	7



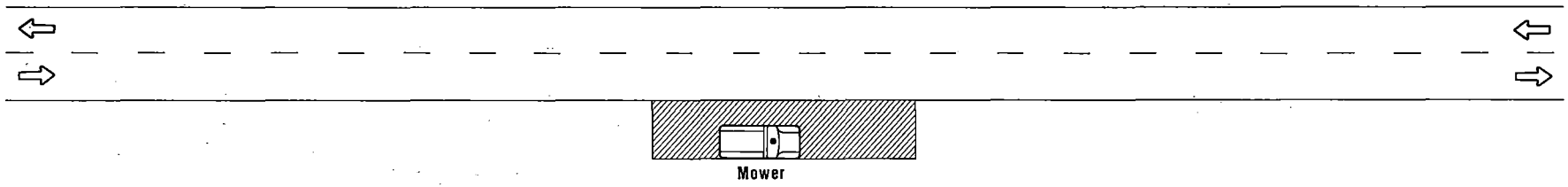
GENERAL NOTES

1. This signing is appropriate where an extreme hazard exists at some distance beyond where a road is closed to all traffic by portable barricades.
2. Signing shown for one direction of traffic only.
3. Barricades should be designed for two-way visibility where local traffic is maintained.
4. One or more amber flasher lights should normally be affixed to each barricade.

TYPICAL APPLICATIONS

- Major bridge repair
- Major washout
- Severe pavement failure

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Rural Local Road	Road Closure	Double Barricading for Extreme Hazards	8

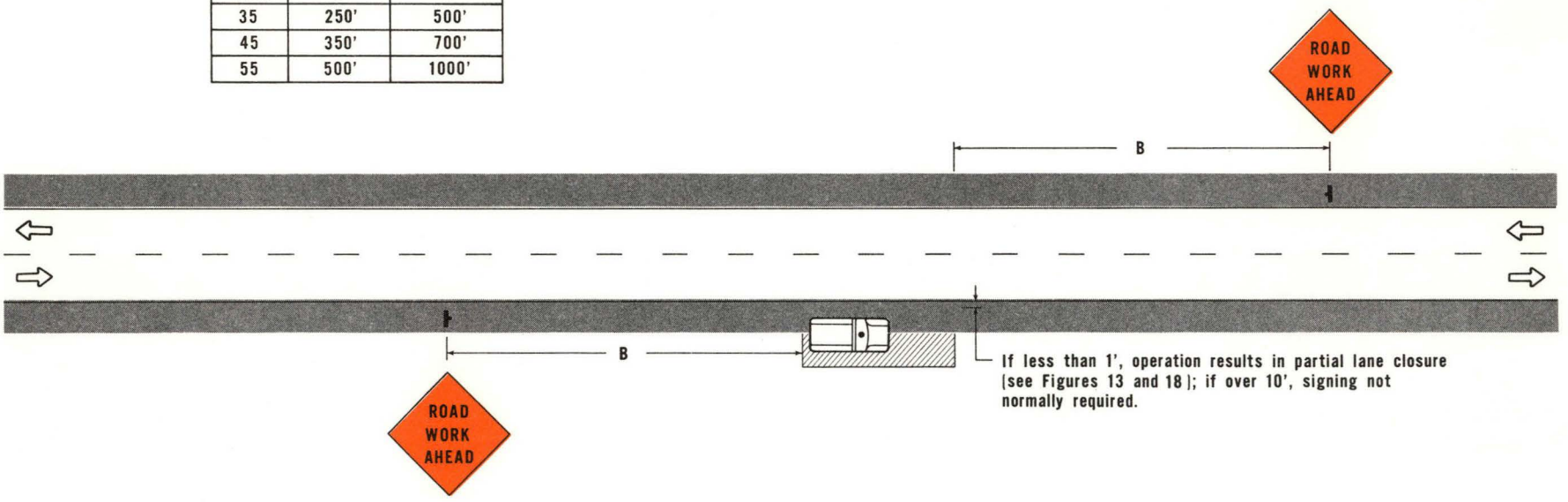


GENERAL NOTE

Mower shall be equiped with beacon and appropriate red flags.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two-Lane Highway	Roadside	Slow Moving Work - Roadside Mowing	9

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



GENERAL NOTES

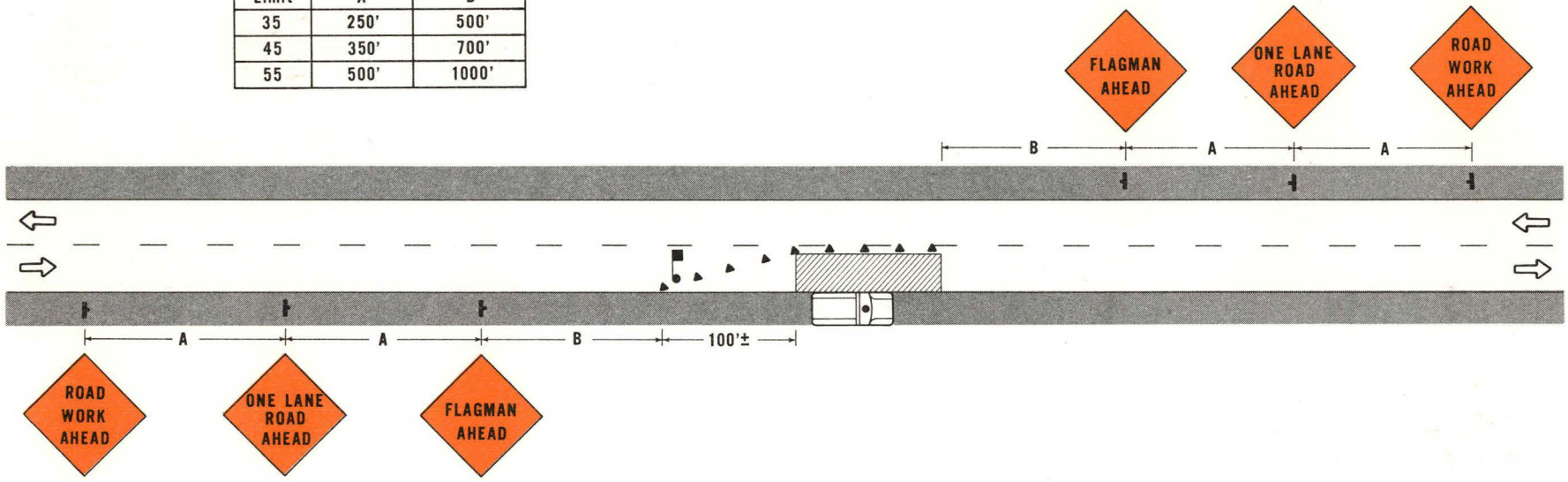
1. Conditions represented are for work which does not interfere with traffic but does result in men and equipment heing on the shoulder for more than a brief period.
2. No parking on opposite shoulder within 500 feet of work area.

TYPICAL APPLICATIONS

- Culvert work
- Shoulder work
- Utility operations
- Backslope repair
- Seeding and mulching
- Fertilizing
- Weed control

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Roadside	Stationary and Slow Moving Work	10

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



GENERAL NOTE

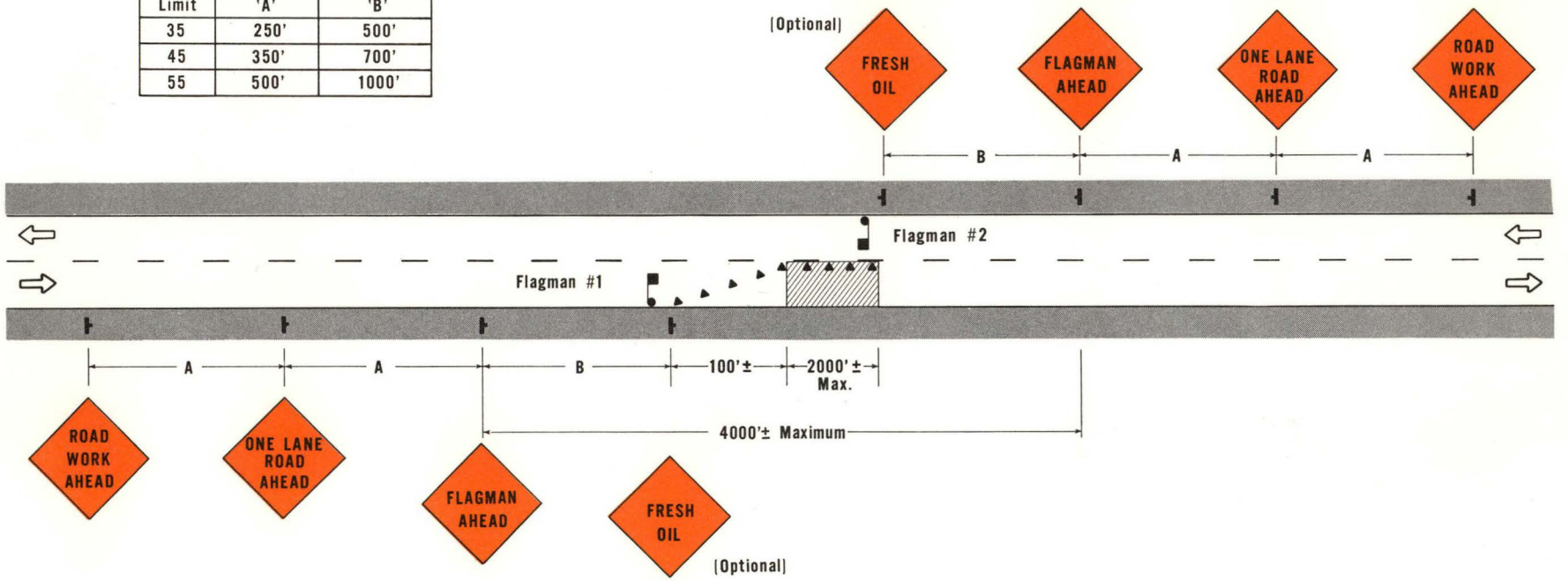
For high volume roads or for the work areas greater than 100' in length, two flagmen may be required.

TYPICAL APPLICATIONS

- Temporary repair of blow-up
- Pavement patching
- Seal coating
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Stationary Work 15 Minutes-2 Hours	11

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



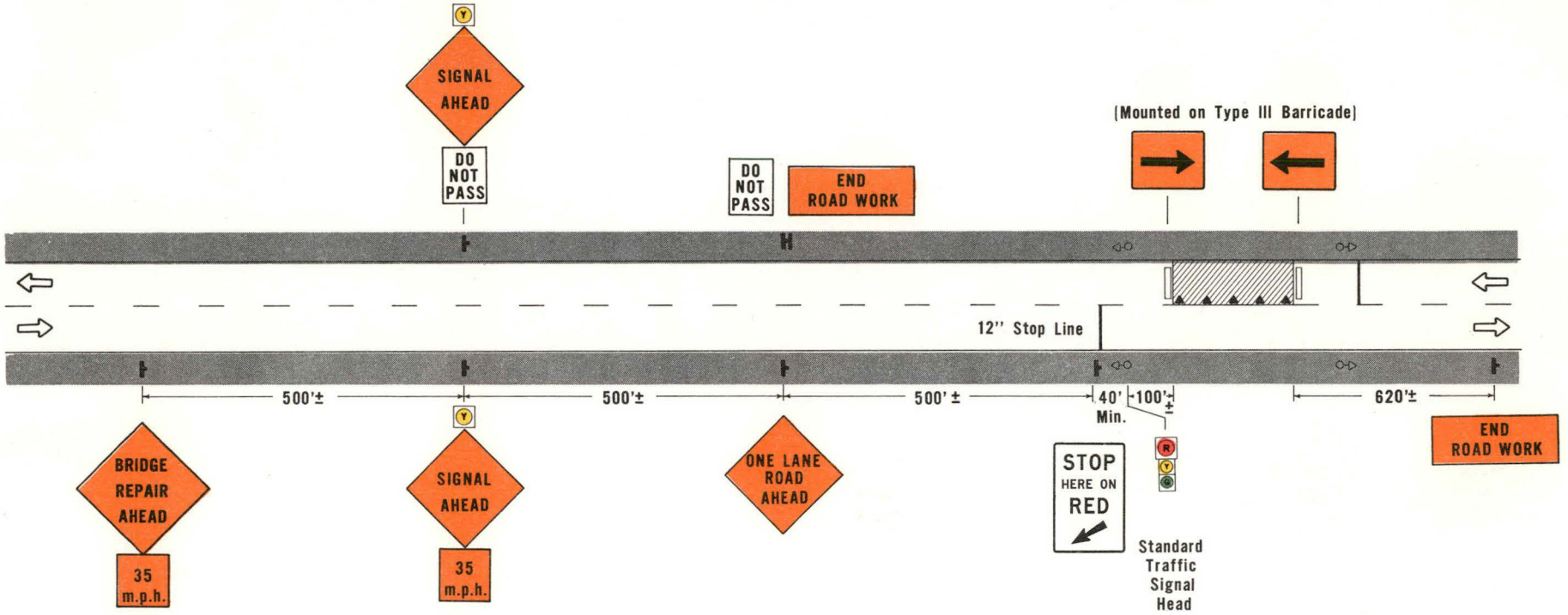
GENERAL NOTES

1. Flagman may not be required where work area is less than 100' long, daily traffic is less than 250 vehicles and visibility is good.
2. Whenever a lane must be taken out of service overnight, reflective channelizing devices must be used and roadway lighting, flashers or traffic signals may be required.
3. However, where lights are needed to delineate the traveled way through and around obstructions in a construction or maintenance area, the delineation shall be accomplished by use of steady burning lamps.

TYPICAL APPLICATIONS

- Seal coating
- Edge rut filling
- Pavement patching
- Temporary repair of blow-ups
- Slab replacement
- Bridge repair

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Stationary Work Over 2 Hours	12



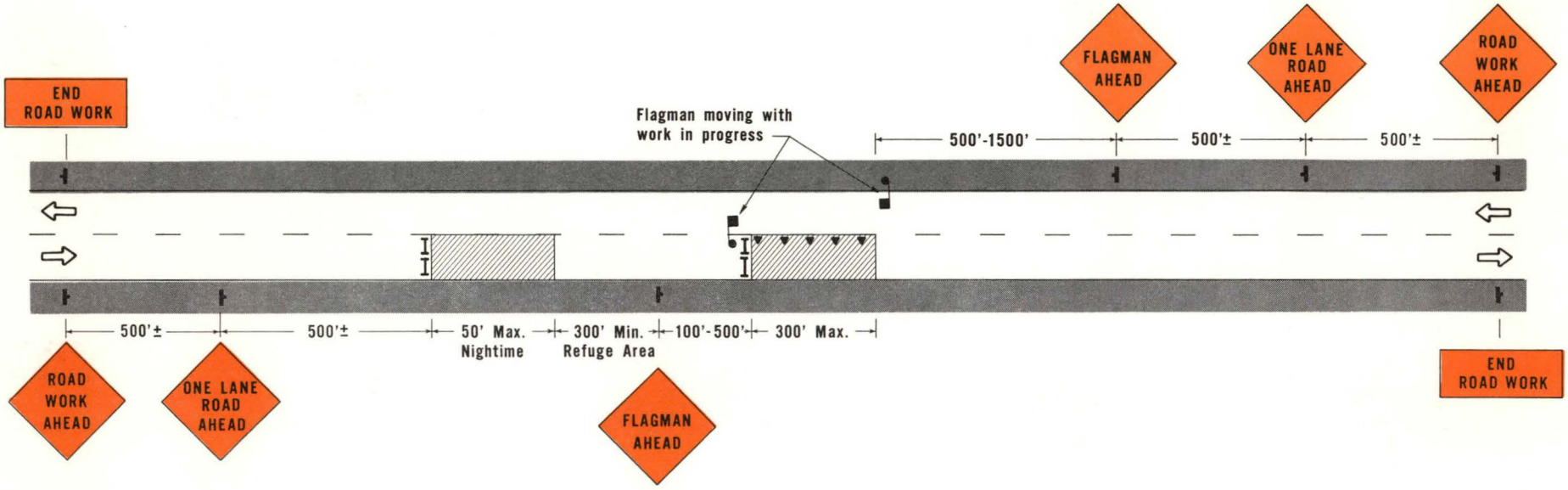
GENERAL NOTES

1. Control devices shown for one direction only.
2. Lighting may be required under certain conditions.
3. Distance between stop lines shall not exceed 680 feet and work area shall not exceed 400 feet.

TYPICAL APPLICATION

- Bridge repair

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Stationary Work Long - Term Time Period	13



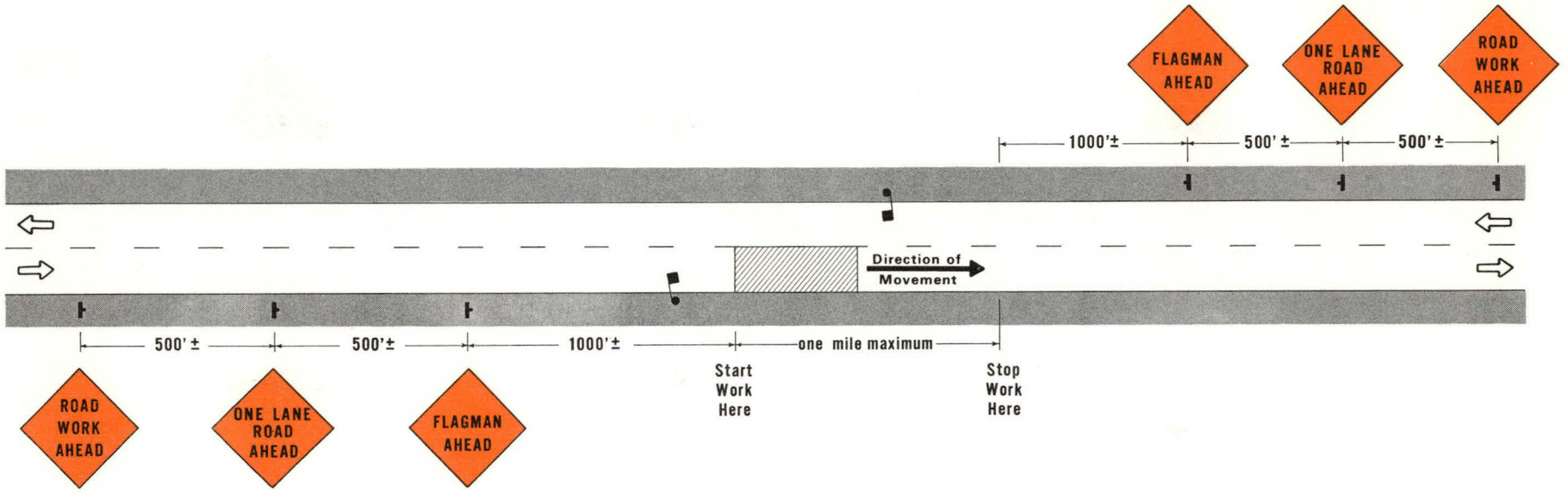
GENERAL NOTES

1. Flagman should be used where work is in progress or at open excavations.
2. Refuge areas shall be maintained between spot lane closures in order to maintain traffic flow through the work area.
3. At least one barricade should be placed at each patch, with a minimum of two when a lane is closed, although up to four barricades may be needed for large patches.

TYPICAL APPLICATION

- Pavement patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two-Lane Highway	Lane Closure	Slow Moving Operation with Intermittent Lane Closures	14



GENERAL NOTES

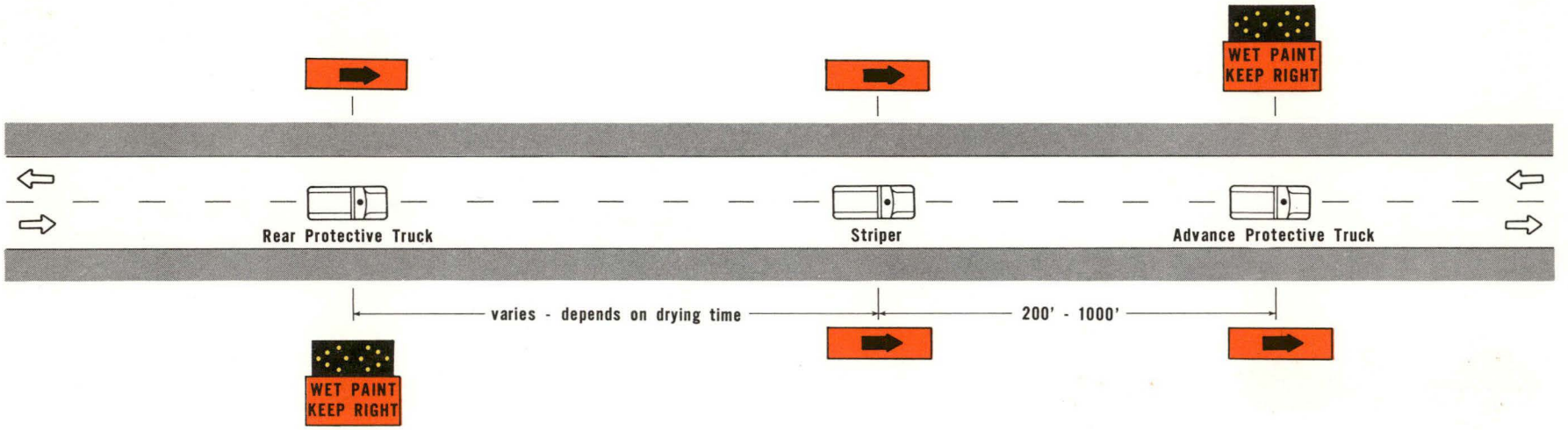
1. Where work area is less than 100' long, daily traffic is less than 400 vehicles, and visibility is good, only one flagman is normally required.
2. Where only a small portion of the lane is blocked by the moving operation ,only one flagman is normally required.
3. Signs should normally be moved at least once every four hours or when work area exceeds one mile.

TYPICAL APPLICATIONS

- Crack filling
- Edge rut repair
- Pavement patching
- Resurfacing

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Slow Moving Work	15

FRONT FACING SIGNS



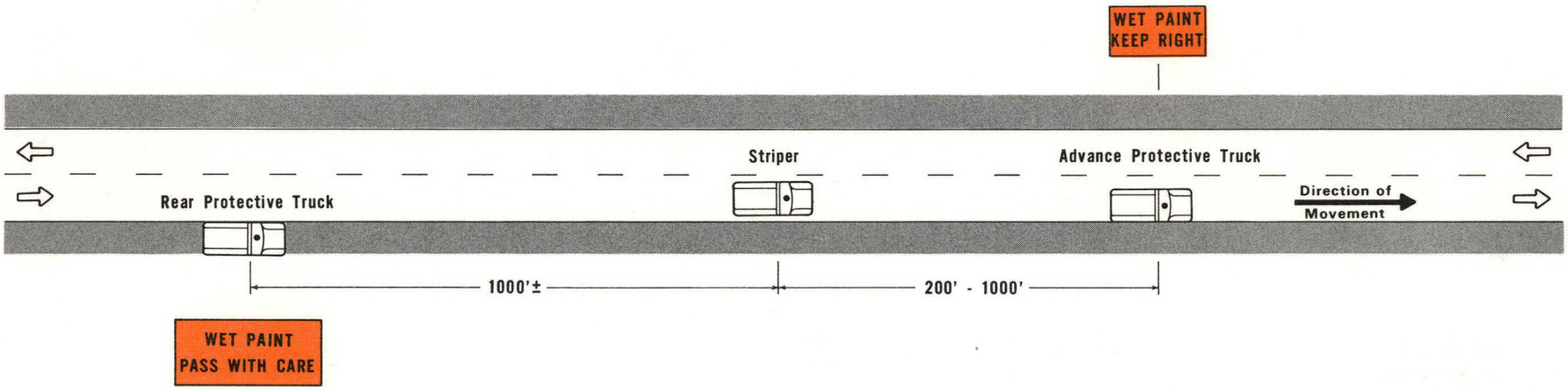
REAR FACING SIGNS

GENERAL NOTES

1. Rear protective truck should be positioned at transition point between wet and dry paint.
2. Advance Protection Truck may be sweeper.
3. One or two flagmen may be needed at primary road junctions.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two-Lane Highway	Lane Closure	Fast Moving-Centerline Striping	16

FRONT FACING SIGN



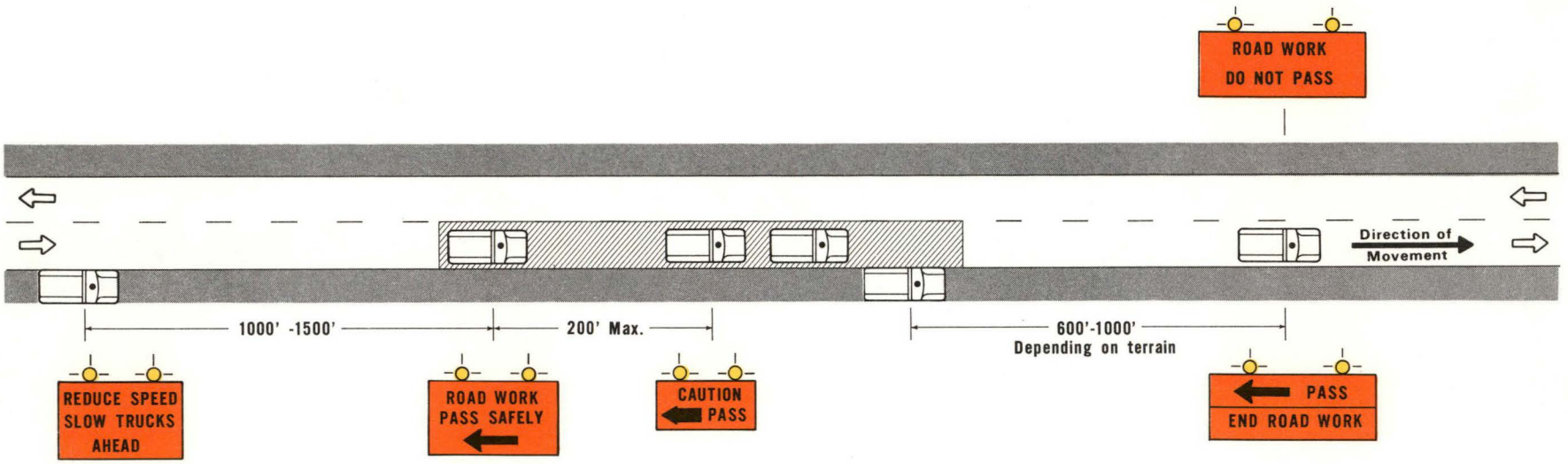
REAR FACING SIGN

GENERAL NOTES

1. Advance protective truck may be sweeper.
2. One or two flagmen may be needed at primary road junctions.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Fast Moving Work - Edge Line Striping	17

FRONT FACING SIGN



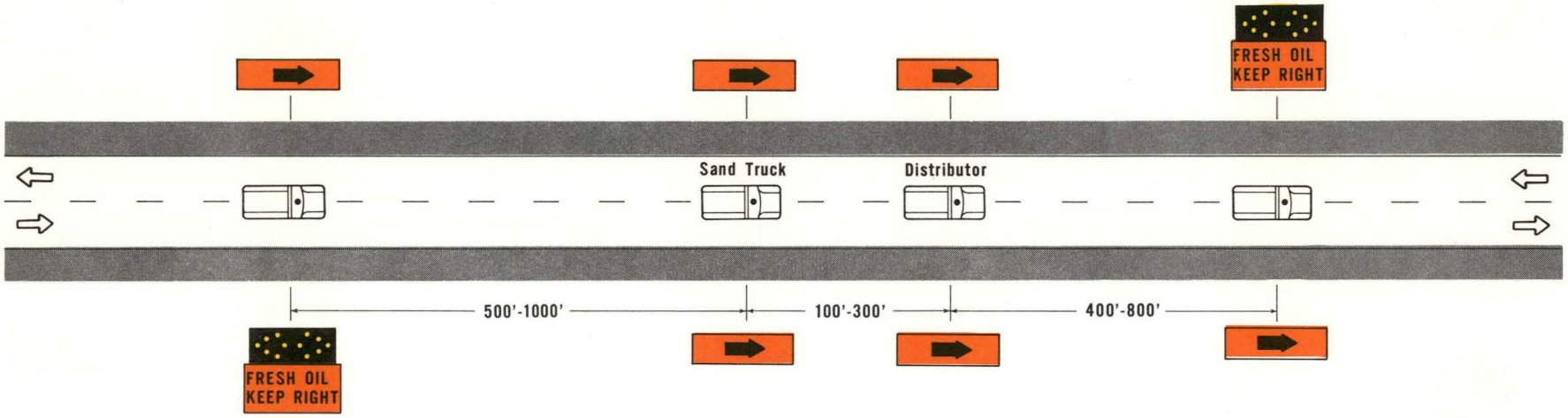
REAR FACING SIGNS

TYPICAL APPLICATIONS

- Edge rut filling
- Fertilizing
- Weed control

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two-Lane Highway	Lane Closure	Vehicle Convoy Work	18

FRONT FACING SIGNS

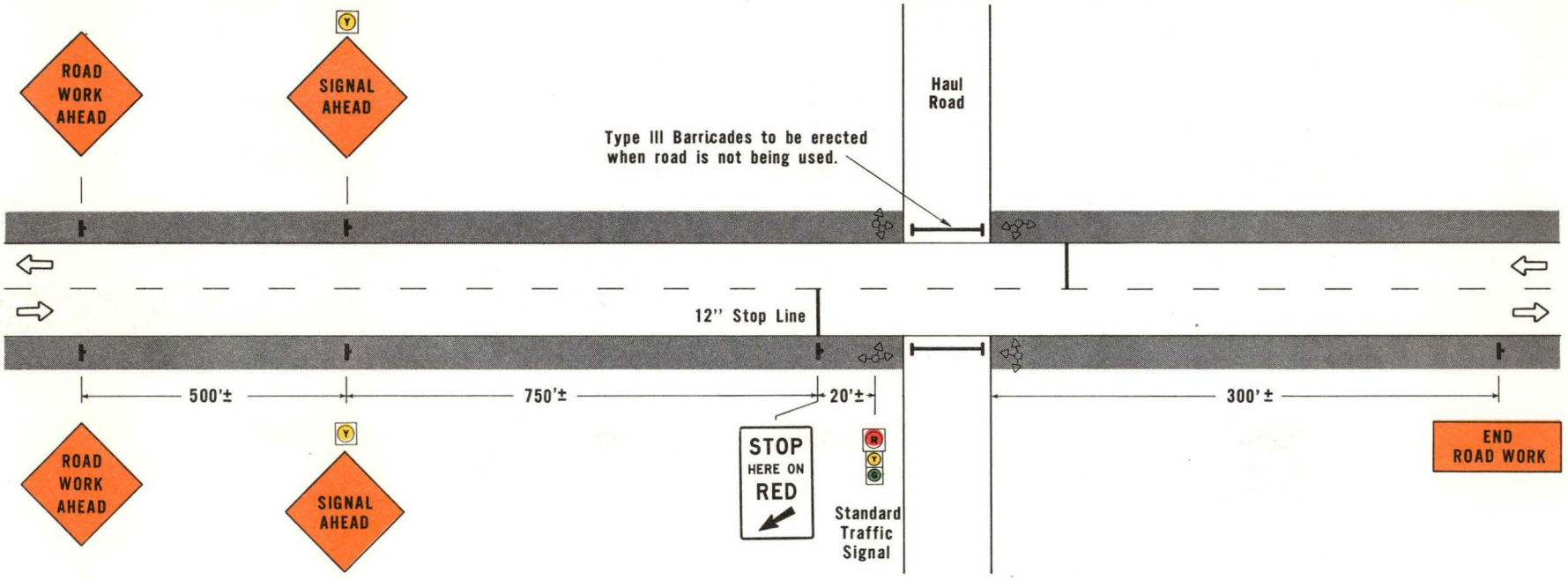


REAR FACING SIGNS

GENERAL NOTE

Distance between vehicles depends on sight distance, speed and volume of traffic on the road.

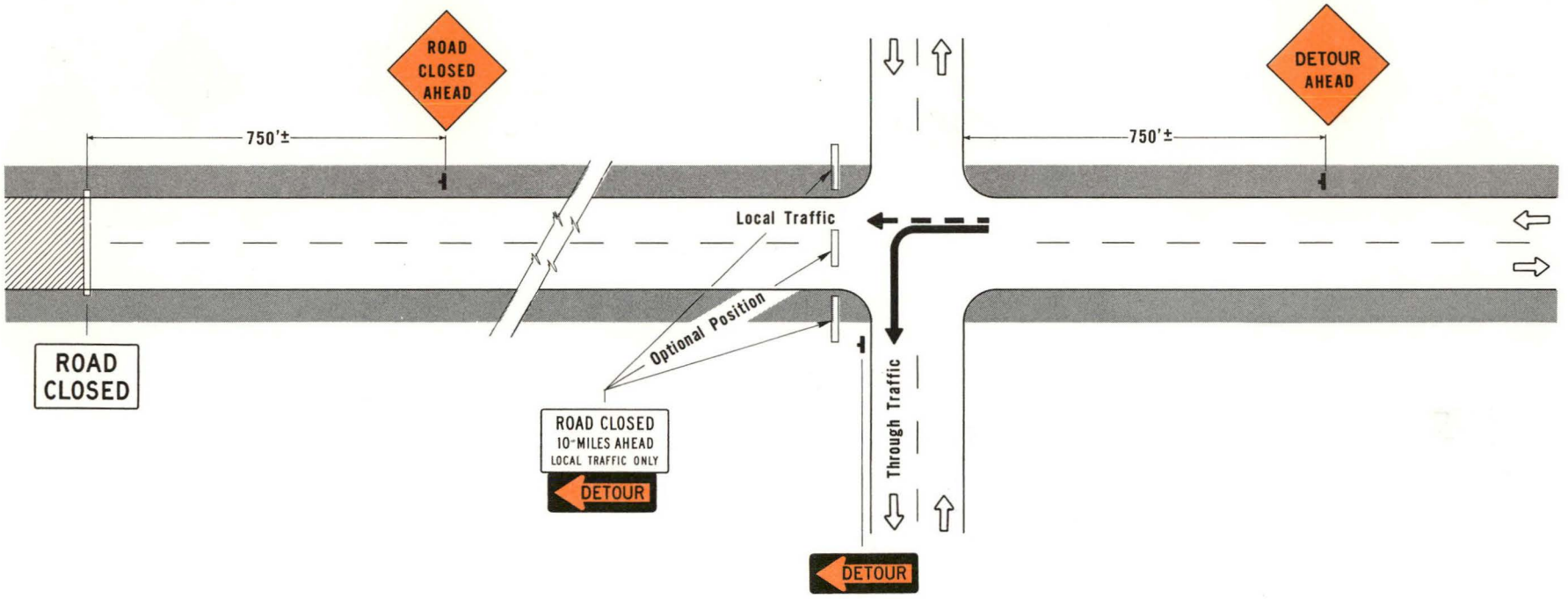
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Lane Closure	Vehicle Convoy Work - Centerline Strip Sealing	19



GENERAL NOTES

1. Control devices shown for one direction only.
2. Lighting may be required under certain conditions.
3. Signals shall be actuated and shall be placed so as to show a near-right, far right and far-left indication and near-left indication for the haul road and the highway.
4. If highway is four or more lanes, mast arm mounted signals shall supplement highway signal idications.

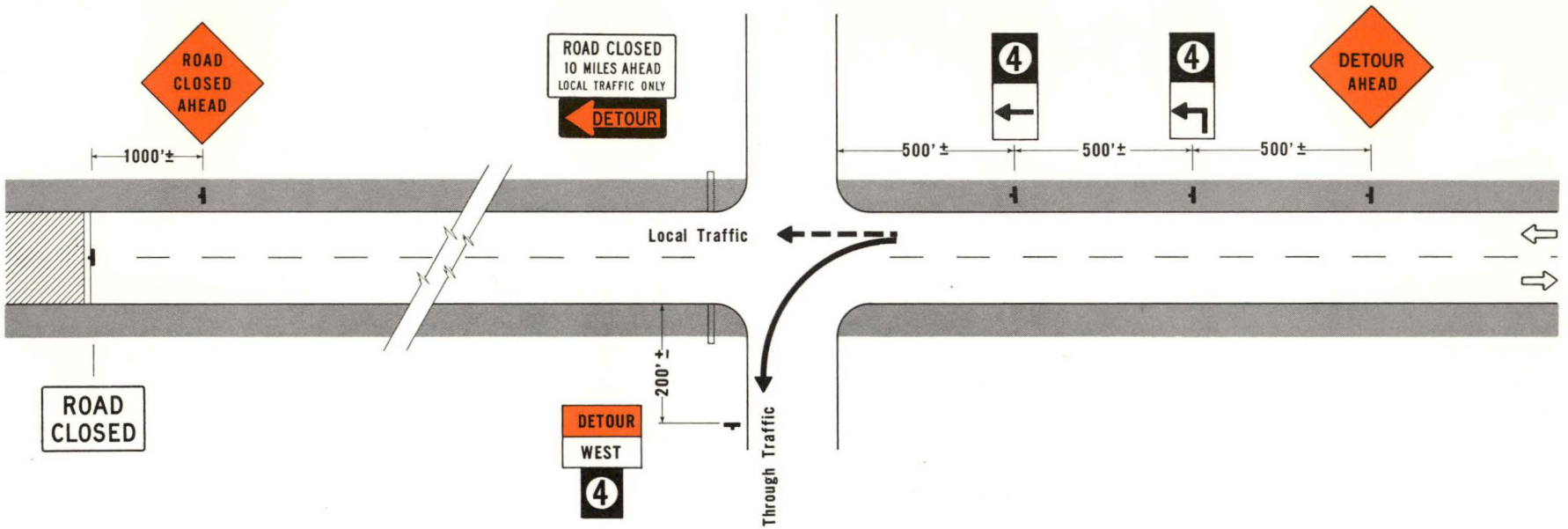
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Road Closure	Intermittent Closure Haul Road Crossing	20



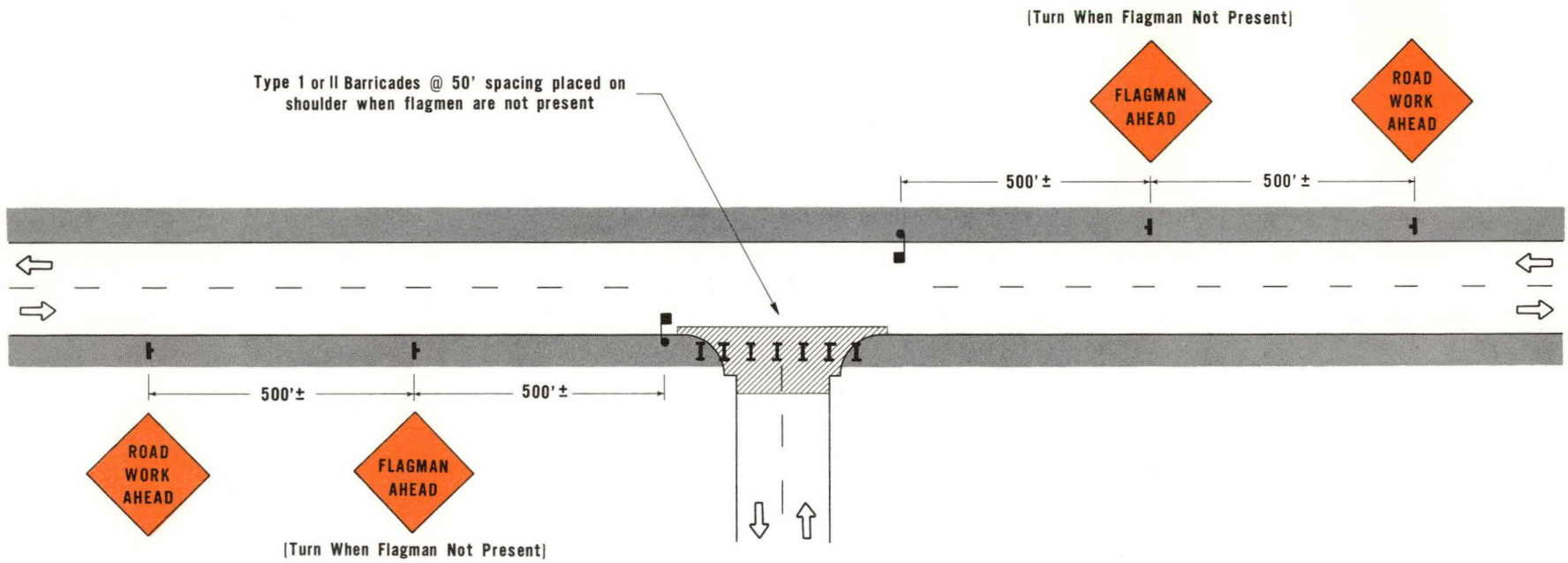
GENERAL NOTE

Regulatory devices may need to be altered along the detour route during the detour period.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Road Closure	Detour for Unnumbered Routes	21



ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Road Closure	Detour for Numbered Routes	22



GENERAL NOTES

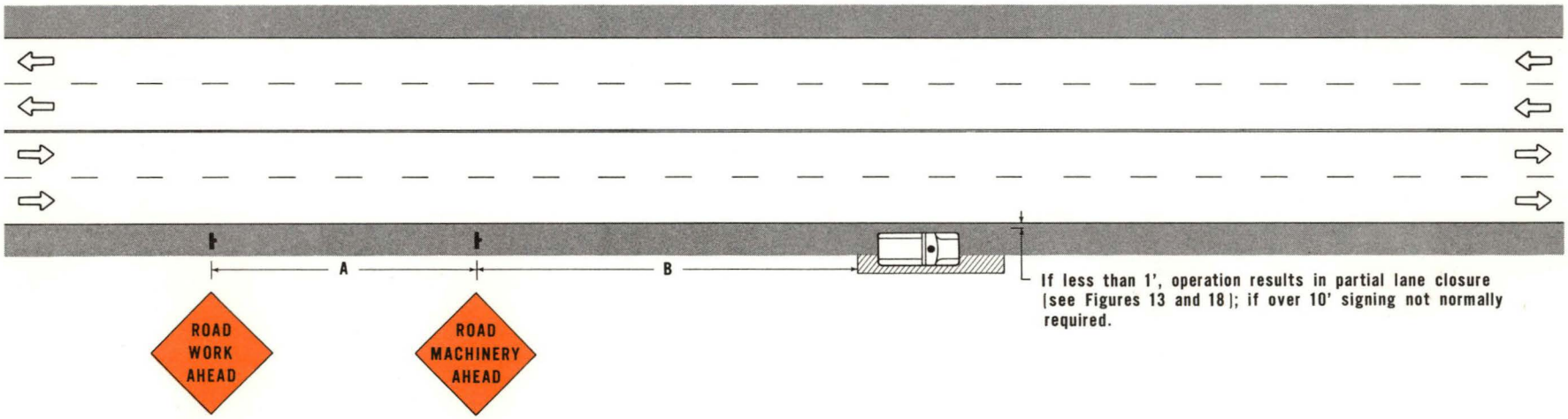
1. Flagmen and signs required when working within 10' of pavement.
2. Steady burning lights may be attached to the Type 1 or II Barricades at night or in periods of poor visibility.

TYPICAL APPLICATIONS

- Construction of new secondary road
- Improving the approach of the secondary road in any manner

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Two Lane Highway	Intersection	Construction at Intersection with Minor Roadway	23

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



GENERAL NOTE

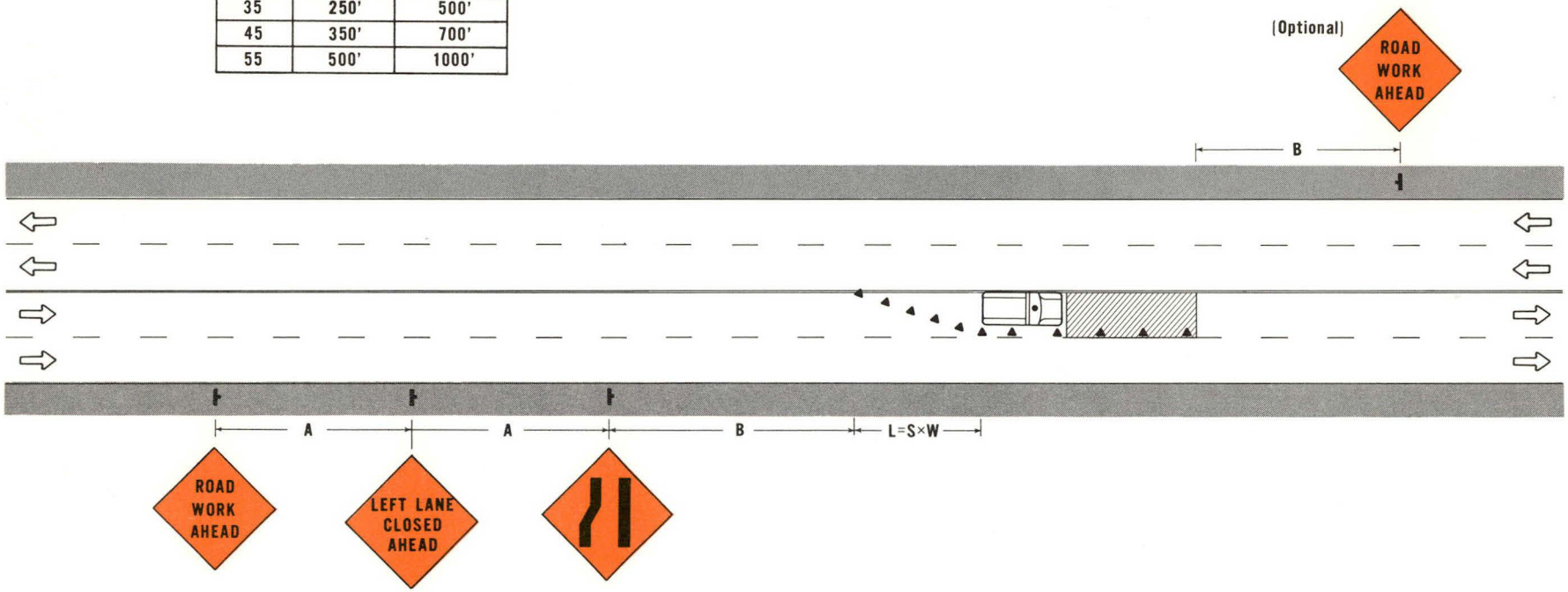
For Slow Moving operations, Dimension "B" can be extended up to a maximum of one mile or the distance covered in four hours, whichever is less.

TYPICAL APPLICATIONS

- Culvert work
- Shoulder work
- Utility operations
- Backslope repair
- Seeding and mulching
- Fertilizing
- Weed control

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Roadside	Stationary and Slow Moving Work	24

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



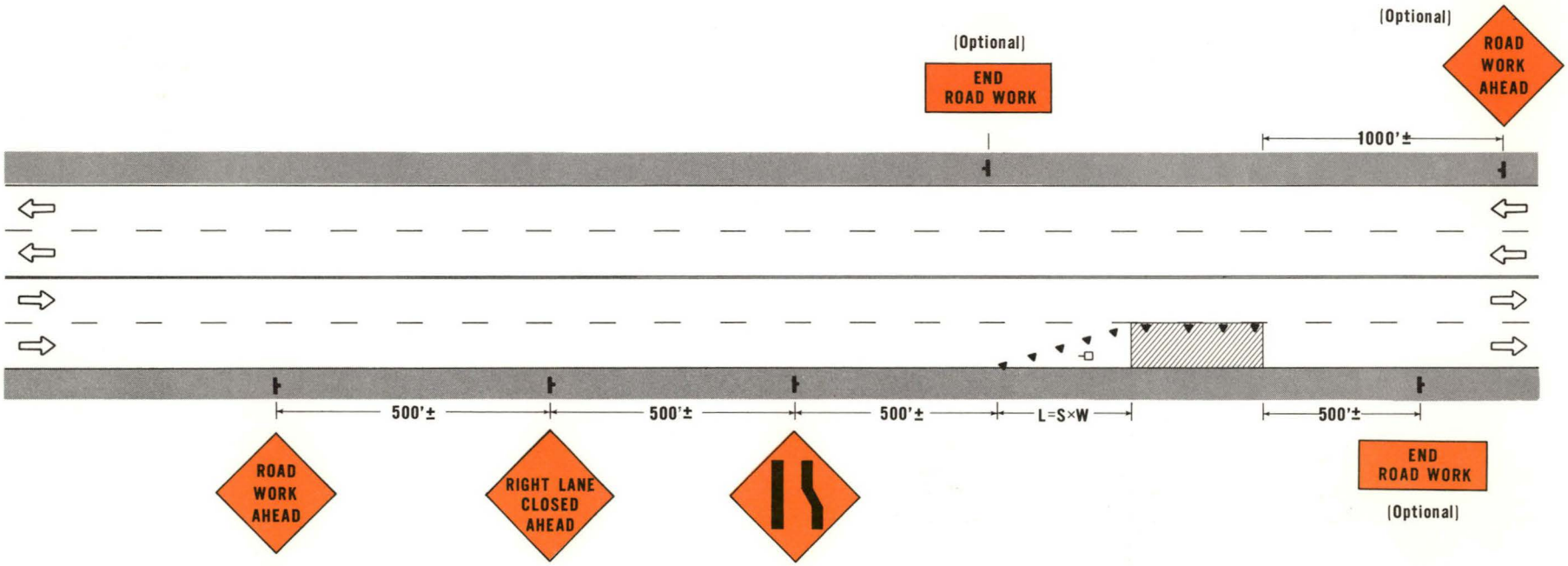
GENERAL NOTES

1. Cones may be required on the centerline of high volume highways or where the work area is greater than 100' in length.
2. "Road Work Ahead" sign may not be required for opposing lanes when roadwork is in the shoulder lane.

TYPICAL APPLICATIONS

- Temporary repair of blow-ups
- Pavement patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Stationary Work 15 Minutes-2 Hours	25

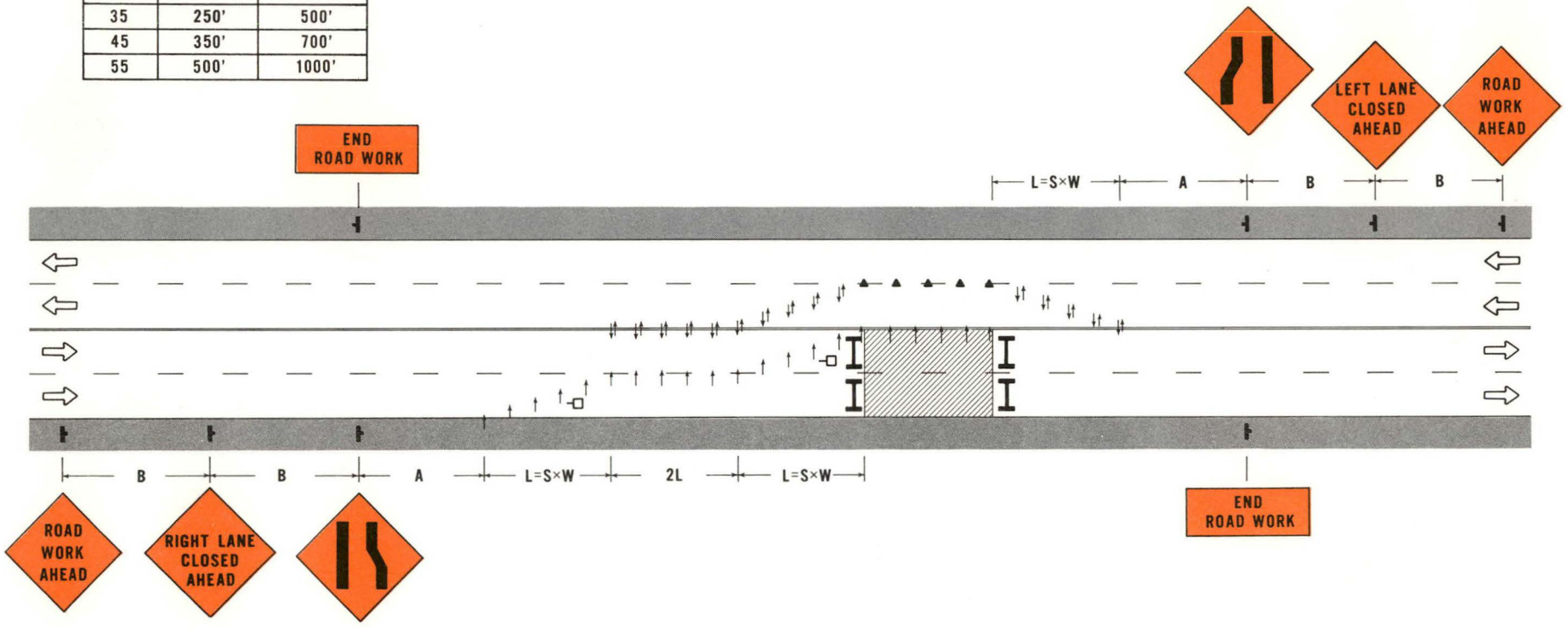


TYPICAL APPLICATIONS

- Temporary repair of blow-ups
- Seal coating
- Pavement patching
- Utility operations
- Mud pumping

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Stationary Work Over 2 hours	26

Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	250'	500'
45	350'	700'
55	500'	1000'



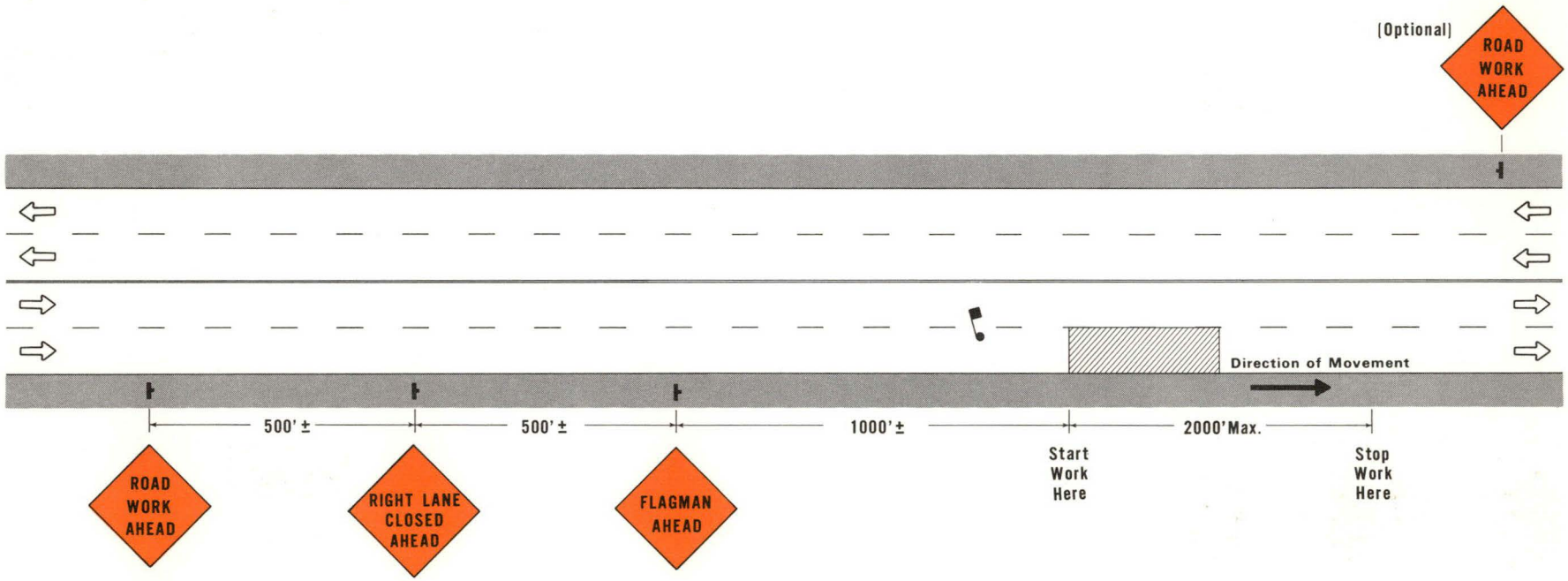
GENERAL NOTES

1. Permanent barricades with arrow boards shall be used where it is necessary to close both lanes for several days.
2. Use steady burning lights on Class II barricades for delineation at night.
3. Advisory speed signs on the advance signs are recommended.

TYPICAL APPLICATIONS

- Bridge repair
- Concrete replacement
- Asphaltic concrete overlay
- Seal coating
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Stationary Work-Two Lanes Closed over 2 hours	27



GENERAL NOTES

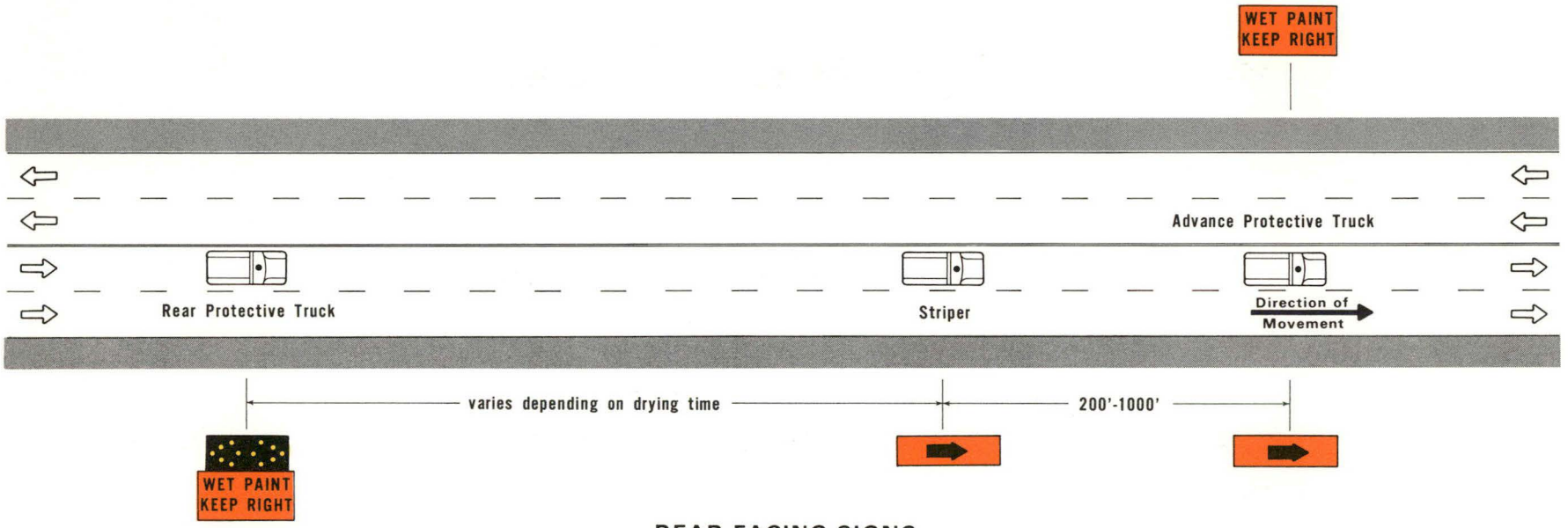
1. "Left" plate used on signs when work is performed on the inside lane.
2. Signs should normally be moved at least once every four hours or when work exceeds 2000'.
3. An electric arrow sign may be used in place of the flagman.

TYPICAL APPLICATION

- Crack filling
- Edge rut repair
- Pavement patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Slow Moving Work	28

FRONT FACING SIGN



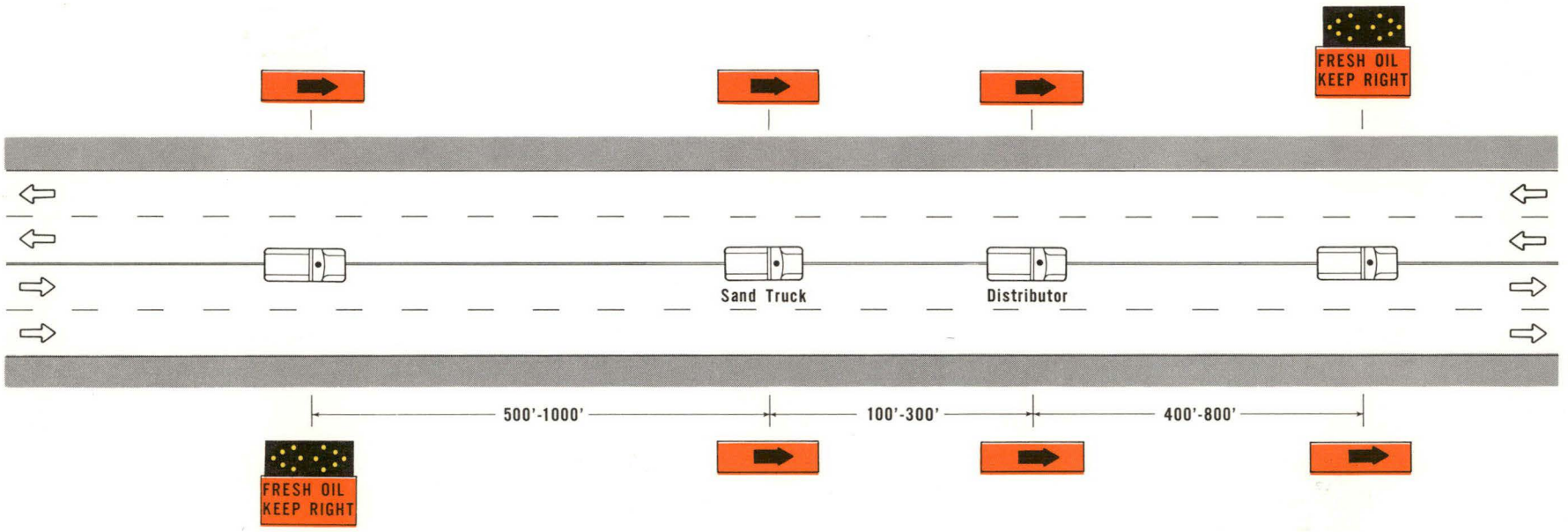
REAR FACING SIGNS

GENERAL NOTE

Operations on inside lane depicted. For operations on outside lane, front facing signs are not required, direct traffic to left of striper

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Fast Moving Work-Center and Lane Line Striping	29

FRONT FACING SIGNS



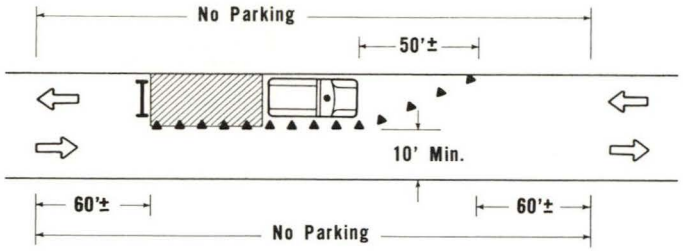
REAR FACING SIGNS

GENERAL NOTE

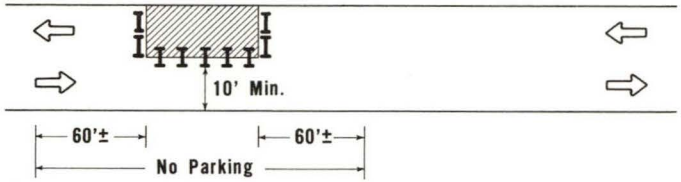
Distance between vehicles depends on sight distance, speed and volume of traffic on the road.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Undivided Multilane Highway	Lane Closure	Vehicle Convoy Work - Centerline Strip Sealing	30

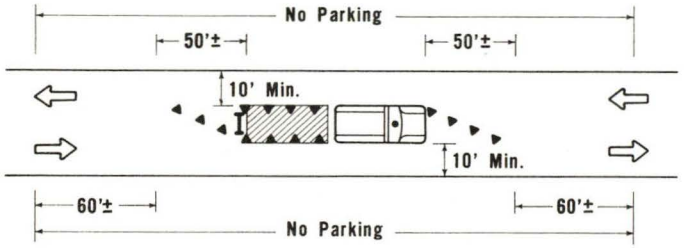
DAYTIME, WORK IN PROGRESS

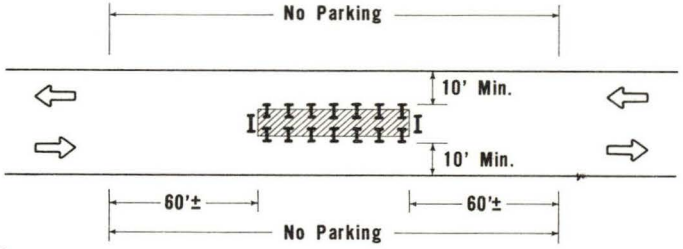


NIGHT TIME, WORK NOT IN PROGRESS



a] Work area on one side of street





b] Work area in center of street

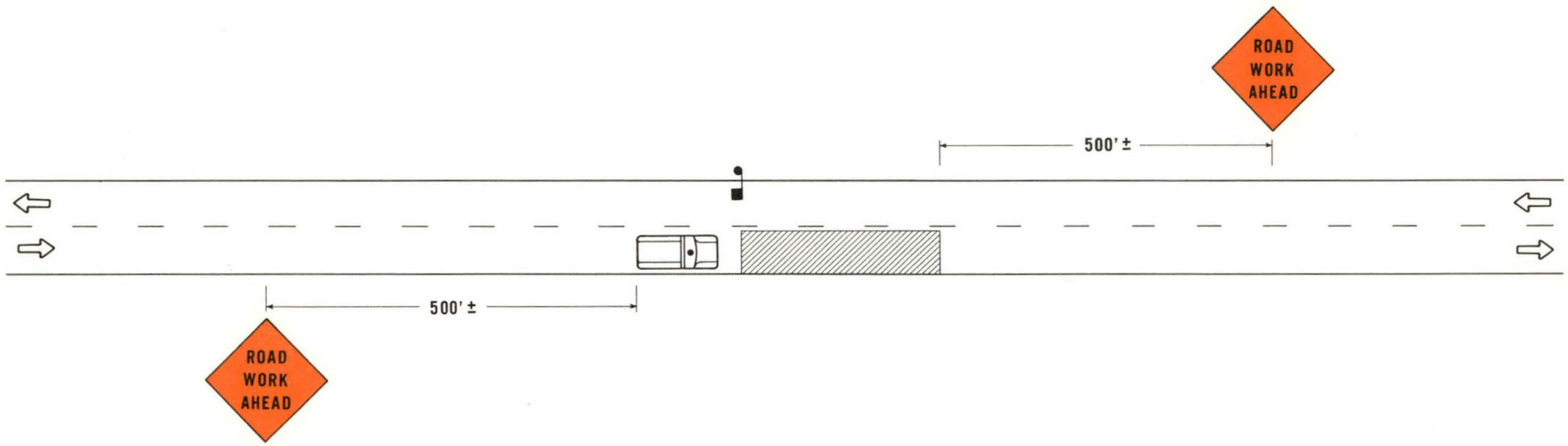
GENERAL NOTE

One barricade is normally adequate for minor pavement repair.

TYPICAL APPLICATIONS

- Pavement patching
- Utility operations
- Seal coating

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Residential Street	Lane Closure	Stationary Work Over 2 Hours	31



GENERAL NOTES

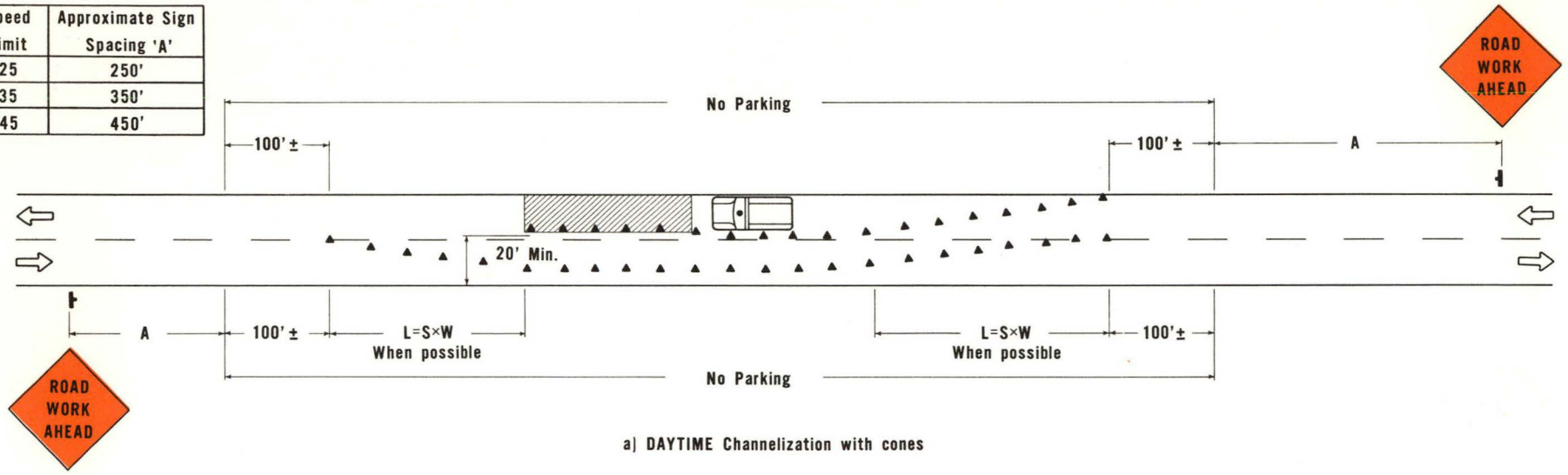
1. For heavy traffic conditions or limited sight distance, two flagmen may be required.
2. Flagmen may not be required on residential streets.

TYPICAL APPLICATIONS

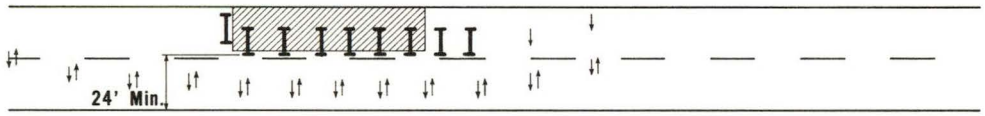
- Temporary repair of blow-ups
- Snow removal from bridges
- Pavement patching
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two Lane Street	Lane Closure	Stationary Work 15 Minutes-2 Hours	32

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



a) DAYTIME Channelization with cones



b) NIGHT TIME Channelization with arrow boards or other approved channelizing devices plus advance signing used in daytime.

GENERAL NOTES

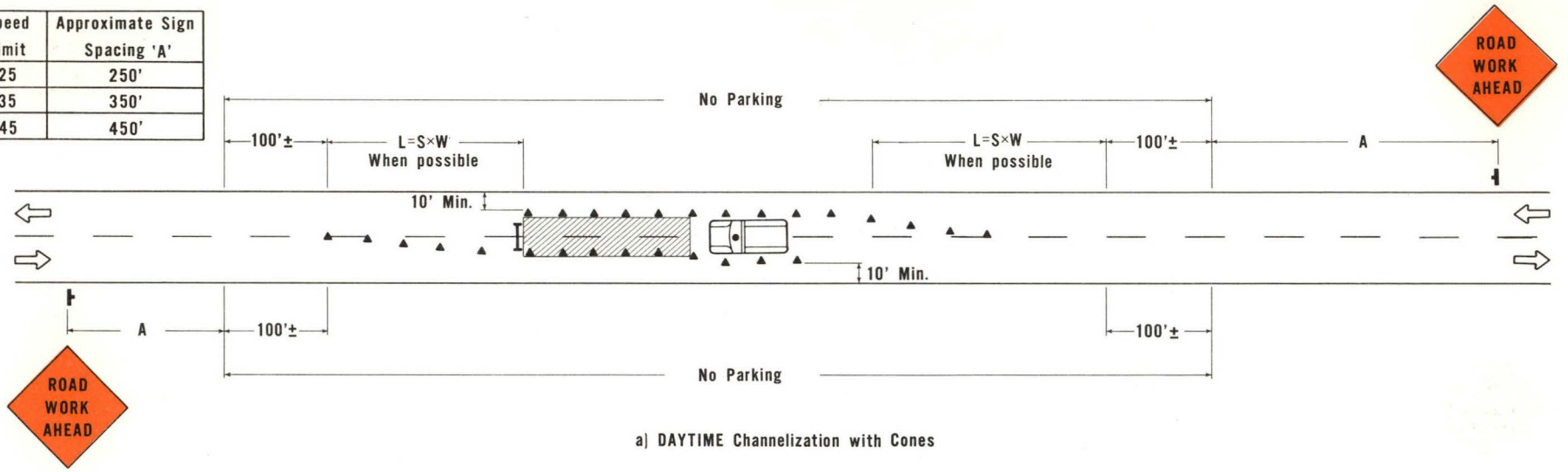
1. If minimum lateral clearances between work area and opposite curb cannot be achieved, one or both directions of traffic must be detoured. See Figures 21, 22, 36 and 37.
2. Cones can be used at night if adequate lighting is available.

TYPICAL APPLICATIONS

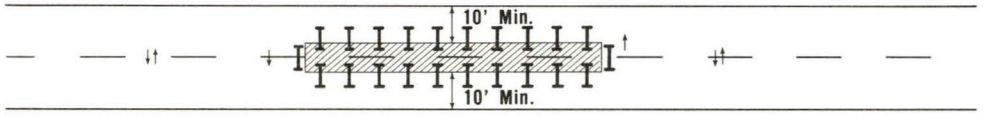
- Pavement patching
- Seal coating
- Utility operations
- Temporary repair of blow-ups

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two Lane Street	Lane Closure	Stationary Work - Curb Lane Closed Over 2 hours	33

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



a] DAYTIME Channelization with Cones



b] NIGHT TIME Channelization with Arrow Boards or other approved channelizing devices plus advance signing used in daytime.

GENERAL NOTES

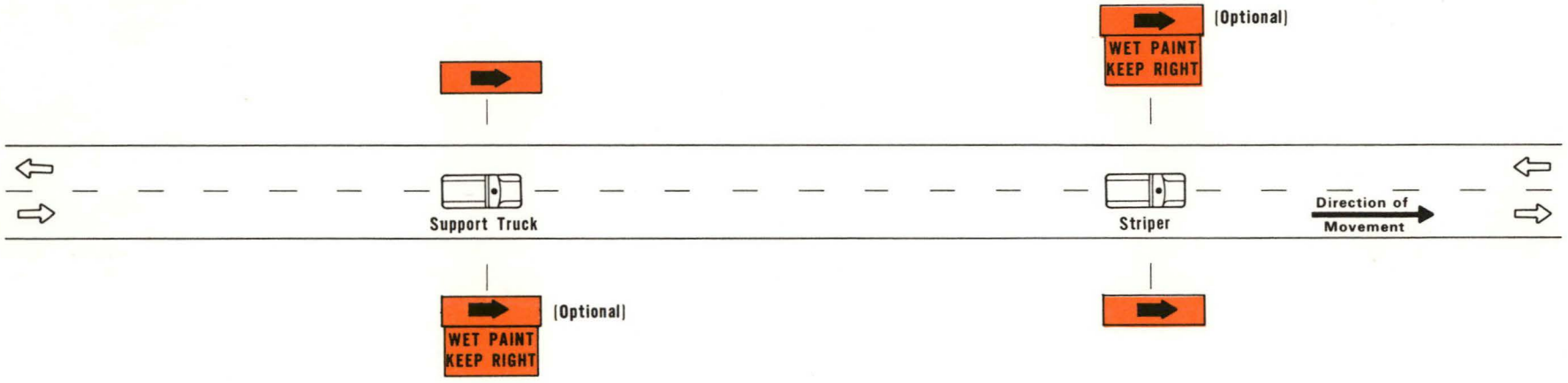
1. If lateral clearances indicated cannot be achieved, one or both directions of traffic should be detoured. See Figures 21, 22, 36 and 37.
2. Cones can be used at night if adequate lighting is available.

TYPICAL APPLICATIONS

- Pavement patching
- Seal coating
- Utility operations
- Temporary repair of blow-ups

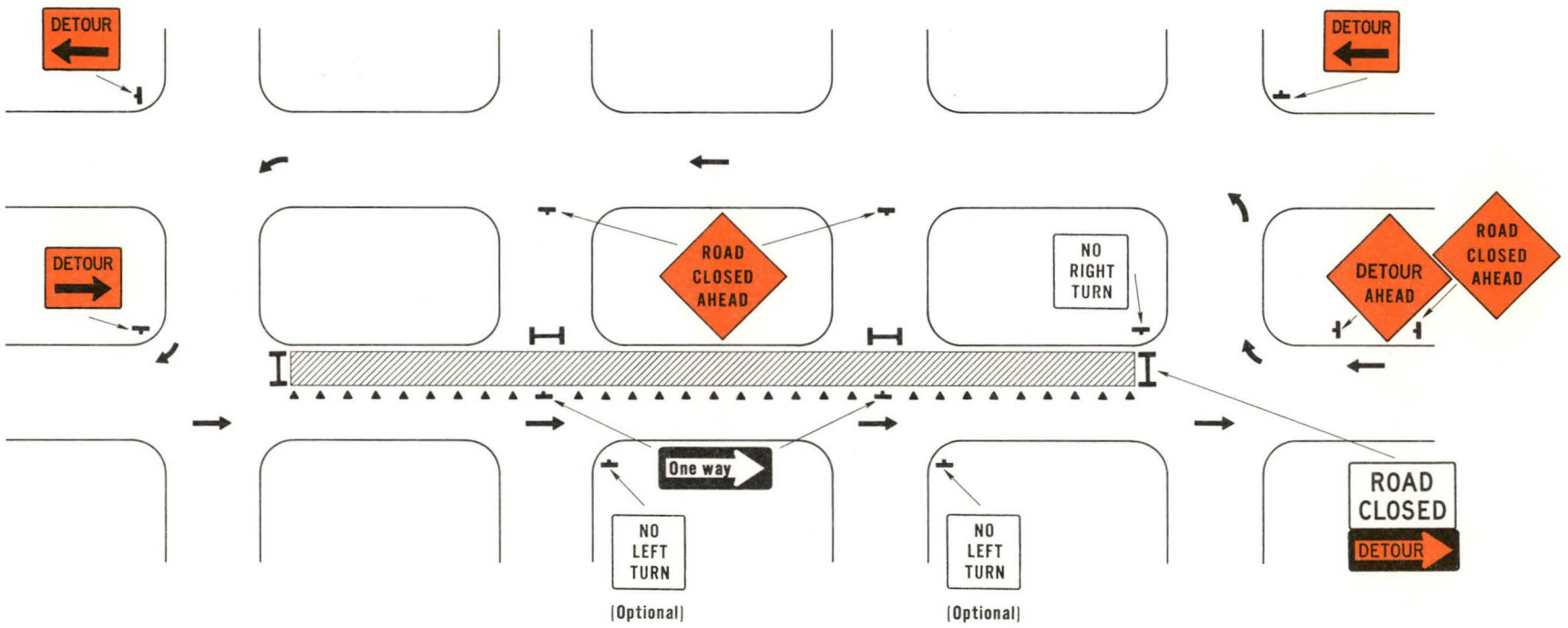
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two Lane Street	Lane Closure	Stationary Work-Center of Street Over 2 Hours	34

FRONT FACING SIGNS



REAR FACING SIGNS

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two-Lane Street	Lane Closure	Fast Moving Work-Centerline Striping	35



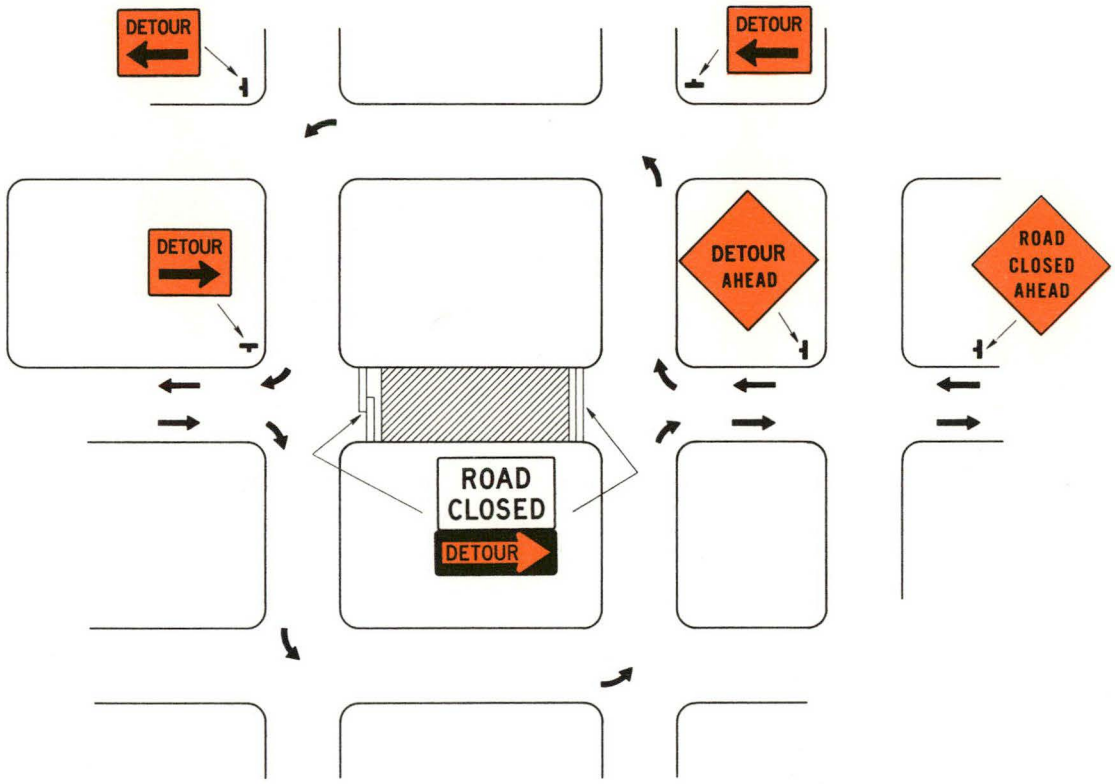
GENERAL NOTE

Stop signs and other traffic control devices may need to be modified along the detour route.

TYPICAL APPLICATIONS

- Street rebuild
- Major utility operation

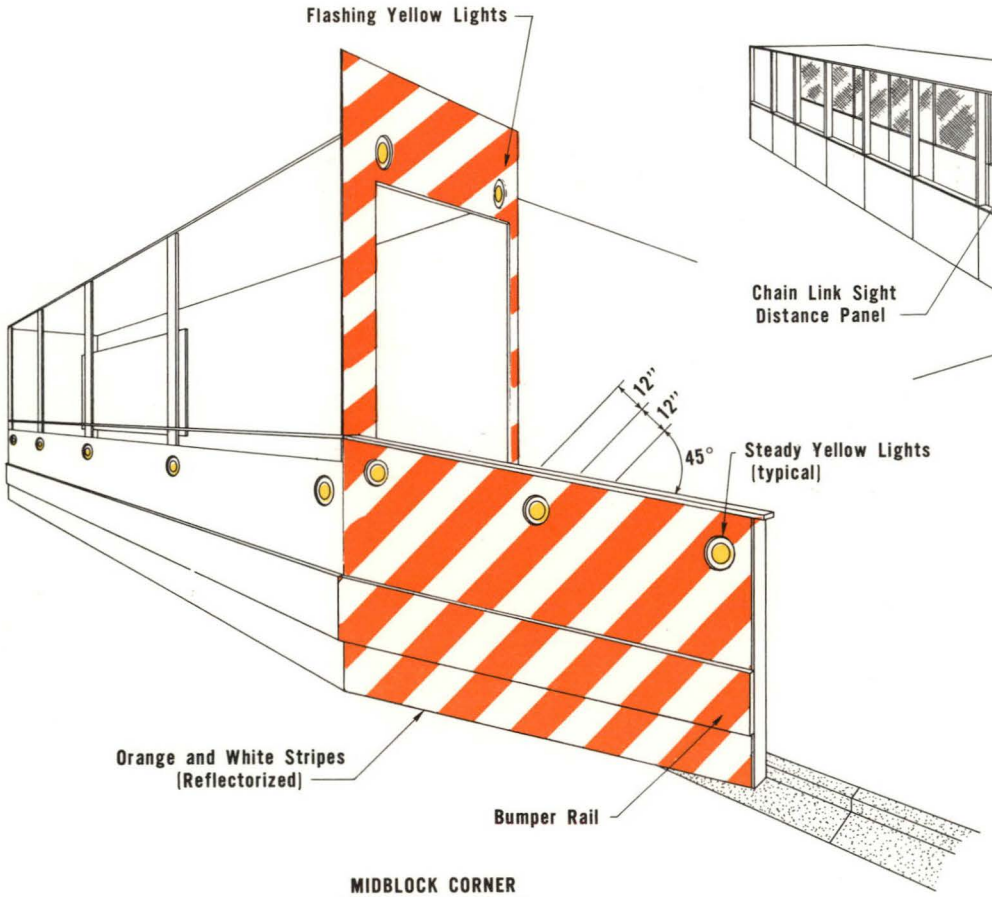
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two Lane Street	Road Closure	Closure of Street to One Direction of Travel	36



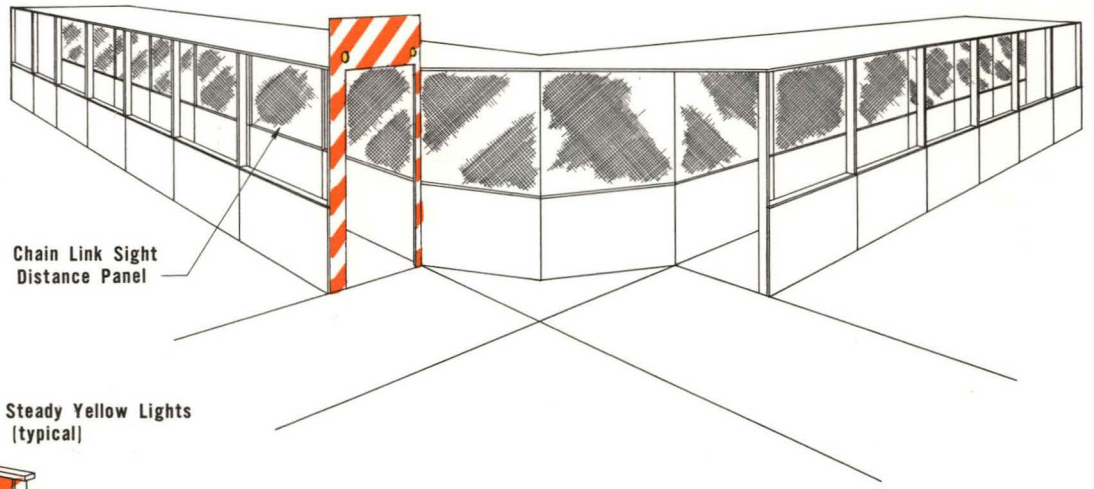
GENERAL NOTES

1. Only one direction of flow shown.
2. Stop signs and other traffic control devices may need to be modified along the detour routes.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Two Lane Street	Road Closure	Detour Signing Patterns	37



MIDBLOCK CORNER

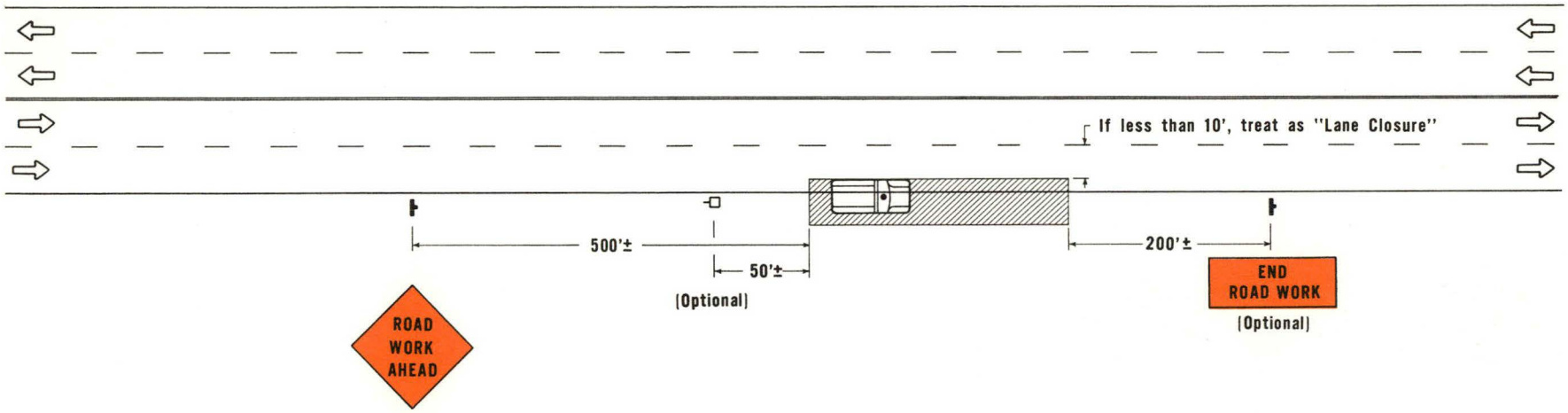


CANOPIED CONSTRUCTION SIDEWALK

GENERAL NOTE

Same design to be used on Urban Multilane Street

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Pedestrian Protection	Urban Two Lane Street	Canopied Construction Sidewalk	38



GENERAL NOTES

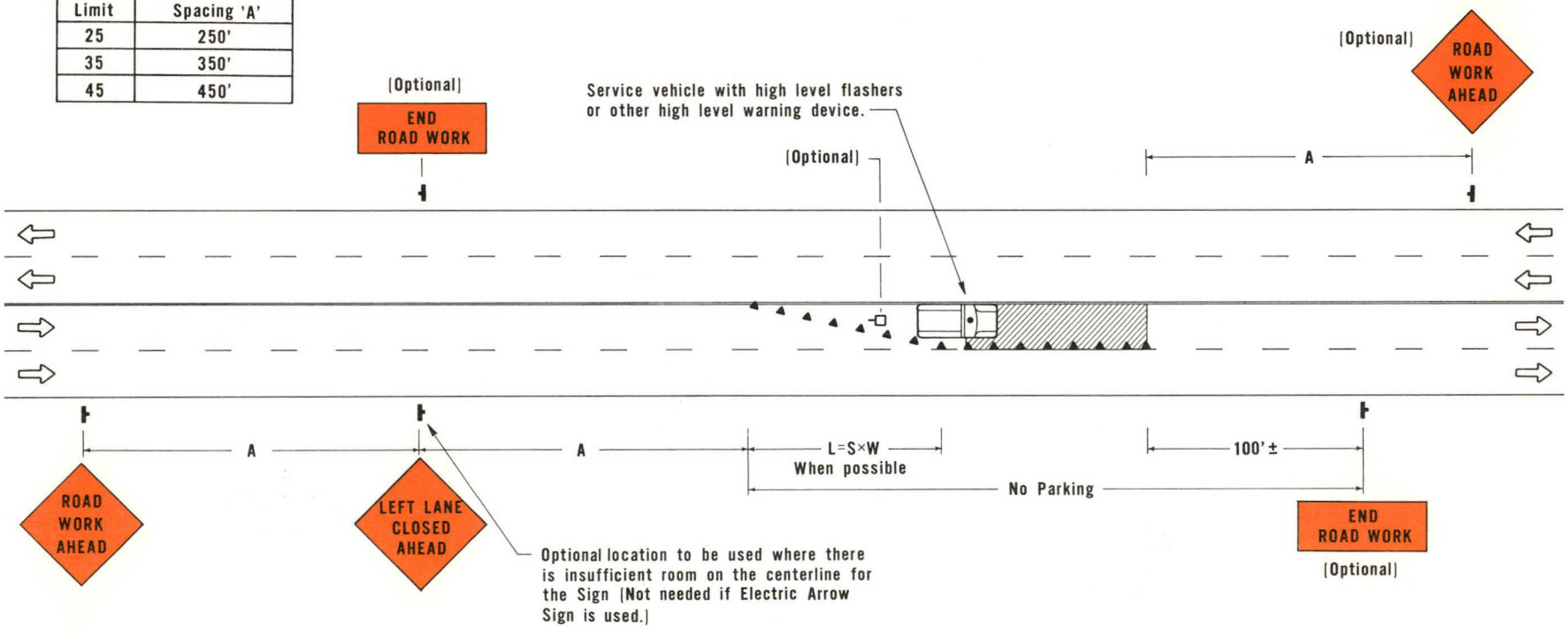
1. Advance signs may not be needed for local or collector streets or for slow moving operation arterial streets.
2. If work area is over 5' outside the curb line, no signing in normally required.

TYPICAL APPLICATIONS

- Utility operations
- Cleaning drainage structures
- Patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Roadside	Stationary and Slow Moving Work	39

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



GENERAL NOTES

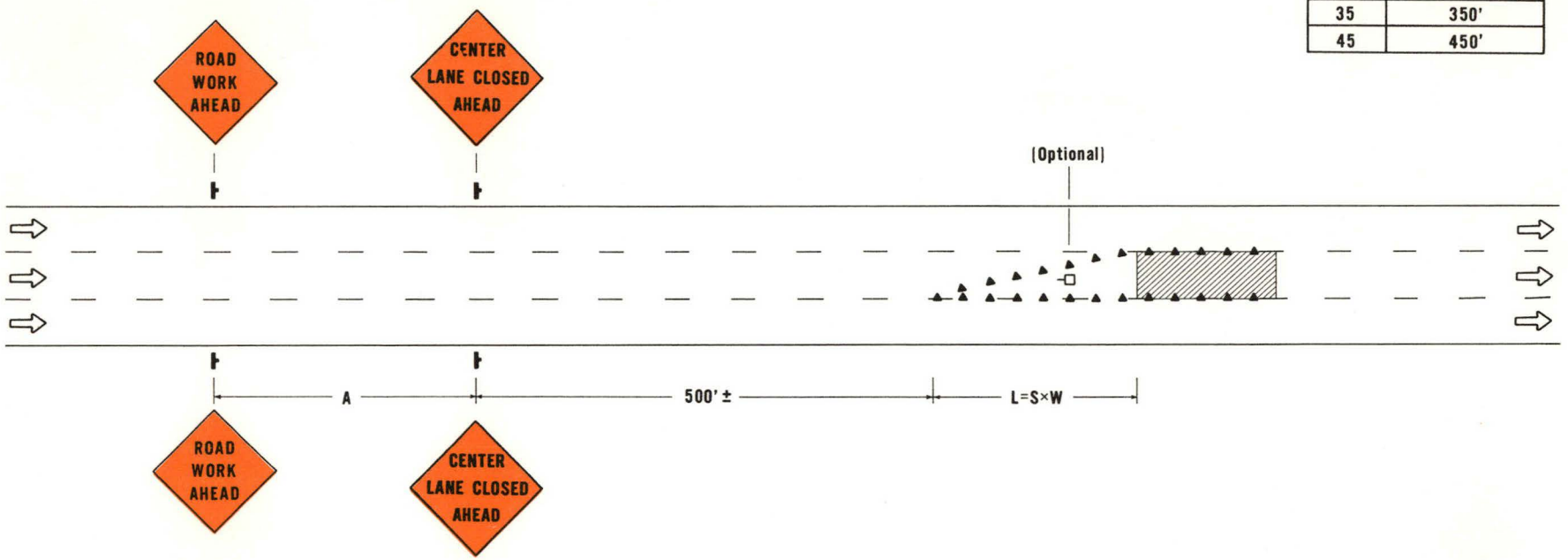
1. Night time Conditions: Arrow boards or Type II Barricades should be used in taper and Type II Barricades placed around the work site.
2. End Road Work Sign should be used whenever work requires closing a lane for several days, or as conditions require.

TYPICAL APPLICATIONS

- Temporary repair of blow-ups
- Seal coating
- Pavement patching
- Utility operations
- Mud pumping

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Lane Closure	Stationary Work Over 2 hours	40

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'

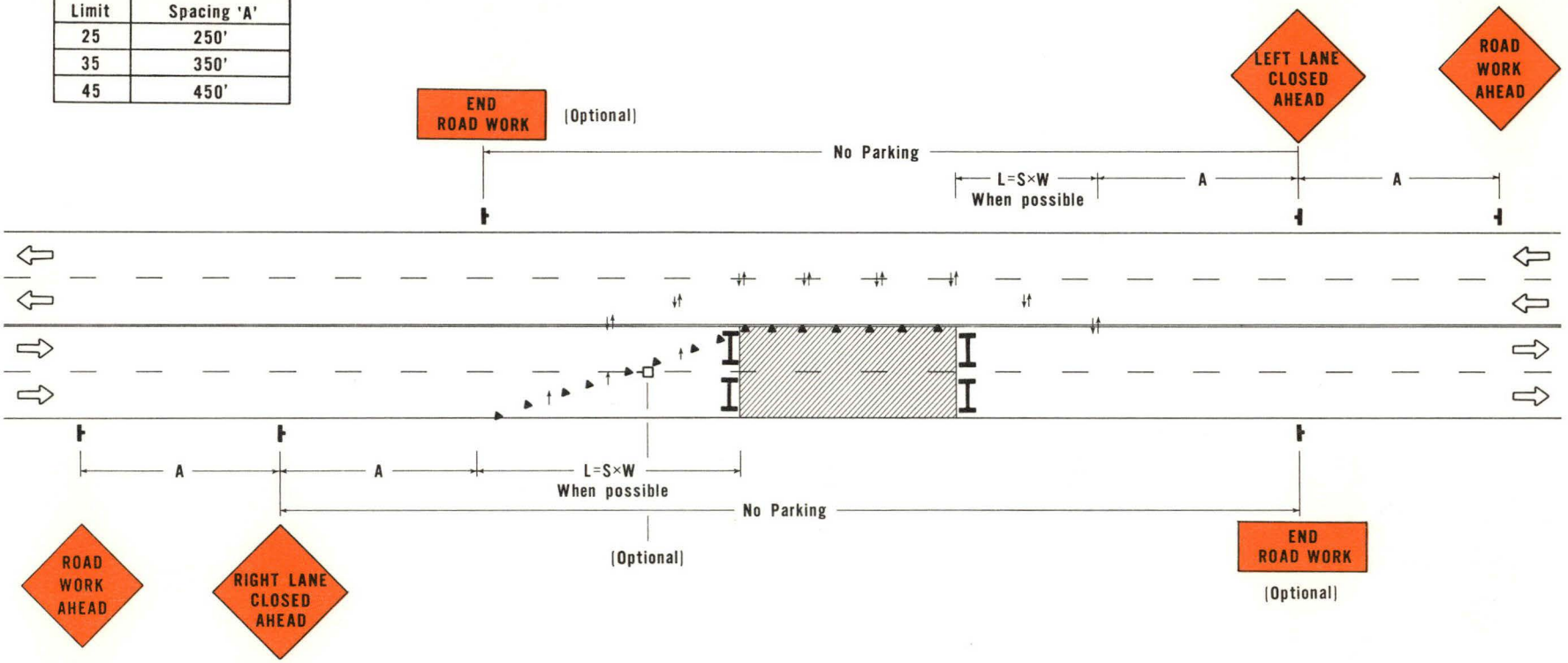


TYPICAL APPLICATIONS

- Pavement patching
- Seal Coating
- Temporary repair of blow-ups
- Mud pumping
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Lane Closure	Stationary Work-Center Lane Closed Over 2 Hours	41

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



GENERAL NOTE

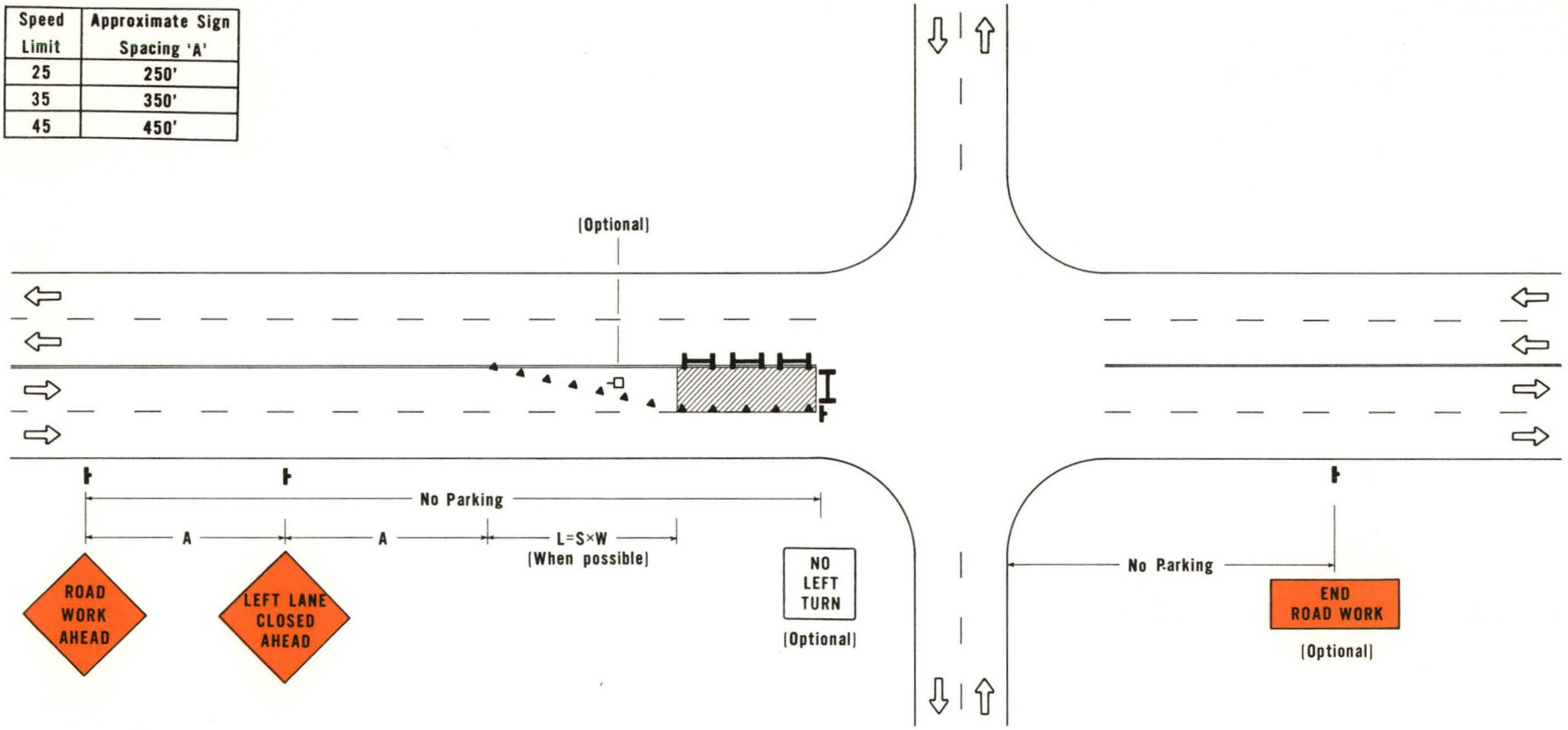
If lane closure is for more than 72 hours, temporary lane striping may be necessary.

TYPICAL APPLICATIONS

- Concrete replacement
- Utility operations
- Seal coating
- Asphaltic concrete overlay

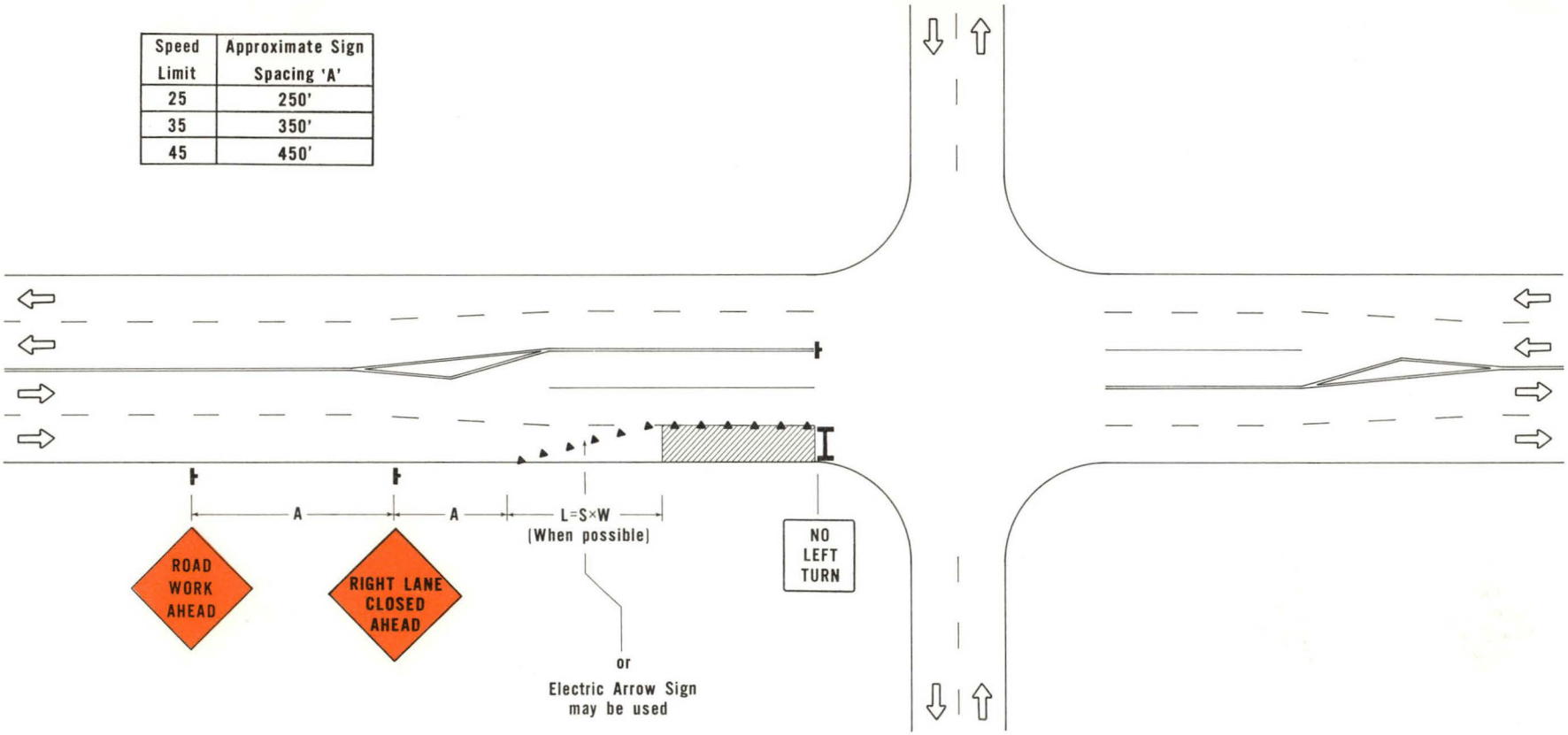
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Lane Closure	Stationary Work-Two Lanes Closed	42

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Intersection	Stationary Work-Near Side Lane	43

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'

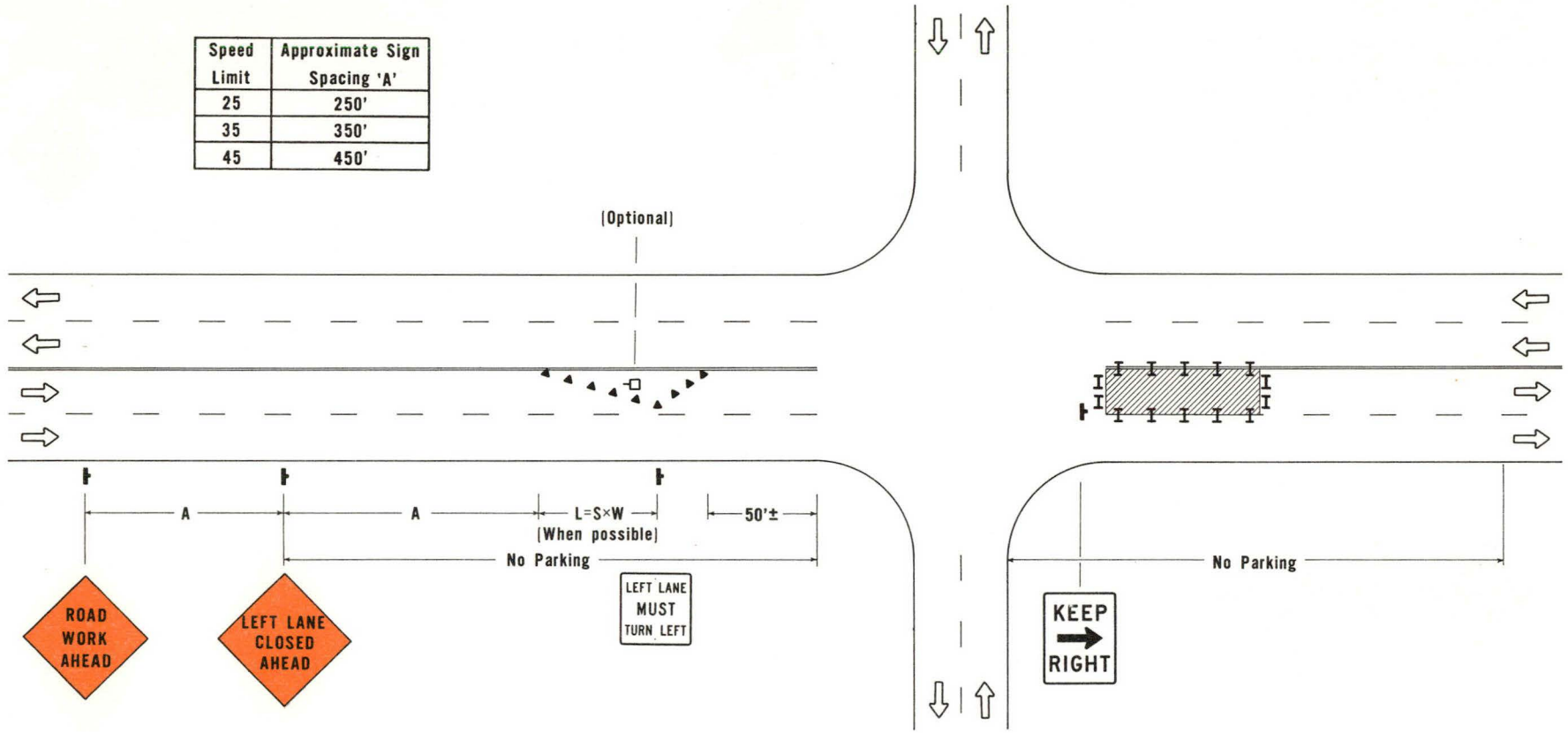


GENERAL NOTES

1. If lane closure is for more than 72 hours, temporary lane striping may be required.
2. Left turn prohibition optional at discretion of the engineer.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Intersection	Stationary Work-Use Left Turn Lanes	44

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'

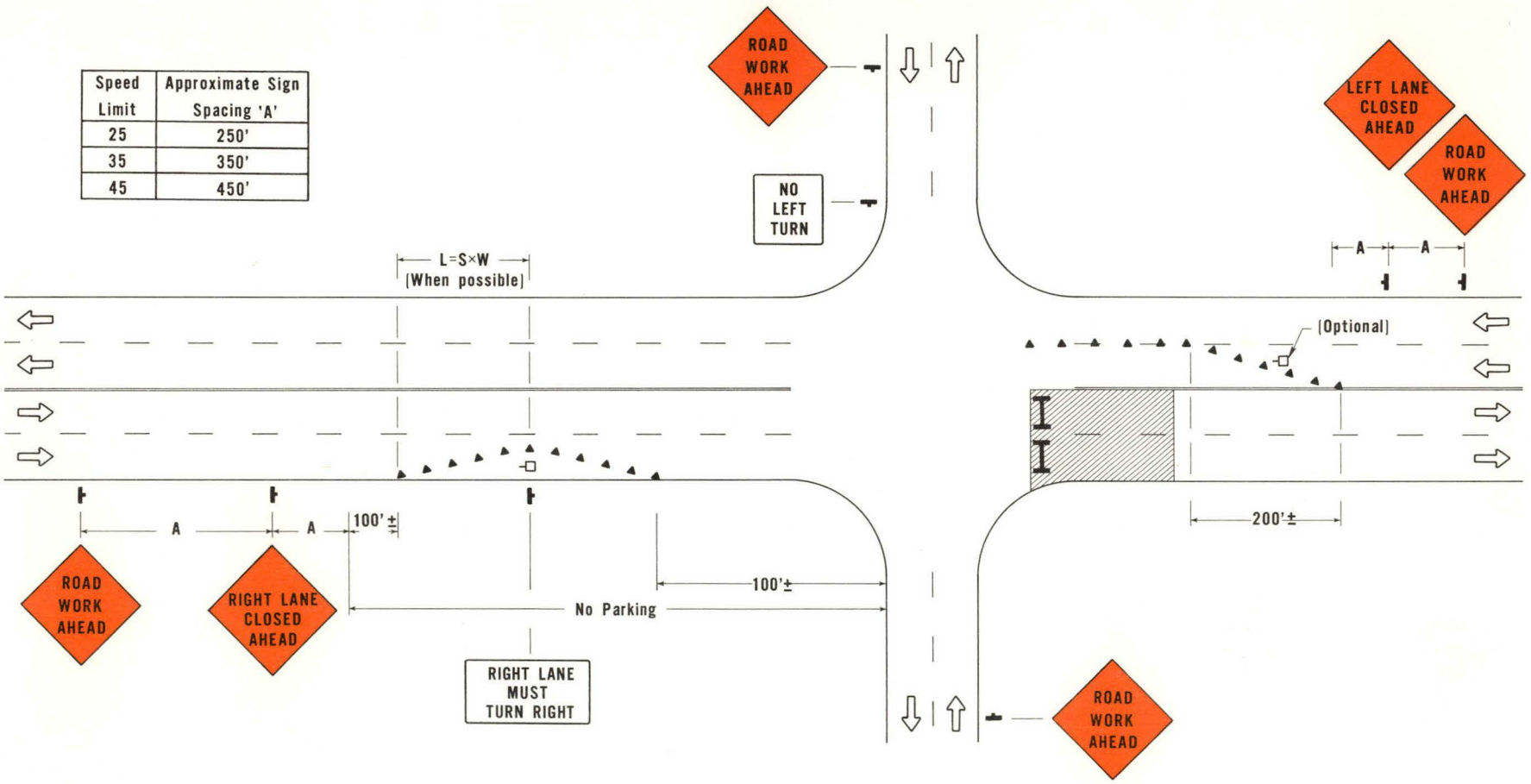


GENERAL NOTES

1. Work area should be lighted at night.
2. If lane closure is for more than 72 hours, temporary lane striping may be required.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Intersection	Closure of Far Side Lane	45

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'

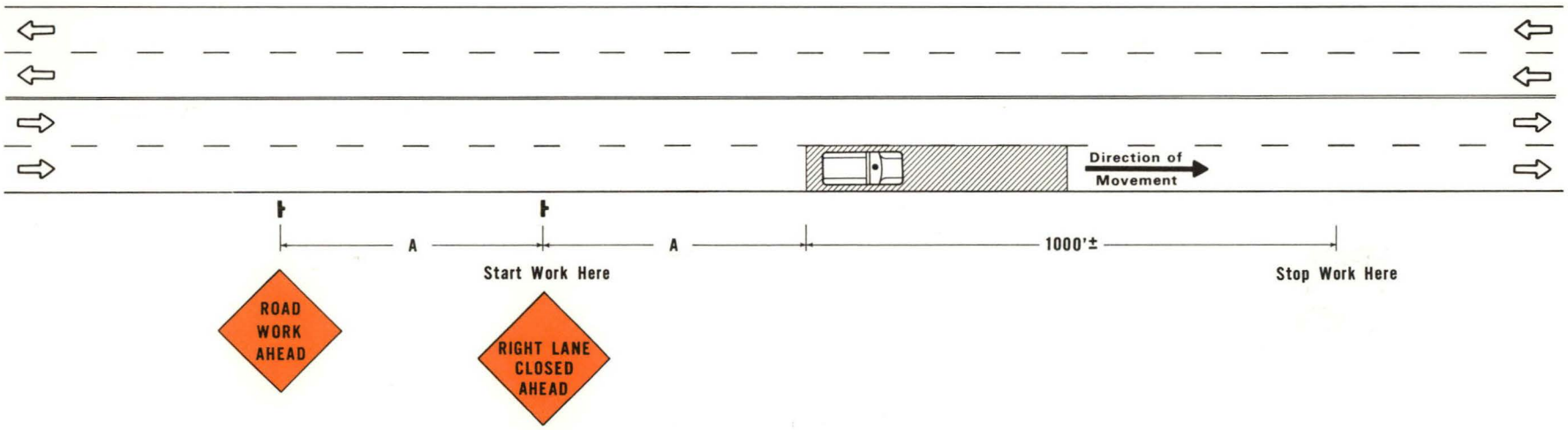


GENERAL NOTE

If lane closure is for more than 72 hours, temporary lane striping may be required.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Intersection	Stationary Work-Far Side Lanes	46

Speed Limit	Approximate Sign Spacing 'A'
25	250'
35	350'
45	450'



GENERAL NOTE

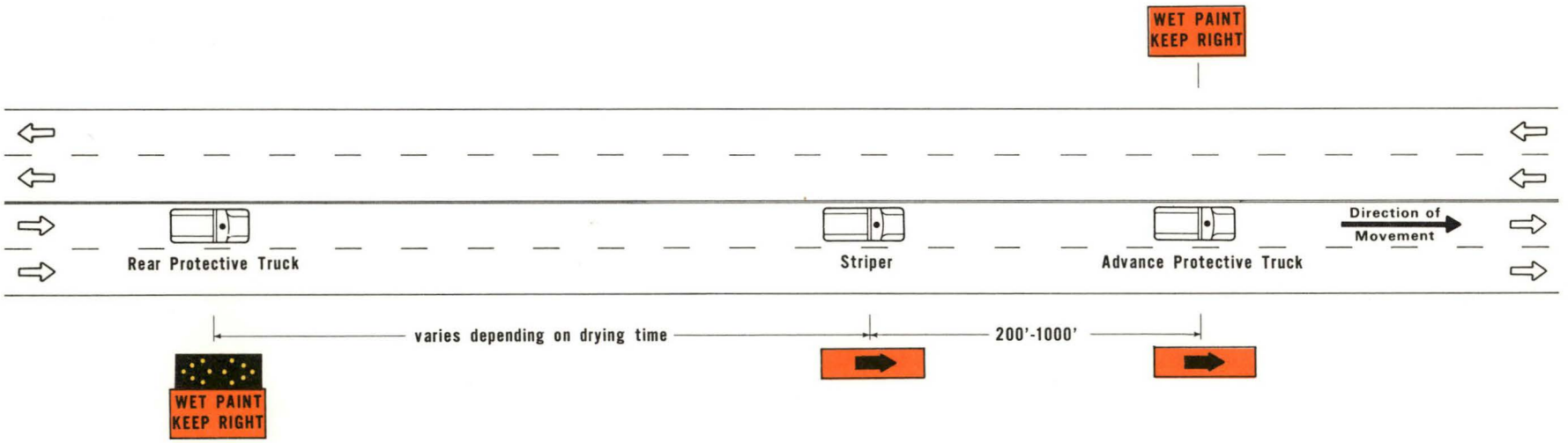
Electric Arrow Sign may be used behind truck

TYPICAL APPLICATIONS

- Crack filling
- Pavement patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Lane Closure	Slow Moving Work	47

FRONT FACING SIGN

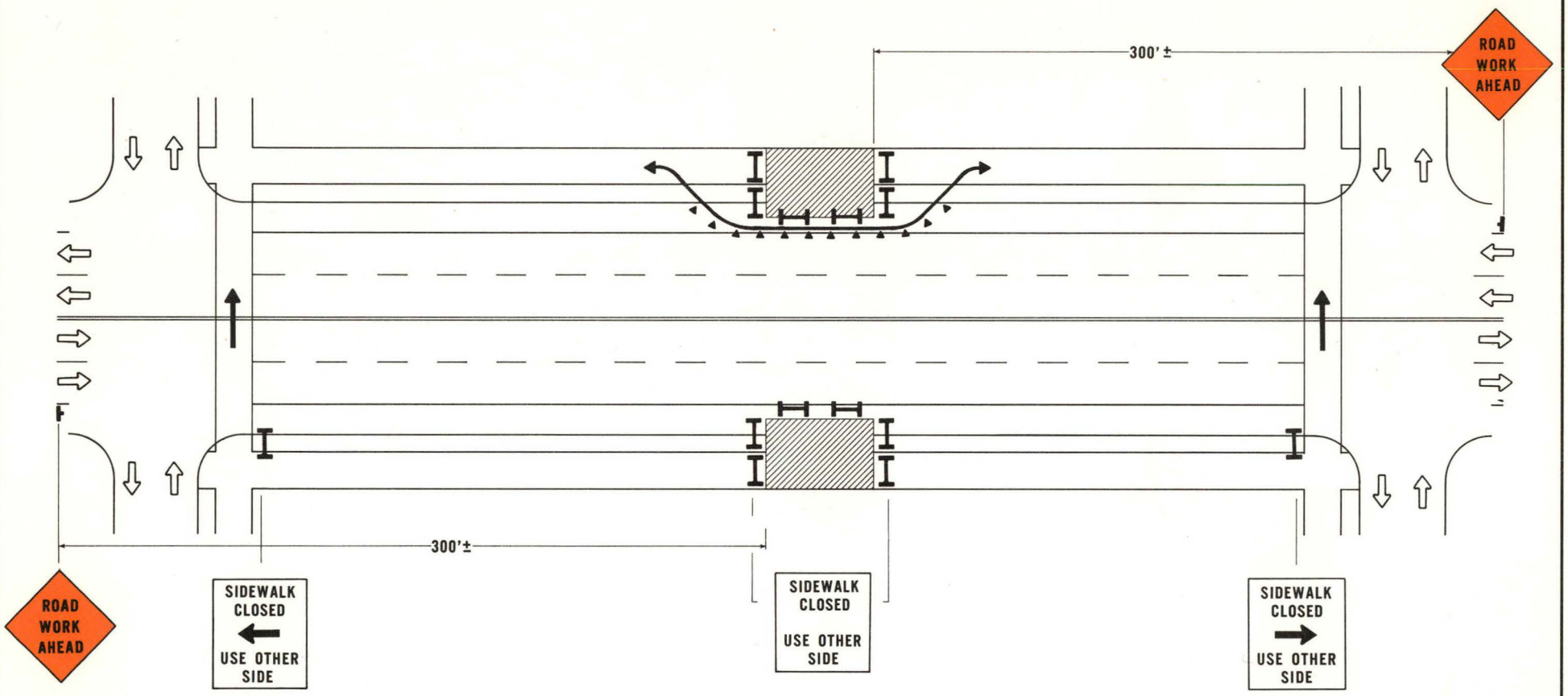


REAR FACING SIGNS

GENERAL NOTE

Operations on inside lane depicted. For operations on outside lane, front facing signs are not required, direct traffic to left of striper.

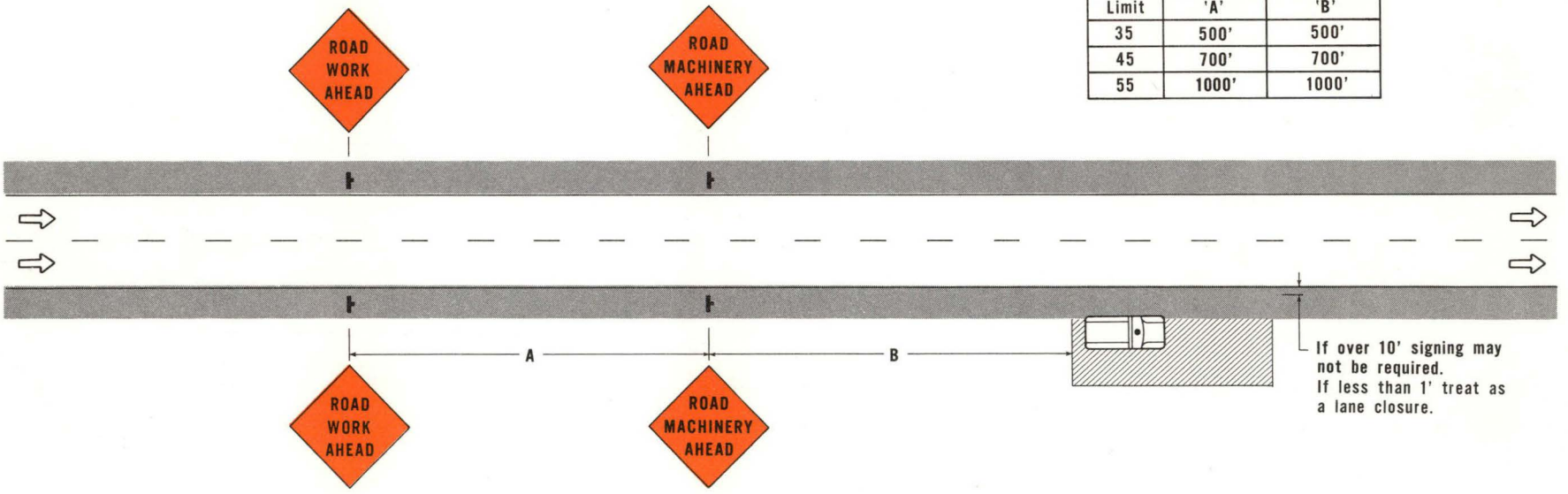
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Lane Closure	Fast Moving Work - Center and Lane Line Striping	48



GENERAL NOTE

Pedestrian ramps may be needed at curbs where pedestrian traffic is directed onto the street.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Urban Multilane Street	Pedestrian Protection	Residential Area Over 2 hours	49



Speed Limit	Approximate Sign Spacing	
	'A'	'B'
35	500'	500'
45	700'	700'
55	1000'	1000'

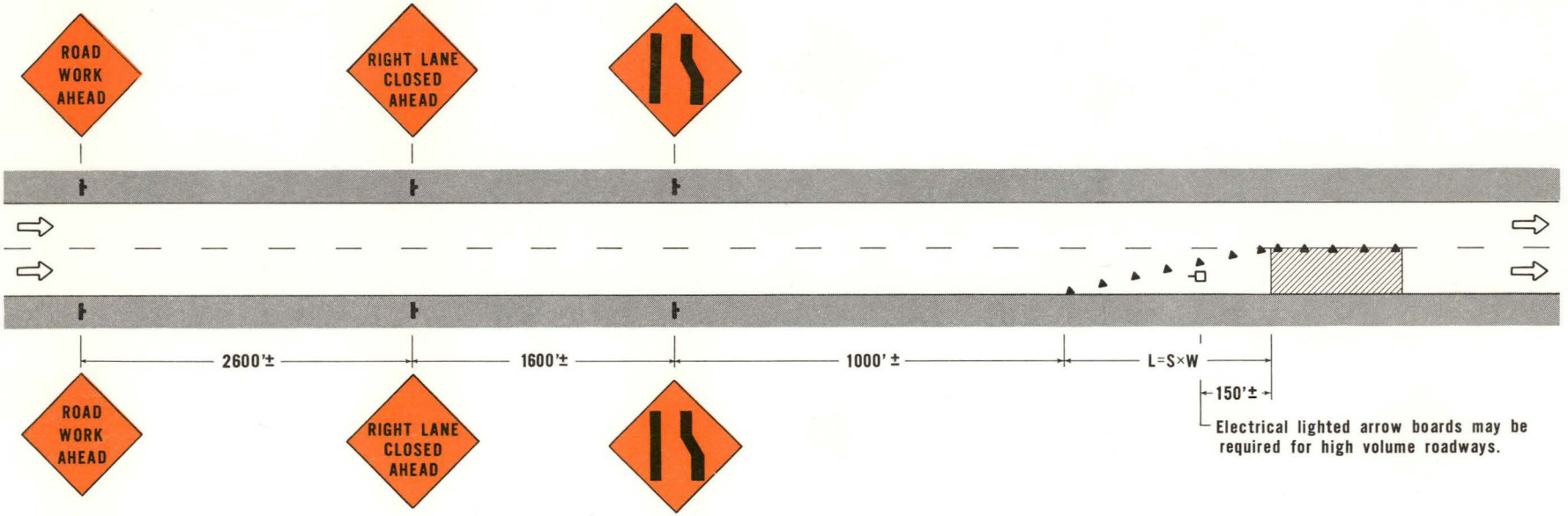
GENERAL NOTE

For Slow Moving operations, Dimension "B" can be extended up to a maximum of one mile or the distance covered in four hours, whichever is less.

TYPICAL APPLICATIONS

- Shoulder work
- Backslope repair
- Seeding and Mulching
- Fertilizing
- Weed control
- Guard rail repair
- Drainage work

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Roadside	Stationary and Slow Moving Work	50



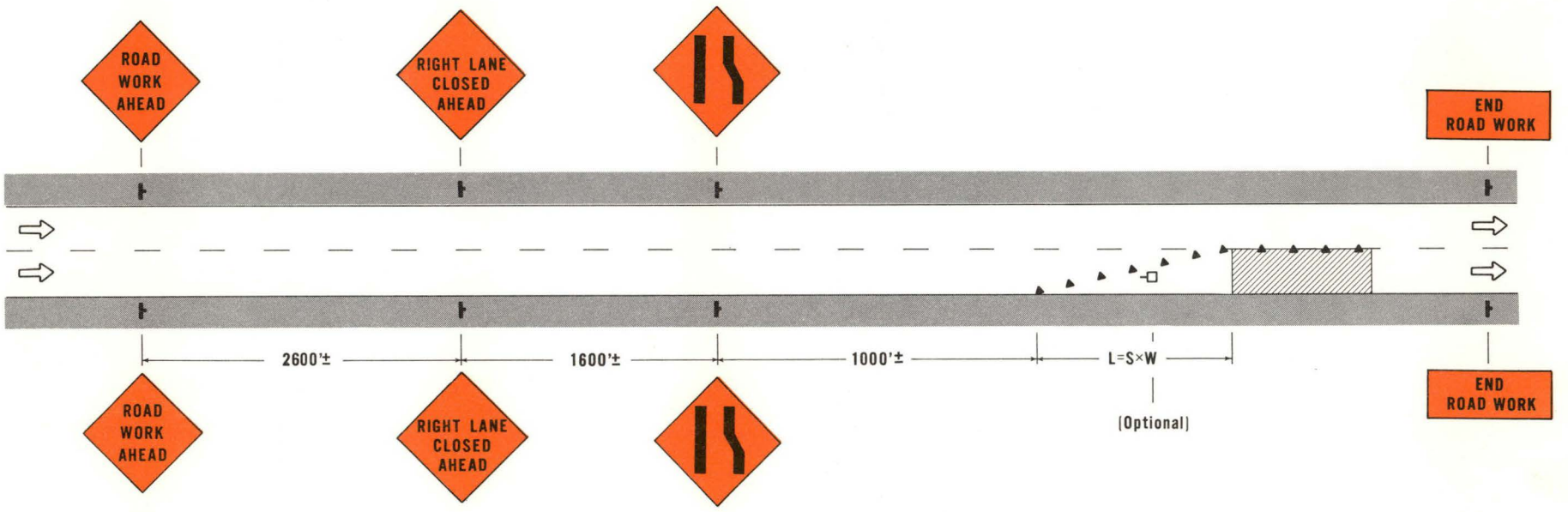
GENERAL NOTES

1. The number of signs and their spacing may have to be adjusted where ramps are in close proximity to work area.
2. No signs required in the opposing traffic lanes.

TYPICAL APPLICATIONS

- Temporary repair of blow-ups
- Pavement patching
- Seal coating

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Stationary Work 15 Minutes-2 hours	51



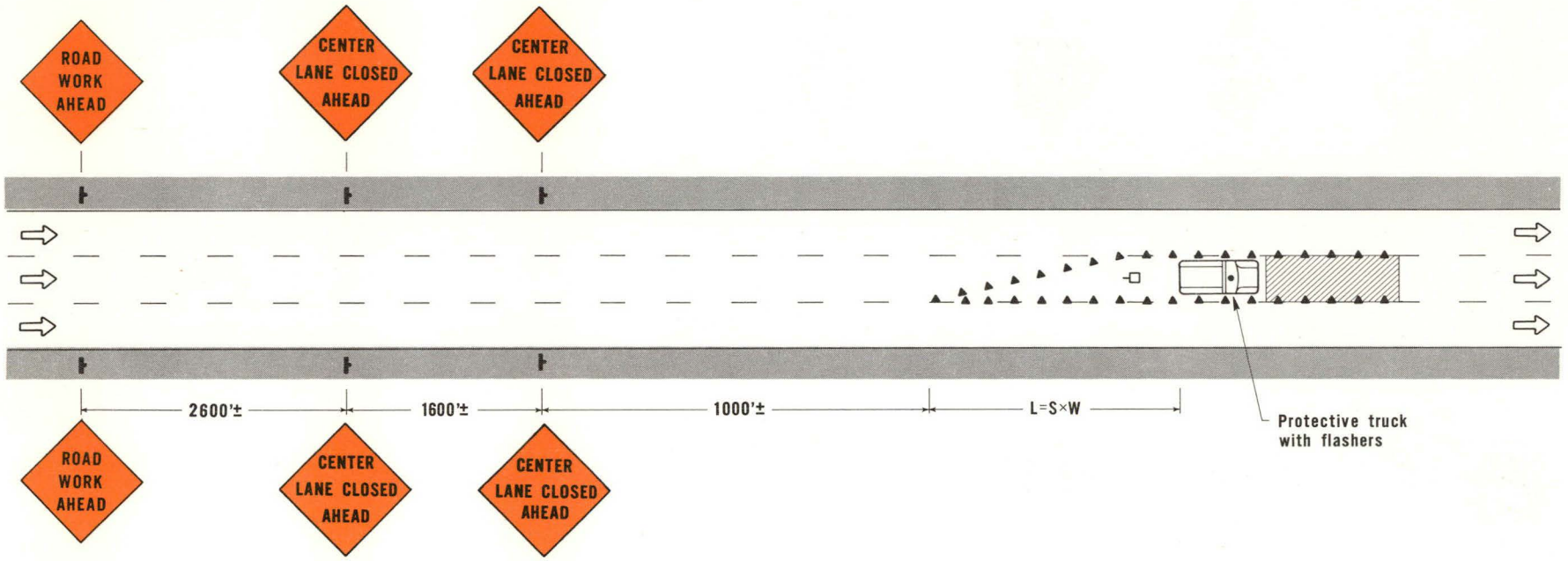
GENERAL NOTE

For overnight operations, arrow signs on skids spaced at approximately 150' should be used with cones. Portable flashers should be mounted on the first two signs in the series.

TYPICAL APPLICATIONS

- Seal coating
- Edge rut filling
- Bridge repair
- Pavement patching
- Concrete replacement

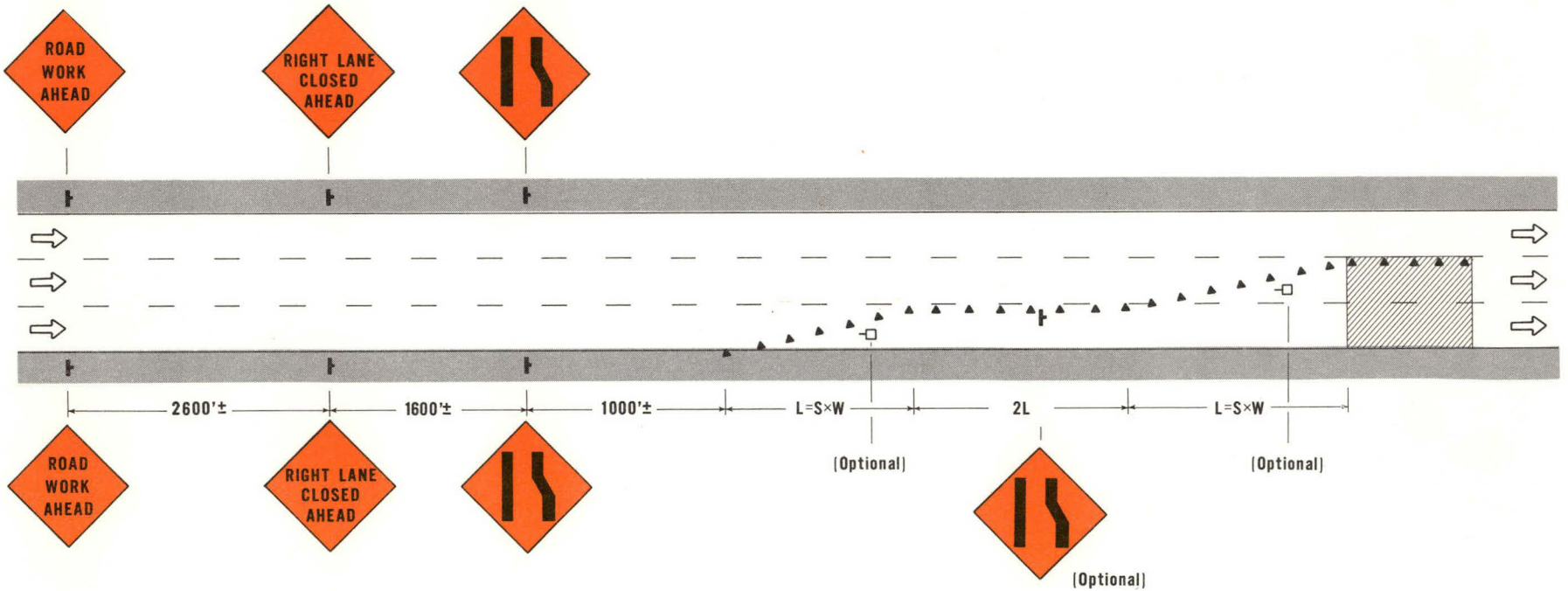
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Stationary Work Over 2 hours	52



TYPICAL APPLICATIONS

- Pavement patching
- Seal coating
- Temporary repair of blow-ups
- Concrete replacement
- Mud pumping
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Stationary Work-Center Lane Closed Over 2 hours	53



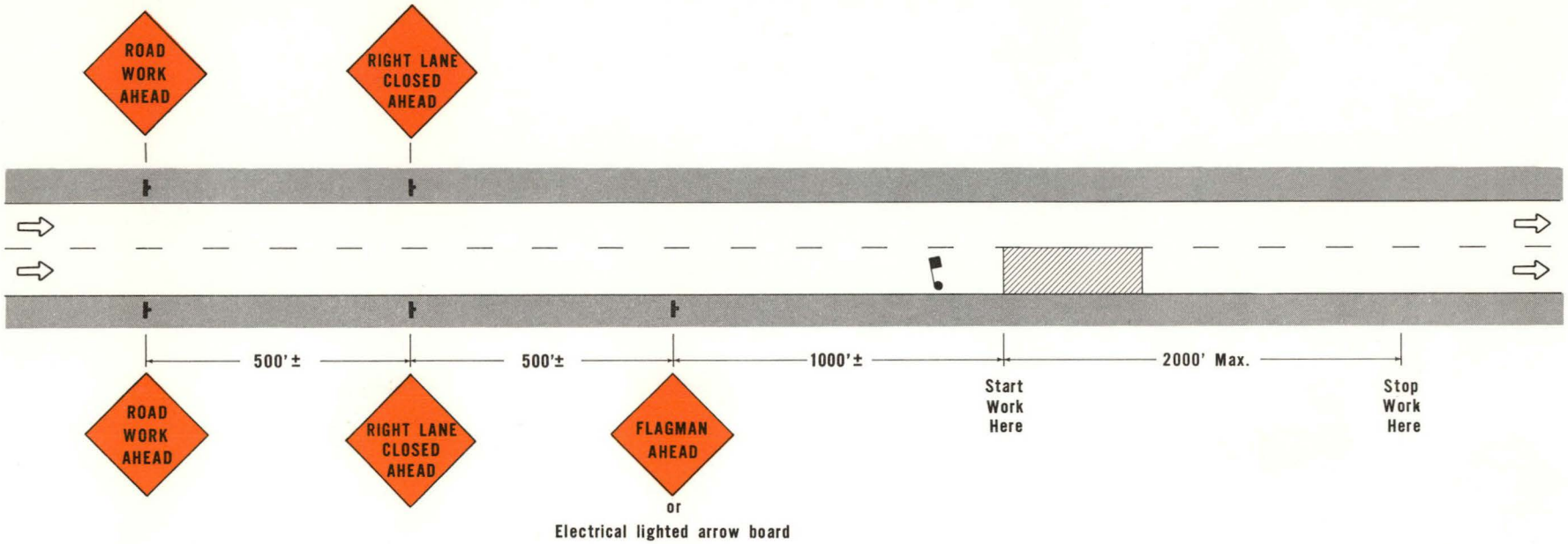
GENERAL NOTE

For overnight operations, arrow signs on skids, spaced at approximatily 150' should be used with cones. Portable flashers should be mounted on the first two signs in the series.

TYPICAL APPLICATIONS

- Concrete replacement
- Asphaltic concrete overlay
- Seal coating
- Utility operations

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Stationary Work - Two Lanes Closed Over 2 hours	54



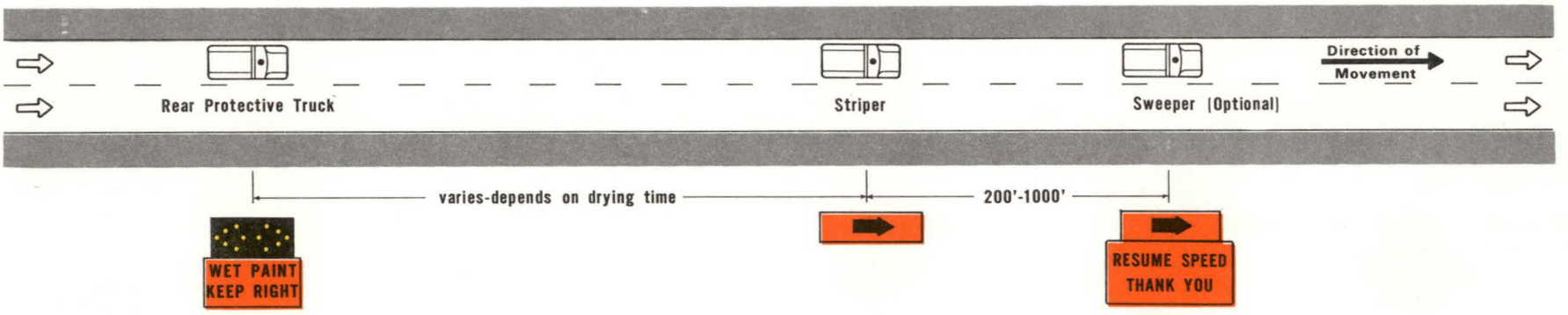
GENERAL NOTES

1. Left plate used on signs as noted when work is performed on left lane.
2. Signs should normally be moved at least once every four hours or when work area exceeds 2000 feet.

TYPICAL APPLICATIONS

- Crack filling
- Edge rut repair
- Pavement patching

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Slow Moving Work	55

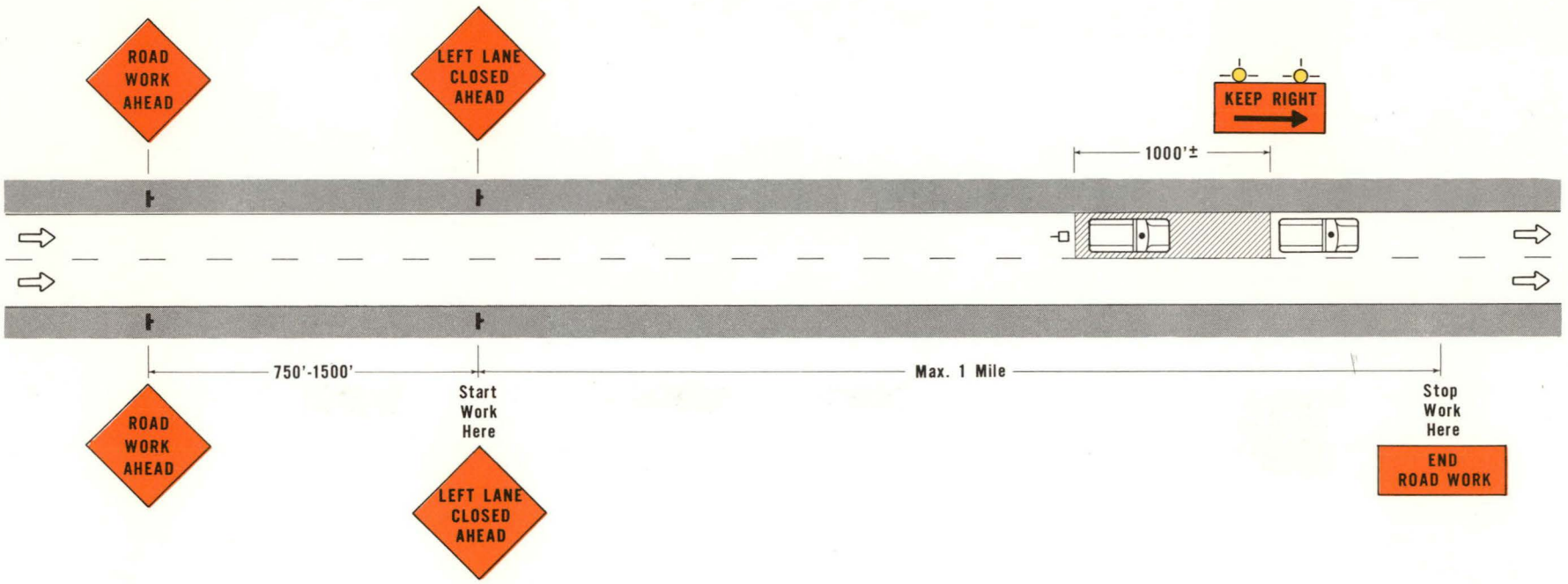


REAR FACING SIGNS

GENERAL NOTE

Signing for operations on inside lane; for operations on outside lane, traffic would be directed to keep left.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Fast Moving Work-Edge and Lane Line Striping	56



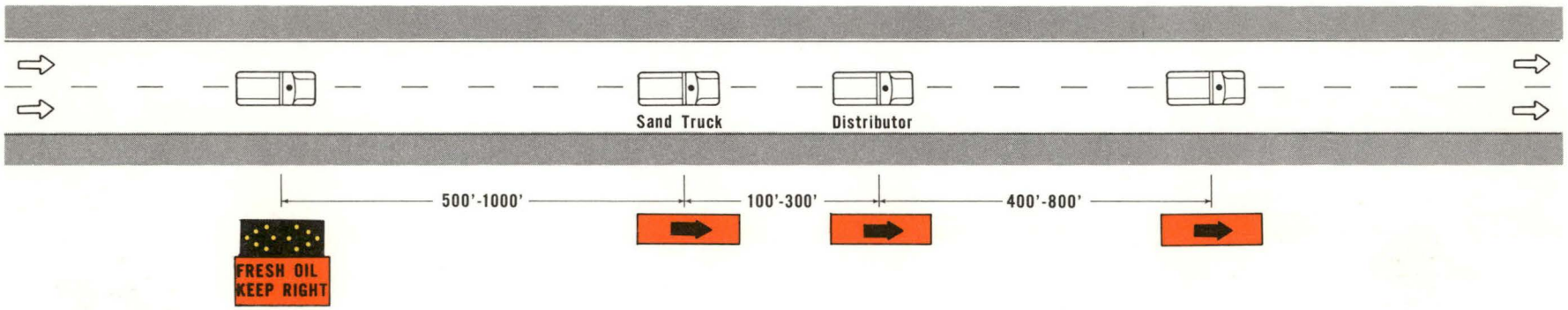
GENERAL NOTE

Signs should be moved when convoy reaches 1 mile from start or every four hours.

TYPICAL APPLICATIONS

- Shoulder repair
- Edge rut filling

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Vehicle Convoy Work	57

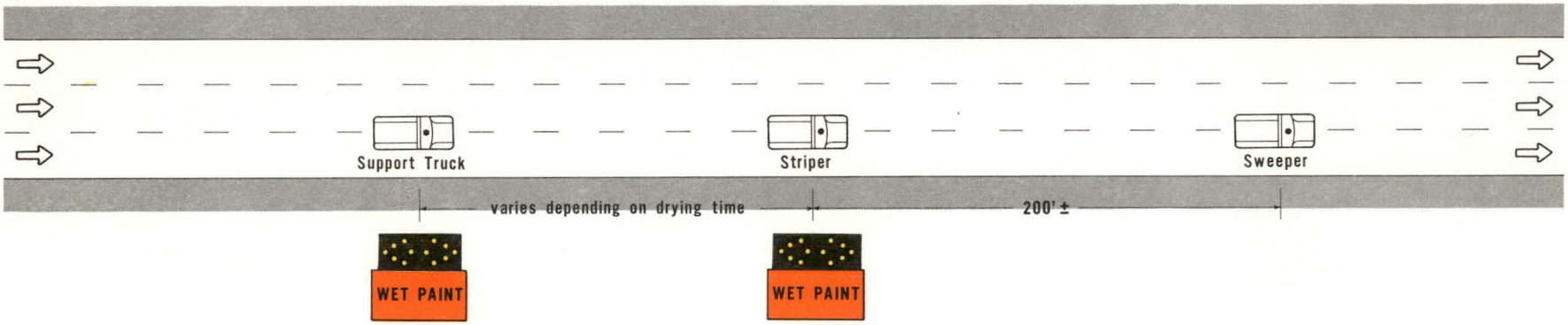


REAR FACING SIGNS

GENERAL NOTE

Distance between vehicles depends on sight distance, speed, and volume of traffic on the road.

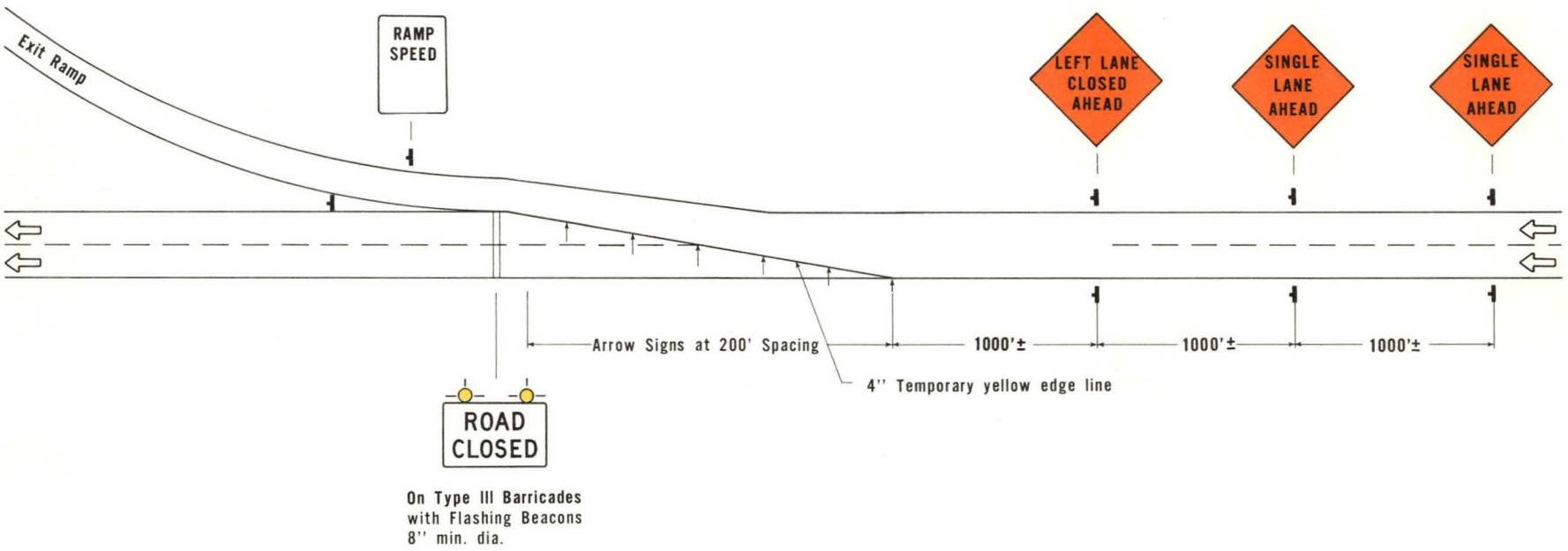
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Vehicle Convoy Work-Centerline Strip Sealing	58



GENERAL NOTES

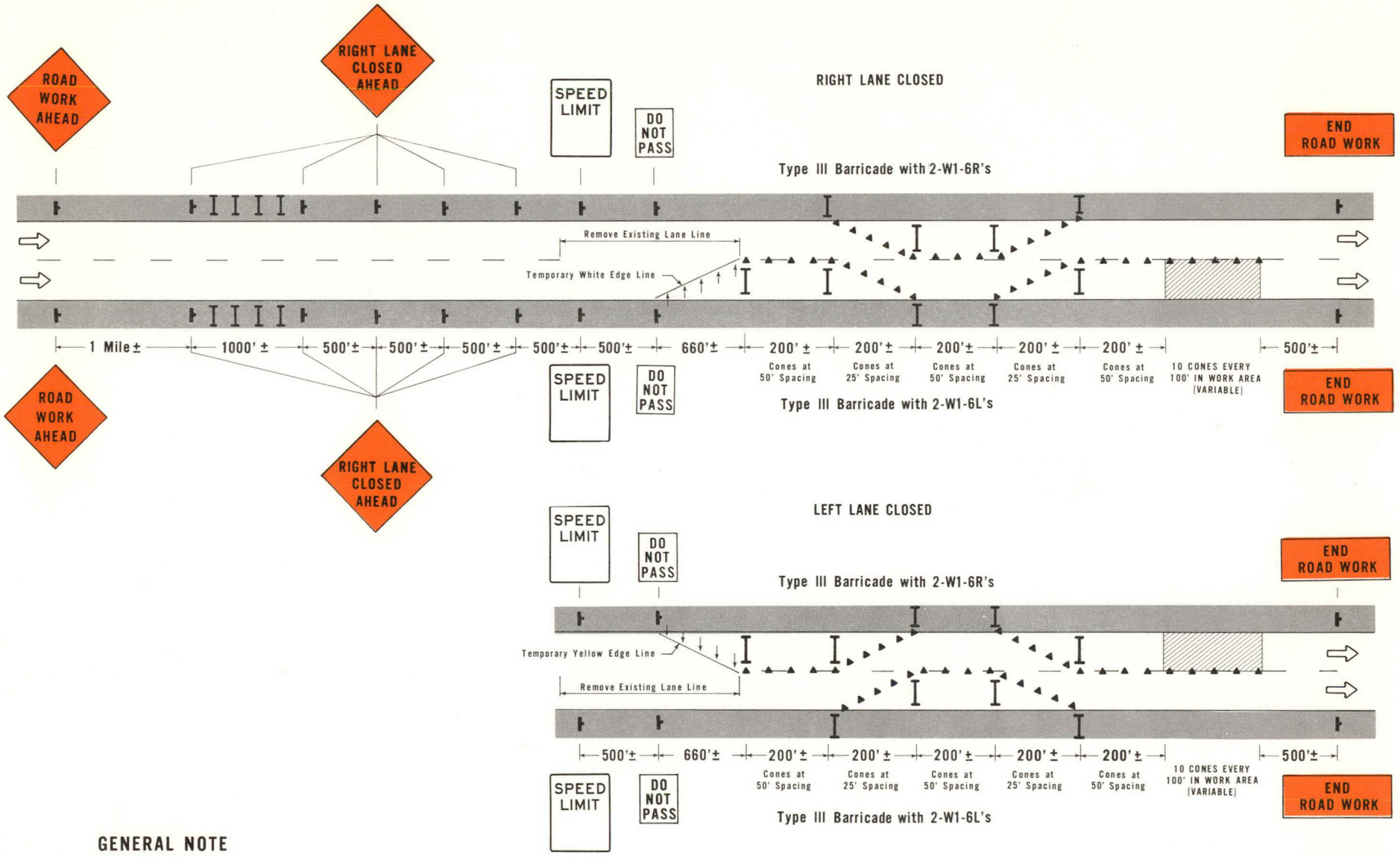
1. This operation generally found in an urban area.
2. Appropriate signs and flagmen placed at on-ramps as required.

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Fast Moving Work - Lane Line Striping	59



On Type III Barricades
with Flashing Beacons
8" min. dia.

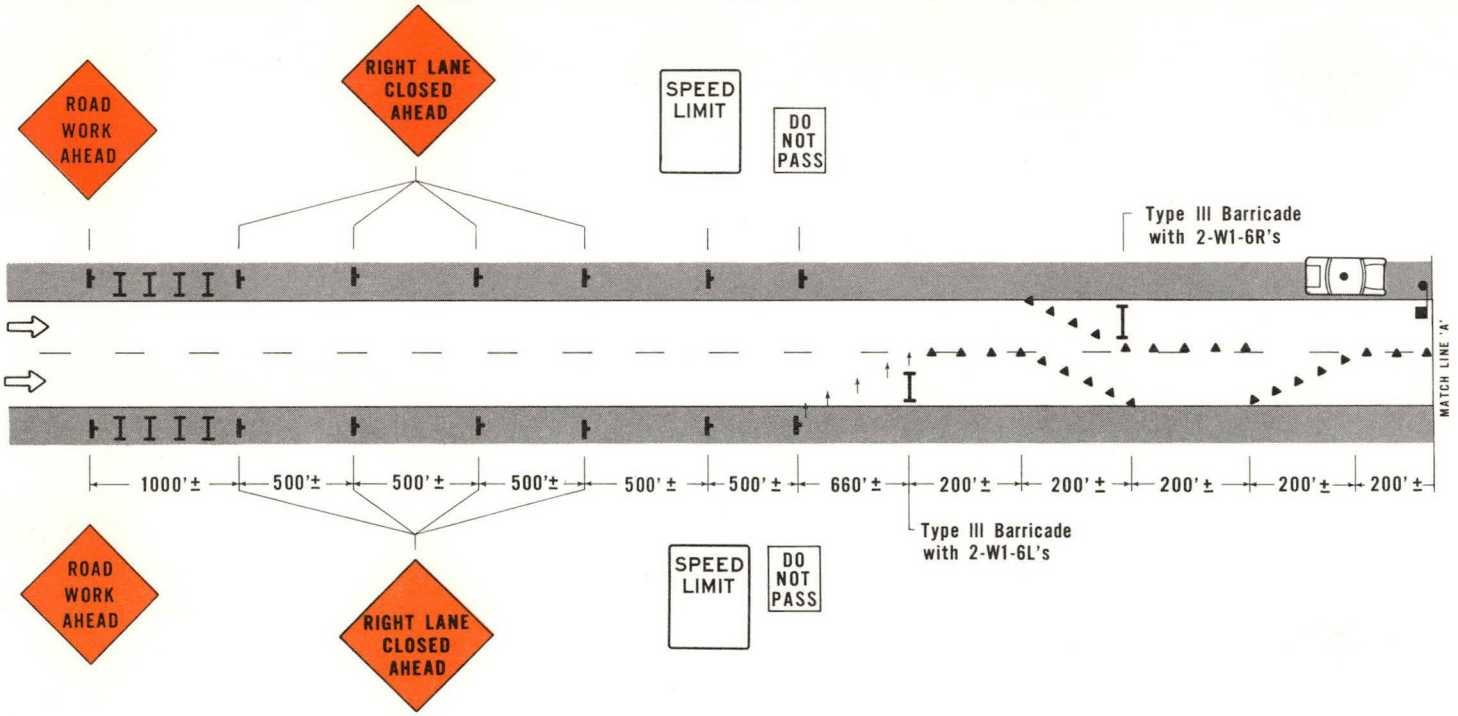
ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Road Closure	Signing for Temporary Detour on a Freeway	60

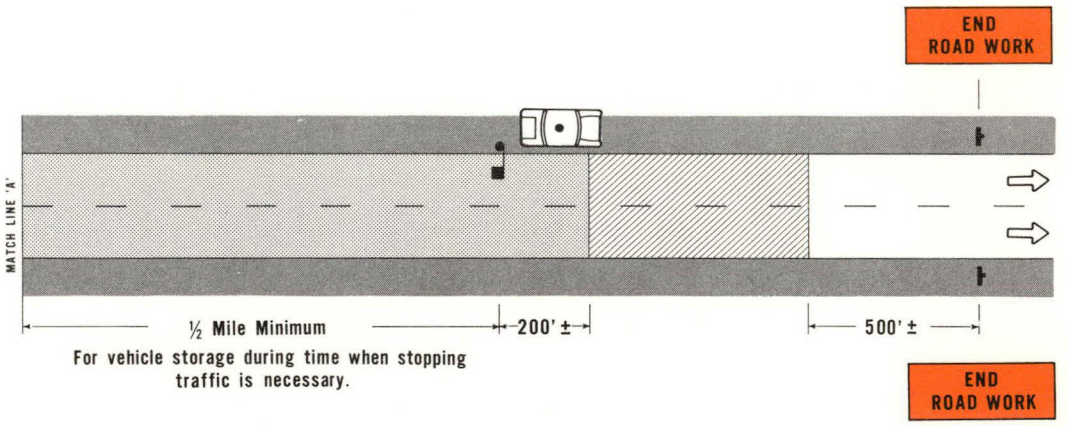


GENERAL NOTE

The word "AHEAD" on the right or left lane closed sign can be changed to a specific distance if desired

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Lane Closure	Speed Reduction Through Freeway Work Area	61





For vehicle storage during time when stopping traffic is necessary.

GENERAL NOTE

The word "AHEAD" on the right lane closed sign can be changed to a specific distance if desired

ROADWAY TYPE	PROJECT TYPE	TITLE	FIGURE
Divided Highway	Road Closure	Temporary Freeway Closure	62

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