CHAPTER 1
INTRODUCTION

The primary function of City streets is to provide for the movement of people and goods. A secondary, but very important function of street right-of-way is to accommodate public utilities. Too successfully enable both functions, streets and utilities must not only be constructed, but be accessible for necessary maintenance activities. Because the primary function that streets provide is so important, it is essential that ***all construction and maintenance activities be planned in such a manner that they impose the minimum disruption to traffic*** (both vehicular and pedestrian), as well as, adjacent land-uses.

No set of rules requiring coordination of limited resources (e.g., street right-of-way) can be effectively sustained without a concerted effort by managers of each and every responsible organization (contractors, utility companies, governmental agencies, etc.). This *Traffic Barricade Manual* has been prepared to help managers properly train their personnel regarding temporary traffic control methods that experience has proven work best on busy urban streets. It is incumbent upon agencies and contractors to familiarize and train *not only* field crews that work in the street, but also those who supervise crews, in the practices contained in the *TBM* and the *MUTCD*.

Authority 9-1-2:

[1]Prescott City Code, Title IX Traffic regulations, Chapter 1 Prescott Traffic Code, 9-1-2 Traffic Administration, (paragraph A.). All Permittees, utilities and other agencies are to abide by all applicable City of Prescott Ordinances when working in public right-of-ways within the City of Prescott.
[2]U.S. Department of Transportation, Federal Highway Administration, Manual On Uniform Traffic Control Devices for Streets and Highways, as adopted by the Arizona Department of Transportation.

CHAPTER 2

PURPOSE

A. PURPOSE OF THE TRAFFIC BARRICADE MANUAL

This Traffic Barricade Manual has been produced for the purpose of promoting safe conditions for motorists, pedestrians, and workers on City streets during construction, closures, or other activities. Additionally the *Manual* has been prepared to augment the *MUTCD* procedures that work well on all streets from busy urban arterials to local residential streets. Temporary traffic control done properly can reduce congestion and confusion by providing uniform applications of traffic control devices in temporary traffic control zones.

This *Manual* establishes uniform requirements for traffic control in temporary traffic control zones to facilitate construction, maintenance, and special event activities. Requirements contained herein are in substantial compliance with the *MUTCD.* Minor deviations in procedures or devices are prescribed in some areas where field experience and engineering judgment have shown improved traffic operation and safety would result. Both the *MUTCD* and Arizona State Law enable use of approved procedures that work toward safe and efficient traffic flow. Typical applications of approved devices are illustrated herein. Application of these devices to other situations shall be handled consistent with the methods illustrated.

The provisions established herein *apply* to all persons, contractors, utilities and other agencies in City of Prescott public rights-of-way, including temporary traffic control used during parades and special events. During incident management situations overseen by Police or Fire personnel such as vehicle crashes, gas leaks, or other major occurrences, there is often no way to immediately get resources in place to fully comply with the provisions of this Manual. Nevertheless, street traffic control management is needed, and this normally occurs under the authority of law enforcement who provide manual control of traffic during emergencies.

During these types of incidents, a generous use of available substitute tools such as flares and roll-up emergency signs is encouraged. The longer the duration of the incident, the more consideration should be given to establish complete traffic control techniques as set forth by this *TBM*

B. PURPOSE OF BARRICADING AND CHANNELIZATION

The purpose of installing barricading and channelization on public streets is to facilitate the safe and orderly movement of vehicular traffic while simultaneously:

- Protecting pedestrians and workers; and
- Providing for expedient and safe construction and maintenance activities

It is important that the entire temporary traffic control setup process be planned and installed in such a manner as to ***minimize*** adverse impacts on traffic service, including the duration of time traffic service has to be disrupted.

CHAPTER 3

GAINING PERMISSION TO RESTRICT CITY STREETS AND SIDEWALKS

A formal street closure process enables the City to:

- Monitor street restrictions and spot check barricading/safety precautions and their impacts on street operations.

- Provide advance notice to those who may be adversely affected by the temporary restrictions.

The ability to obtain a permit through an efficient process at normal cost helps facilitate needed construction and maintenance activities. Permits are granted quickly contingent on the applicant agreeing to comply with the provisions of the *Traffic Barricade Manual* and any special regulations, or other applicable requirements.

Exception: Given the many activities occurring in Downtown Prescott (Central Business District), ***advance approval*** is required for use of right-of-way in that area.

Central Business District: that area consisting of the property contained within the boundary of the following streets (including all adjacent sidewalks to the city right-of-way line): From Sheldon and Marina Streets west to Montezuma Street, south to Willis Street, west to McCormick Street, north to Sheldon Street, west to Grove Avenue, south to Gurley Street ,east to Summit Street, south to Goodwin Street, east to the alley west of the 200 block of South Montezuma Street, south to Carleton Street, east to Marina Street, north to Sheldon Street.

All Permittees, including City departments ***must*** obtain a street closure permit (partial or complete) for restrictions of all streets, sidewalks, bike lanes and alleys within Prescott. While issuance of a permit authorizes work to be performed within the public right-of-way, the permit does ***not*** guarantee the requester any exclusive right to occupy a particular portion of the public right-of-way. Weather, emergencies, incidents, or other planned projects that require use of the right-of-way might temporarily curtail construction and maintenance activities for which a permit has been issued.

Requests for street closure permits (partial or complete) must conform with ***Chapter 4, "GENERAL TRAFFIC REGULATIONS" of the Traffic Barricade Manual,*** and with any "Special Traffic Regulations" listed in the City project specifications/special conditions or permit conditions. Except in emergency situations, any deviation from those regulations ***must*** have the prior approval of the Transportation Services Division.

What kind of temporary traffic control planning do you need to do?

Good traffic control planning requires forethought. Provisions may be incorporated into project bid documents that enable prospective Permittees to develop alternative traffic control plans, which may be used only if the agency issuing the permit determines they are equal or better than those requested by the plans/specifications. For maintenance and minor utility projects that do not require bidding, forethought must be given to selecting the best traffic control before occupying the temporary traffic control zone. Also, coordination must be made between projects to ensure that duplicate signing is not used and to ensure compatibility of traffic control between adjacent projects.

Depending on the complexity of traffic control needed, the type of restriction that is requested and the impact on traffic operation, a Traffic Control Plan may be required.

The purpose of *a Traffic Control Plan* is to encourage proper planning as to the time of day, sequence of construction, degree of restriction required, and traffic control needed. Good advance planning can provide not only for efficient construction and maintenance, but also for minimum interference to the flow of traffic. *Traffic Control Plans* may range in complexity from use of typical illustrations in this manual to a detailed site plan showing signing, barricading, detours, pedestrian walkways, bike lanes, construction fences and project phasing. In all cases, the required *Traffic Control Plan* needs to satisfactorily address all requirements of this *TBM*. For large or unusual projects, advance consultation and review during the planning and design phase are *encouraged* to preclude delays. This will also ensure that street projects strike an appropriate balance between those needing to work in the public right-of-way, and those needing to use the public right-of-way.

A *Traffic Control Plan* is usually required for long-term or complex projects such as detours and channelization for bridge construction, street restrictions for building construction walkways and fences, construction of large utility lines, parades, special events, and major street closures. *Traffic Control Plans* may also be required by the Transportation Services Division for other projects.

Street closure permits are generally requested by the following individuals or agencies:

On City Projects/Permits: The assigned City Construction Project Manager
On County Projects Affecting City Streets: The County Project Supervisor
On ADOT Projects affecting City Streets: The ADOT Resident Engineer

Other types of Projects involving restrictions also require right-of-way permits:

- Work by city departments
- Surveying
- Swimming pool, landscaping, and fence construction materials in streets, sidewalks and alleys
- Temporary walkways, fences and equipment needed to enable construction, maintenance, or demolition of buildings on private or public property.
- Parades and other special events

Right-of-way Use Permits, including those for which partial or full street closures are being requested, are obtained at the "One-Stop" permit counter in City Hall. ***Advance notice of restrictions is required*** to enable notification of emergency and other affected services. Except in an emergency, closures ***WILL NOT*** be permitted without the required advance notice.

Advance Notice Requirements:

- 72 hours for complete closures on major and collector streets
- 48 hours for partial closures on major and collector streets including bike lane and sidewalk closures.

Short-duration restrictions during non-peak traffic hours, (described on pages 50-51 of the TBM) do not generally require Right-of-way Use Permits. However, the Transportation Services Division may require this permit if, in its judgment, either the traffic impact warrants it or the past performance of the applicant indicates the need for special monitoring.

Advance Notice Required by Others.

Residential Alleys: The Sanitation Division requires ***three (3) working days*** notice of all alley closures (partial or complete). This notice provides time to notify affected residents and reschedule solid waste pickup. The person requesting the alley closure shall contact the Sanitation Division by telephone and make suitable arrangements for alley service ***prior*** to requesting a residential alley closure.

Commercial Alleys: At least ***24 hours*** prior to the closure, the applicant shall coordinate with adjacent tenants. Suitable arrangements for alley service shall be made, as necessary.

The City ***reserves the right*** to deny or revoke Right-of-Way Use Permits during any time when, in its sole judgment, traffic restrictions could result in undue congestion, unacceptable inconvenience, collision potential, or hazard to workers or pedestrians and/or the in the event Permittee fails to follow the guidelines of the TBM.

CHAPTER 4

GENERAL TRAFFIC REGULATIONS

The following are the ***minimum*** traffic control requirements for all traffic restrictions, except during emergency situations, as otherwise specified by the "Special Traffic Regulations" herein, or given ***prior*** approval by the Transportation Services Division.

A. Traffic restrictions ***are not*** permitted on Arterial or Major Collector streets during the peak traffic hours of ***7:00 a.m. to 9:00 a.m.,*** and ***4:00 p.m. to 6:30 p.m.*** weekdays.

B. During other (off-peak) traffic hours the following ***minimum*** number of lanes must be maintained open to through traffic:

# Existing Lanes (Including Left-Turn Lanes)	Maintain Open
More than 4 lanes	Four Lanes (two each way)
Four or fewer lanes	Two Lanes (one each way)

C. Traffic signals constrain capacity and consequently are the locations where ***most*** congestion occurs. At multi-lane signals when traffic lanes are restricted, the left-turn lanes ***shall*** be used with channelization and turn restrictions to provide a minimum of two lanes for each direction of travel. Note again: street capacity restrictions are normally allowed only during off peak hours.
(See Figures 17, 22, and 23 on Pages 57, 62 and 63).

D. Unless otherwise approved by the Transportation Services Division, the Permittee ***shall*** provide a uniformed off-duty Police Officer to manually allocate green time" at multiple lane signalized intersections, whenever traffic in any one direction is restricted to one through lane. ***(See Chapter 6, Paragraph E for more information).***

E. A traffic or bicycle lane surrounded by, or adjacent to, existing pavement shall ***not*** be considered satisfactorily open to through traffic unless it is paved. Where all existing pavement has been

removed, a traffic or bike lane shall not be considered satisfactorily open to through traffic, unless graded smooth, maintained dust-free, and determined open by the Transportation Services Division.

F. Local streets may be closed when necessary for construction or maintenance activities, subject to maintaining satisfactory access to adjacent properties.

G. Local access shall be maintained to all properties on all streets (major, collector and local) at all possible times. When local access cannot be maintained, it is the responsibility of the Permittee, to notify all affected property owners, residents or tenants a minimum of ***24 hours*** in advance. The reasons for the closures shall be explained to the affected persons. Alternative access procedures shall also be explained. Full access shall be restored as soon as possible.

H. Access to facilities such as fire stations, police stations, hospitals, and schools shall be maintained at all times. When access restrictions are necessary, the Permittee shall coordinate such access with the responsible person in charge of the affected facility.

I. Sidewalks, crosswalks (especially school crosswalks), access to bus stop locations and other pedestrian walking areas, shall be maintained open in a safe usable condition as detailed in Chapter 7 of the *TBM***,** or in the American with Disabilities Act (ADA) Accessibility Handbook. In the rare event when their function cannot be retained, ***it is the responsibility of the applicant*** to first prove that dismantling is necessary, and secondly to locate a safe and reasonable alternative. Generally, this requires the Permittee to repair, cleanup, and prepare conflicting areas, before the day of the work to provide clean and safe conditions.

J. Special coordination efforts are required for special events such as parades and marathon races, when construction and maintenance operations may conflict with such events.

K. Construction and maintenance activities are restricted during the holiday season of November 15 through January 1, and 4th of July week, in the downtown Prescott area and on major streets serving as primary access to large shopping centers. Construction and maintenance activities that interfere with traffic flow near shopping areas and on high volume streets must be carefully evaluated and imposed only when absolutely necessary.

L. Coordination with other Permittees ***must*** occur between projects to ensure compatibility of traffic control precluding duplicative or inconsistent signing.

IMPOUND AUTHORITY

As a rule, City right-of-way may not be used to store temporary traffic control devices. In addition, such devices shall not be left in "active" position longer than required.

City-authorized agents may remove and store temporary traffic control devices when they are creating a hazard or if the owner will not pick them up. Fees will be assessed to the owner for retrieval of temporary traffic control devices from impound.

CHAPTER 5

EXISTING TRAFFIC CONTROL DEVICES

During temporary traffic control operations, existing traffic control devices must remain compatible with the traffic restrictions imposed. These include signs, traffic signals, and pavement markings. Some devices will remain in operation while others must be covered, relocated, or removed. Requirements for each group of devices are detailed in this section.

A. TRAFFIC SIGNS

The Permittee shall maintain all existing STOP, YIELD, and street name signs erect, clean and in full view of the intended traffic ***at all times.*** If these signs interfere with construction, the Permittee shall temporarily relocate the signs to permit construction, but the devices must be kept in full effective view of the intended traffic. Portable signs may be used to supplement these signs in unusual situations.

Other applicable signs shall also be maintained erect, clean and in full view of the intended traffic by the Permittee at all times. Existing signs that are no longer applicable shall be removed, without damage, by the Permittee and salvaged on the adjacent property line. ***The Transportation Services Division shall be notified immediately of all sign removals.***

When construction is complete, the Transportation Services Division will reset all needed signs at permanent locations. ***The Project or Permit Inspector shall notify the Transportation Services Division for sign replacements prior to completion***.

B. TRAFFIC SIGNALS

The Permittee shall notify the Construction Services Division of the Engineering Services Department (City Construction Inspector) <u>and</u> the Transportation Services Division of the Public Works Department (Traffic Signal Maintenance Supervisor) not less than 48 hours prior to the start of any underground construction in the vicinity of signalized intersections.

The Permittee shall maintain existing traffic signal equipment and street light luminaires fully operational, and in full view of the intended traffic at all times, unless otherwise specified in this manual, or in the City Project or Permit plans and specifications.

Vehicle detector sensing devices may be de-activated when necessary for construction. They shall, however, be replaced by the Permittee when work is completed. Prior approval is required for de-activating sensing devices. The request must be accompanied by a full explanation of why it is necessary to do so, what alternative procedures shall be used to accommodate traffic, and what efforts are being made to minimize the time the detectors will be out of service. Left-turn arrows shall be de-activated when left-turn prohibitions are in effect. If signals cannot efficiently operate without sensor loops, the Permittee may have to employ, at their cost, alternative detection devices at the request of the Transportation Services Division. Twenty-four hour advance notice to the Traffic Signal Maintenance Supervisor is required for this type of work.

The Traffic Signal Section will, upon request, provide the approximate locations of all underground signal equipment (conduits, junction boxes, vehicle detector sensing devices, etc.). The exact location

of underground equipment shall be determined by the Permittee prior to excavation.

The Permittee shall exercise due care to prevent damage to existing traffic signal equipment. Should damage occur, the Traffic Signal Section must be notified immediately so they can make the necessary repairs to restore traffic signal operation.

Responsibility for permanent repair or replacement of damaged equipment shall be:

- At the Permittee's expense when the approximate location of the damaged equipment is made known to them. They will also be charged by the City for any necessary temporary repairs. Permanent repairs or replacements must be made by a qualified electrical contractor to the satisfaction of the Traffic Signal Maintenance Supervisor.

- At the City's expense when the approximate location of the damaged equipment was not made known to the Permittee; ***provided full compliance with the notification requirements of this section and requested underground locations occurred.***

When existing traffic signal equipment cannot be maintained, the Permittee ***shall, at their expense,*** have a qualified electrical contractor move said equipment to a temporary location, or provide additional temporary equipment to ensure all functions and indications of the existing signal equipment, except vehicle detector sensing devices, are maintained and in full view of the intended traffic at all times. The location and type of all temporary signal equipment must be approved by the Transportation Services Division

Signal equipment relocation or the installation of temporary signal equipment shall be coordinated with the Traffic Signal Maintenance Supervisor by the Permittee a minimum of ***24 hours*** in advance of doing the work.

When temporary or new equipment is installed to replace existing equipment, it shall be fully operational before the existing equipment is removed.

The Permittee shall restore all signal control equipment to the original locations, or new specified locations, as soon as possible after all the work in the immediate area is completed.

C. PAVEMENT MARKINGS

Existing pavement markings that may cause driver confusion and conflict with the vehicle path indicated by barricades and channelization devices shall be removed or obliterated by the Permittee as directed by the Transportation Services Division. Prescott purposefully requires use of portable traffic control devices. Under normal conditions, these devices will be sufficient to prevent confusion. Accordingly pavement marking obliteration will normally only be required on long term or high speed construction projects such as detours, special channelization for bridge construction, realignment for building construction, and similar fixed location projects. However, the City of Prescott may require the removal or obliteration of existing pavement markings required at any location when visual inspection and/or collision history shows driver confusion exists due to pavement markings.

Proper pavement marking removal or obliteration will leave a minimum of pavement scarring. Sandblasting, high pressure washing, grinding, or other methods may be used to remove existing

markings.

Note: *Only water blasting and/or grinding are an acceptable method of removal.*

When used, slurry seal shall be applied over existing markings in passes at least 24 inches wide. Markings that become exposed shall be recovered with slurry seal. Painting over existing markings with black paint or asphalt material is prohibited, except for short durations during emergency situations.

CHAPTER 6

TEMPORARY TRAFFIC CONTROL

Temporary traffic control is used to delineate hazards, alert and guide motorists, and protect pedestrians and workers. Types fall into six basic categories:

- Signs
- Barricades and Channelizing Devices
- High-Level Warning Devices
- Pavement Markings
- Police Officers and Flaggers
- Portable Barriers

The Permittee shall provide and maintain all necessary temporary traffic control devices, including regulatory signs, to protect and guide vehicles, pedestrians and workers during traffic restrictions.

Storing barricading in the public right-of-way is a privilege which may be extended for the purpose of economy and as a convenience. The name and phone number of the responsible party who will assure take-downs and set-ups are done in strict accordance with all provisions contained in the *TBM* and shall be provided with each request to use the pubic right-of-way for this purpose. This should almost always be the same name and number indicated on each Type I, II, and III barricade. Temporary traffic control devices are portable and need reasonable supervision to correct vandalism or displacement from weather, etc. Temporary traffic control shall not be stored on the right-of-way unused for extended periods of time. Temporary traffic control must be checked at least once per day, including weekends, by the responsible party who must also be willing to provide 24-hour correction of deficiencies. Unless otherwise designated the city's contact will be with the responsible party stenciled on the devices. If no response is forthcoming, the barricade company who owns the barricades will be called to correct the situation.

Temporary traffic control physical devices shall be manufactured in a workmanlike manner to conform to the *MUTCD.* Stenciled signs are not allowed except during emergency conditions. All devices used on Prescott streets must be crash worthy and designed to not pose a hazard to workers, pedestrians, bicyclists, or motorists. Upon impact, these devices should not cause a vehicle to either lose control or change direction.

The City of Prescott fully supports the ***Quality Standards for Work Zone Traffic Control Devices, 1993*** published by the American Traffic Safety Services Association (ATSSA). These standards include photographs of varying conditions of signs and barricades.

The City of Prescott will not allow devices that, in its sole judgment, fall into the "Unacceptable" category, and may require the replacement of devices in the "Marginal" category.

PLEASE SEE FULL COLOR INSERT

Temporary traffic control devices shall be:

- Installed prior to the start of all restrictions
- Properly maintained and operated when restrictions exist
- Kept clean and fresh appearing at all times
- Kept in place only as long as needed and removed ***immediately*** thereafter.

Wherever staged construction is occurring, only devices applicable to the current stage shall be in place. All signs that do not apply to the specific type of construction taking place shall be removed, covered, or turned away from traffic by the contractor, utility or other agency, so as not to be readable by oncoming traffic. Portable signs should be turned away from traffic at more than a ***45*** degree angle (enough to make sure the sign is not readable, but not so far that the edge of the sign is unnoticeable and becomes a potential hazard).

SPECIFIC PLACEMENT AND STORAGE OF BARRICADE/SIGN DEVICES ON PUBLIC RIGHT-OF-WAY WHEN NOT IN ACTIVE USE

Property dedicated for public roadways is for the benefit of the public at large, and the right-of-way needs to be kept clear for important public uses rather than for private benefit. All stored barricade/traffic control devices shall be strategically placed so as to "cluster" the devices in compact groups and placed in such a manner which does not cause additional obstructions to the public. Please refer to the applicable accompanying photographs contained herein where "clustered" barricades are evident. By applying the "cluster" method of barricade storage, liability risks will diminish for all involved in construction and maintenance activities and enhance the aesthetic appearance of this great City.

Removal of advance warning signs and other associated temporary traffic control devices from public view when no longer in use and/or applicable.

Advance warning signs and barricade devices shall be immediately removed from drivers' sight lines when no longer in use and/or applicable

Channelization, including "KEEP RIGHT" signs placed at frequent enough intervals that the proper message is self-evident to drivers, shall be provided whenever:

- traffic is moved across the street center line
- the existing center line is obliterated, or
- opposing traffic is maintained in other than the normal traffic lanes.

Where existing or new signing and/or pavement markings must be installed or replaced, temporary traffic control devices shall be provided and maintained by the Permittee until the permanent work is completed.

All temporary traffic control devices shall be stabilized with sandbags or other approved material (ballast), when necessary. Ballast shall be placed on lower parts of the frame, or on the base, and shall not be placed on top of any striped rail. The use of rocks, concrete blocks, concrete or asphalt chunks, etc. as ballast is prohibited.

A. SIGNS

Signs are a very important part of temporary traffic control being used to alert, advise, and guide motorists and pedestrians. Temporary traffic control signs are necessary, and must be placed in advance of traffic restrictions and whenever motorists have to change their path of travel. It is especially important to use warning signs well in advance of traffic restrictions, placing them to convey the intended message most effectively.

Temporary traffic control signs fall into the following three major categories:

- Regulatory Signs
- Warning Signs
- Guide Signs

Most signs to be used in temporary traffic control zones are included in this *TBM;* however, other signs included in the *MUTCD* or alternative signs pre-approved by the Transportation Services Division may be used. Each sign shall be displayed only for the specific purpose described in this *TBM* and as indicated by the sign legend. Uniformity of signs and sign usage is necessary so that similar situations will also be marked with the same type of sign whenever such situations occur, and motorists are conditioned to the action indicated by the signs.

Temporary traffic control signs for construction and maintenance operations follow the basic standards for all traffic signs as to size and shape. However, Warning and Guide signs in construction and maintenance areas shall have a black legend on an orange background. Color for other signs shall follow the standards set by the *MUTCD.*

Minimum sign sizes, colors, and shapes are shown in the following illustrations. The size and stroke of the legend or symbol shall be the largest possible as permitted by the size and design of the sign consistent with good legibility. The guidelines set forth in the *MUTCD* should be followed whenever practical.

The dimensions of signs shown herein are standard sizes, which may be increased when necessary for greater legibility or emphasis. Deviations from the standard sizes set forth herein shall normally be in six-inch increments.

Signs mounted on posts along the side of the street (street-side supports) shall be at least six inches larger per dimension unless otherwise indicated in the sign illustrations.

Experience has proven that flags mounted on the first warning sign entering a work zone can be helpful due to enhanced visibility. Two orange or fluorescent red-orange flags, 16 inches square or larger, shall be mounted on the first of the series of street-side sign supports, and on the first in the series of portable signs used for *advance* warning. If double signing is provided (both right side and left side), the two signs placed first in the series of advance warning shall have flags. The flags add substantial daytime emphasis, but are not as effective during hours of darkness. Because fluorescent orange warning signs have proven to provide additional nighttime target value, and their uniqueness likely attracts more attention to them, they may be used instead of flagging the first sign(s) in the advance warning sign series.

All signs used during hours of darkness shall:

- Be retroreflectorized with smooth surface weather-proof retroreflective sheeting.

- Be equipped with operating Type A flashing barricade warning lights when mounted on portable supports.

- Be equipped with operating Type B flashing warning lights when mounted on street-side supports for advance warning at major street construction projects.

- Have a minimum application of 150 square inches of orange weather-proof retroreflective sheeting on the back of signs exposed to opposing traffic. The retroreflectorized sheeting shall be placed in strips not less than 5 inches wide along each outer edge of the sign. Signs placed in two-way left-turn lanes shall have at least one Type I barricade placed a maximum of 10 feet behind the sign to alert opposing traffic.

  All signs shall be mounted on suitable supports with minimum heights to the bottom of signs as follows:

Signs Mounted on Portable Supports

- ***Regulatory*** – 36 inches, except R4-7a and 8a (KEEP RIGHT/LEFT), R11-7, 8 and 1 l (SIDE-WALK CLOSED/ PEDESTRIANS), which shall be 18 inches, and R11-7A (SIDEWALK CLOSED AHEAD CROSS HERE) which shall be 24" x 30".

- ***Warning*** - 12 inches, except WJ-6 (TARGET ARROW) which shall be 36 inches

- ***Guide*** - 24 inches.

- ***Combination Regulatory and/or Warning*** -12 inches.

Signs Mounted on Street Side Supports (Post Mounted)

- ***All signs*** -to be mounted at a height of 7 feet.

Barricades, vertical panel channelizing devices, and flag type high level warning devices are acceptable portable sign supports. When flag type high level warning devices are used as sign supports, they shall be provided in addition to those required in Chapter 6, Part C of this *TBM*. Approved ballast shall be placed on the base of all portable signs that are unattended.

Metal and wood sign posts, such as those commonly used to mount permanent traffic signs, and steel streetlight poles are acceptable street side sign supports. Signs shall not be mounted on wood utility poles. Street side signs should not normally be placed in sidewalks or walkways. However, if absolutely necessary, care shall be taken to minimize interference with pedestrians.

As a general rule, portable signs shall be located on the right side of the street when right-lane traffic is

restricted, and on the center line or median, when left-lane traffic is restricted. Street side signs shall be located on the right side of the street and in protected medians. Where special emphasis is required, and where more than one lane of traffic in any one direction is affected, dual signs should be provided approximately opposite each other. Care ***shall*** be taken when signs are placed in the two-way left-turn lane, to not obstruct driveways or intersecting streets.

Portable supports should be used for short-term and moving operations. Street side supports shall be used for construction speed limit and advance warning signs on long-term, fixed construction operations, such as major street reconstruction.

For maximum mobility on certain types of construction and maintenance operations, signs may be mounted on a vehicle stationed in advance of the work, or moving along with it. This may be the working vehicle, pavement marking equipment, or crack sealing equipment, or a vehicle provided expressly for this purpose.

Mobile sign displays, such as changeable message signs and arrow panels, may be mounted on a trailer. Experience has proven the effectiveness of providing advanced notice of projects though the use of electronic changeable message signs. This notice is typically given seven days in advance of the work. Careful attention needs to be given in the placement of these signs so they do not impede pedestrian activity, block driveway access, or create visibility obstructions. These signs may be provided with self-contained electric power units for flashers and lights, or mounted on a regular maintenance vehicle. Vehicles used solely for mobile sign display should be equipped with an impact attenuating device to provide additional safety for workers and motorists.

1. Regulatory Signs

Regulatory signs impose legal obligations or restrictions and are enforceable by the Police Department. To be enforced, their use must be approved by the Transportation Services Division. Special care must be used to insure proper use, maintenance, and ***removal*** of all regulatory signs in a timely fashion. Conflicting existing regulatory signs shall be covered or removed.

All regulatory signs shall be provided by the Permittee. Commonly used signs are illustrated in ***Figures 1 and 2, Pages 17 and 18).***

Regulatory signs used in construction and maintenance areas shall be of the shapes and colors shown in the illustrations. They shall be used as follows:

Turn Restrictions:

- NO LEFT (RIGHT) TURN signs are used whenever turns may cause excessive congestion at intersections during restrictions. There shall be a minimum of two (one on the near side and one on the far side of the intersection) for each direction of traffic affected.

- Mandatory turn signs are used to show motorists when they must turn right or left from a special turning lane, separated from the through traffic lane. There shall be a minimum of two signs (one in advance and one at the intersection) for each direction of traffic affected. These must always be used in conjunction with the W12-l lane split sign, otherwise motorists may be led to believe through lanes exist on both sides of the sign.

Speed Limits:

- The combination "WORK ZONE" and "SPEED LIMIT #" sign is used to inform drivers of reduced speeds. Past practice has confirmed this to be an effective method of gaining compliance with reduced speed limits necessary in temporary traffic control zones. "SPEED LIMIT #" signs shall always be co-mounted with "WORK ZONE" signs when reducing speed limits in construction areas. There shall be a minimum of one in advance of construction, and a minimum of three signs per one-half mile for each direction of traffic affected. The large, post-mounted "WORK ZONE" and "SPEED LIMIT #" signs on posts at the side of the street shall be used in all major street reconstruction areas. At other locations, small signs on portable supports may be used. Existing conflicting "SPEED LIMIT #" signs shall be covered or removed.

- The "SPEED LIMIT *25"* sign is used where the existing pavement has been removed or where traffic is being maintained on temporary detour roads, on unpaved shoulders, or on traffic lanes that are severely restricted.

- The "SPEED LIMIT *35"* sign is used in advance of the "SPEED LIMIT *25"* sign when reducing existing speed limits from 40 and 45 miles per hour.

- Speed limits set by State law shall not be reduced in increments greater than 10 miles per hour. The "SPEED LIMIT 35" sign is also used for interim speed reduction in construction areas until construction progress requires *25* miles per hour. The "SPEED LIMIT *35"* is also used where traffic is being maintained on new asphalt paving during the completion of street paving projects and in most construction zones on improved streets where restricted traffic is maintained on a reduced number of lanes.

- The "SPEED LIMIT 45" sign is used when reducing speeds from 50 and 55 miles per hour.

Street Closures:

- The "STREET CLOSED TO THRU TRAFFIC" (R11-4) sign shall be used for all complete closures of major and collector streets. When in use, the proper "DETOUR ARROW" and detour instructions (M4- 10) shall be displayed. "STREET CLOSED AHEAD" and "DETOUR AHEAD" signs shall be used a minimum of 300 feet and 600 feet, respectively, in advance of all major and collector street closures ***(see Figure 14, Page 54).*** Mandatory turn lanes approaching street closures shall be closed ***(see Figure 15, Page 55).***

- The "STREET CLOSED LOCAL TRAFFIC ONLY" sign shall be used for all local street closures, unless otherwise approved by the Transportation Services Division.

- The "ALLEY CLOSED" sign shall be used for all alley closures.

- The "DETOUR" sign with arrow shall be used to mark detour routes when required by the Transportation Services Division.

- The "OPEN TO LOCAL BUSINESSES" sign may be required where access becomes a problem on major and collector streets that are closed for construction. It is installed on a barricade adjacent to the "STREET CLOSED" sign when requested by the Transportation Services Division.

Other Regulatory Signs:

- "KEEP RIGHT (LEFT)" signs shall be used at, or near, the start of all channelization, except where the "DOUBLE ARROW" warning sign is used.

- The "KEEP RIGHT" sign shall be used on both sides of intersections where temporary center line channelization is required.

The "SIDEWALK CLOSED" sign and "PEDESTRIANS PROHIBITED" sign shall be used for walkway closures as provided for in Chapter 7 of this Manual. Special attention shall be given when contemplating closure of pedestrian paths, to assure that safe, accessible alternatives exist. Closures should only be requested and approved when necessary for safe construction. Even then, access to open businesses, and transit stops must be fully taken into consideration. When complete closure is necessary for safety, advance warning of the conditions should be given by carefully positioning a "SIDEWALK CLOSED AHEAD" sign, so as not to impede access and to allow a pedestrian alternative at another location. The pedestrian symbol/directional arrow sign shall be used to guide pedestrians to alternate walkways.

2. Warning Signs

Warning signs are used to notify motorists of specific hazards or restrictions in temporary traffic control zones. Within construction zones there may be a variety of conditions such as, reduced width, open excavations, or pavement removal. Motorists must be properly alerted well in advance to provide adequate time to react safely.

All warning signs shall be provided by the Permittee. Commonly used signs are illustrated in ***Figures 3 and 4, Pages 19 and 20.***

Warning signs used in temporary traffic control zones shall be diamond shaped, except as shown in the warning sign illustrations. They shall have a black legend and/or symbol on an orange background. The warning signs illustrated shall be used for only those situations indicated by their legend or symbol. Distances such as 500 feet, 1,000 feet, 1/4 mile, or 1/2 mile may be used in place of the word "AHEAD" on advance warning signs and numerals may be used in place of words (e.g. "2" instead of "TWO"). The "ROAD WORK AHEAD" sign shall be used in advance of all construction and maintenance areas in addition to other applicable warning signs. Minimum spacing for advance warning signs in advance of channelization should be equal to the taper lengths shown in ***Figure 5, Page 22.***

3. Guide Signs

Guide signs are used to direct motorists on detour routes and provide information in advance of street closures.

All guide signs shall be provided by the Permittee.

Guide signs used in temporary traffic control areas are generally rectangular; and shall have a black legend on an orange background.

Guide signs most frequently used are "DETOUR" signs with arrows, as shown with the "STREET CLOSED" signs in ***Figure 2, Page 18.*** –"DETOUR" sign and detour instructions are incorporated

into the design of the “STREET CLOSED TO THRU TRAFFIC” sign.

When required, the Permittee shall provide separate “DETOUR” signs, with the directional arrows, at locations along a specific detour route as directed by the Transportation Services Division. When required, detailed detour route instructions and/or State and Federal route symbols shall also be provided and attached to the detour signs.

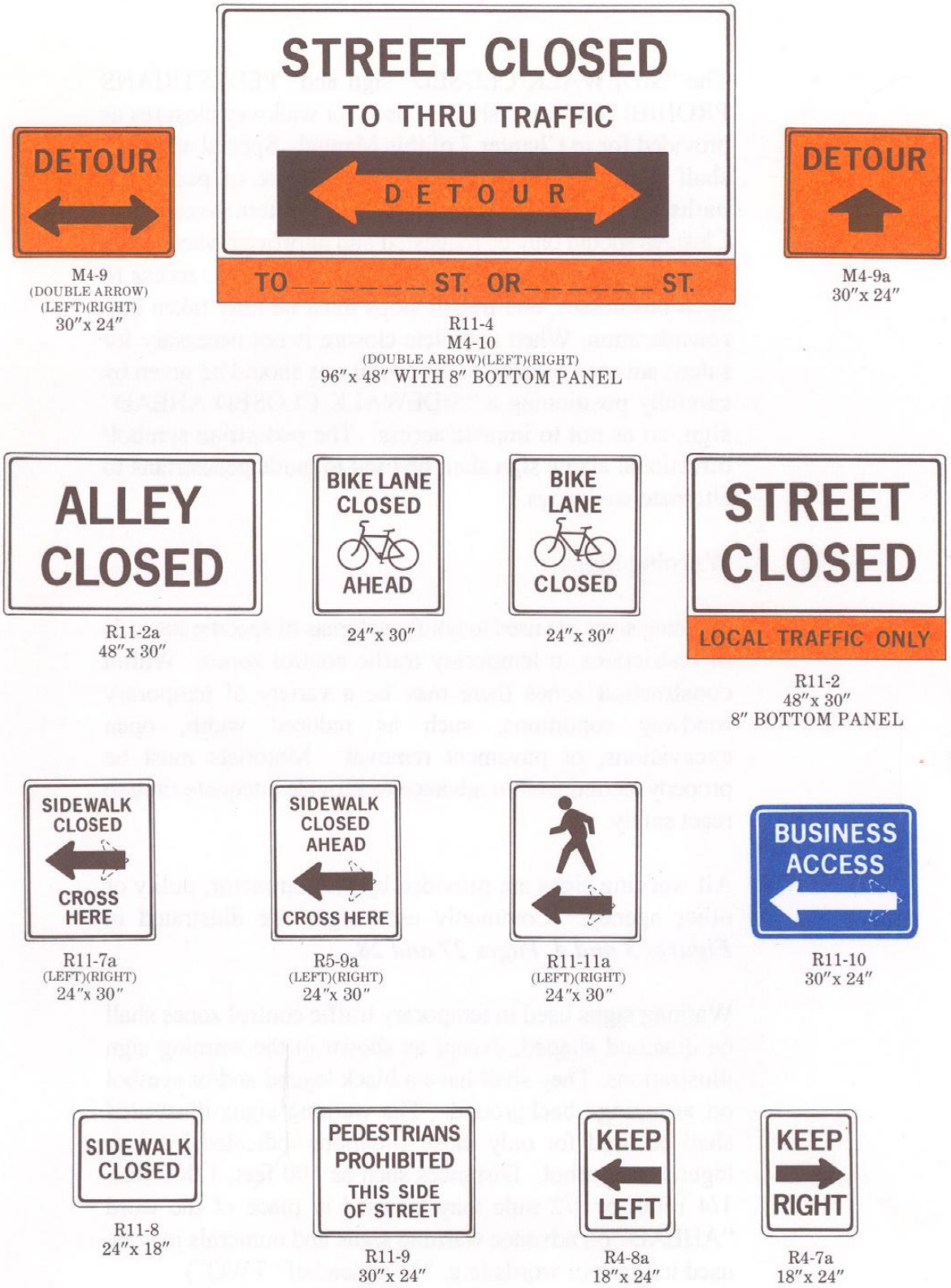
At times, when alternate detour routes for street closures are offset or points of closure are at locations where detours are not available, it is necessary to provide additional guide information signs. These signs generally have a legend similar to **“**SR-89 TO PRESCOTT LAKE PARKWAY NB CLOSED-USE SR 69 TO PRESCOTT LAKES PARKWAY”, with appropriate detour arrows. These signs shall be rectangular with a minimum size of 48 inches by 48 inches. The legend shall be black on an orange background.

SPEED LIMIT SIGN SIZES

Sign	City Street Post Mounted All Freeway & Expressway	City Street Portable
W20-6	36″x 36″	24″x 24″
R2-1	24″x 30″	18″x 24″

FIGURE 1

REGULATORY SIGNS



REGULATORY AND GUIDE SIGNS

FIGURE 2

WARNING SIGNS FIGURE 3

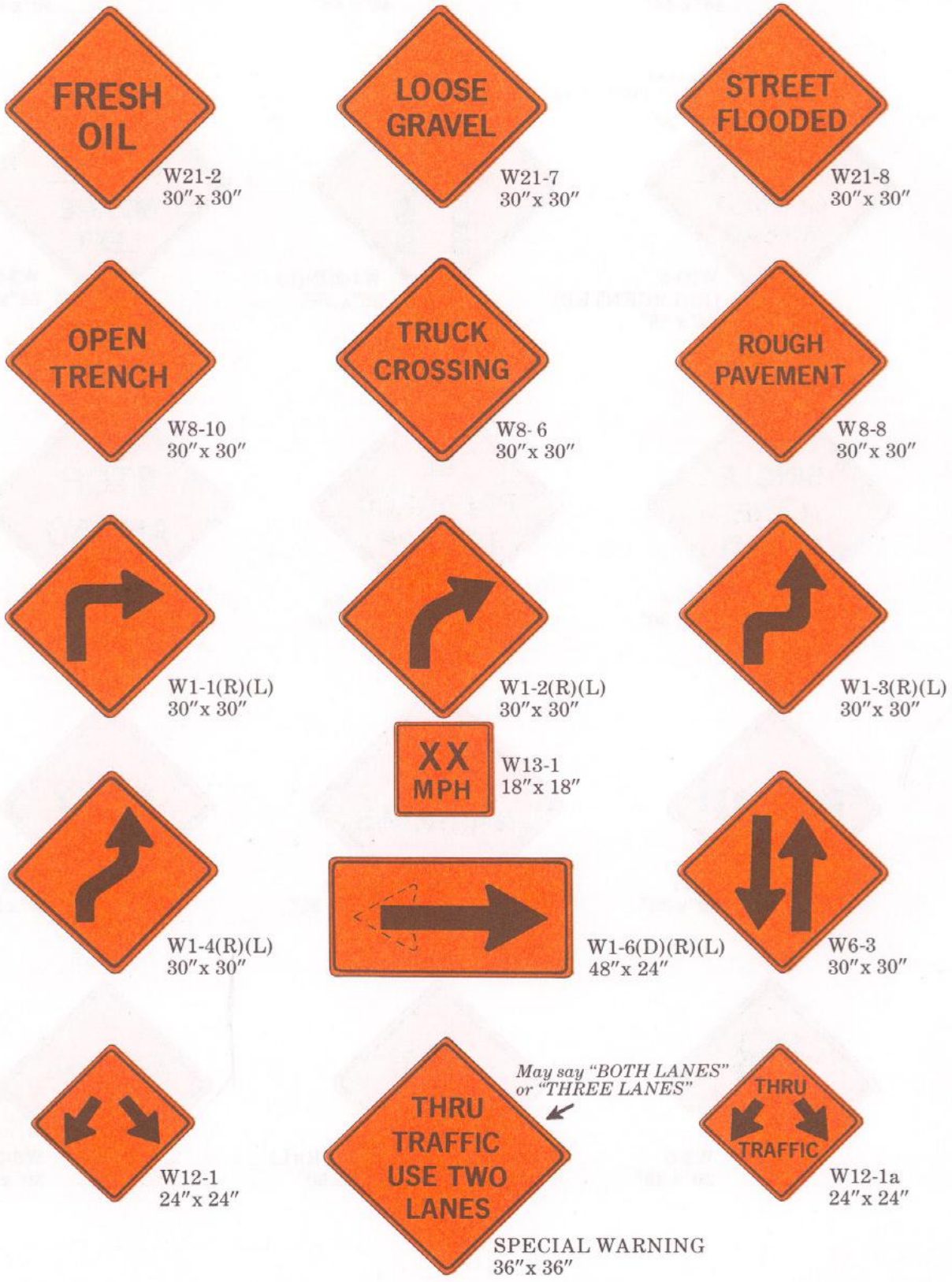


FIGURE 4

WARNING SIGNS

B. BARRICADES AND CHANNELIZING DEVICES

Barricades and channelizing devices are the most important part of temporary traffic control in construction and maintenance areas. They are used to warn and alert motorists of temporary restrictions, and to guide motorists and pedestrians through restricted areas. They are not intended to be physical barriers. Barricades and channelizing devices should always be used in groups to warn and guide traffic.

Rope, flagging, and woven plastic tape, may be used between barricades and channelizing devices in construction areas, to provide additional guidance and security. In some major construction areas and in areas with substantial pedestrian traffic, the use of plastic or metal (minimum height of 72") construction fencing may be necessary for maximum security.

Barricades and channelizing devices used to guide motorists must provide a smooth, gradual transition when moving traffic from one lane to another, onto a bypass detour, or when reducing the width of the street. This smooth, gradual transition is referred to as the "taper length." ***The minimum desirable taper length formulas, calculated taper lengths, and spacing of devices for tapers are shown in Figure 5, Page 22.***

Minimum desirable taper lengths apply to streets of relatively flat grade and straight alignment. Adjustments may be desirable to provide adequate sight distance on the approach to channelization and to accommodate cross streets and adjacent driveways. In urban areas characterized by short block lengths and driveways, longer tapers are not necessarily better than shorter ones. Extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily.

When more than one lane of traffic is diverted, a tangent length of channelization equal to twice the taper length should be used between the taper for each lane closed. ***(See Figure 25, Page 65).*** A tangent distance of one half the taper length should be used between tapers when diverting a single lane to an alternate alignment. ***(See Figure 27, Page 69).*** Spacing for devices used in tangent areas between tapers should be the same as the spacing for devices used in the adjacent tapers.

Barricades and channelizing devices are also used to protect workers in the street and to guide and protect pedestrians. Consequently, it is important that barricades and channelizing devices be substantial enough to provide protection, yet not so much as to cause severe damage to vehicles should a collision occur.

Typical uniform applications of barricades and channelizing devices are shown in the barricade illustrations included in this *TBM*. Situations not illustrated shall be handled consistent with the examples and discussions set forth herein.

FORMULAS FOR TAPER LENGTH

Speed Limit	Formula
40 mph or under	$\frac{WS^2}{60}$
45 mph or over	L-WS

L = Length of Taper W = Width of Lane S = Posted Speed Limit

TAPER LENGTH, AND DISTANCE BETWEEN DEVICES

Speed Limit (mph)	Taper Length (L) (feet) **			Maximum Distance between devices (feet)	Minimum Number of Devices Needed
	10' Lane	11' Lane	12' Lane		
25	104	115	125	25*	6
30	150	165	185	30	7
35	204	225	245	35	8
40	267	293	320	40	9
45	450	495	540	45	13
50	500	550	600	50	13
55	550	605	660	55	13

** Distance between **Traffic Cones** used for tapers shall not exceed 25 feet, regardless of speed.*

*** Advance warning signs shall be placed a minimum of Distance (L) in advance of taper.*

FIGURE 5

1. Barricades

Barricades approved for use in the City of Prescott shall be of three types: Type I, II and III. ***(See Figure 6, Page 24).*** Markings for all barricade panels shall be alternate orange and white stripes sloping down at a *45* degree angle to the side on which traffic is to pass. Both stripes (orange and white) shall be retroreflective with smooth surface weatherproof sheeting.

All barricades shall be constructed of suitable materials in a workmanlike manner to the dimensions shown in ***Figure 6, Page 24.*** Barricade supports shall be substantial enough to support what they must hold up.

Type I and II barricades are intended for use where traffic is maintained through construction and maintenance areas. Type I and II barricades are also used to delineate hazards in or near the street or sidewalk, to close local and collector streets, to close sidewalks and alleys, and to channelize traffic. When used to ***delineate hazards*** parallel to traffic, spacing should not exceed ***75 feet.*** When used to close streets, sidewalks, and alleys, spacing should not exceed ***5 feet.***

Type I and II barricades used to channelize traffic shall be placed on a taper to guide motorists past hazards. Taper lengths and barricade spacing should be as shown in ***Figure 5 Page 22.***

Type III barricades are used for complete street closures of major streets when they are under construction. They shall be placed with a minimum of one on each side of the "STREET CLOSED TO THROUGH TRAFFIC" sign, and one centered on the back of the sign. Additional Type III barricades shall be used as required to close the street to through traffic.

Barricades used in the right-of-way during hours of darkness shall have an approved barricade warning light attached, and operational. The warning light shall be mounted above the top panel and on the end of the barricade closest to traffic. Type A flashing warning lights shall be used to delineate hazards and close streets, sidewalks, and alleys. Type C steady burn warning lights shall be used in a series to channelize traffic and to guide traffic through construction areas.

Type I, II and III barricades shall have the responsible party's (contractor, utility or other agency) name and phone number placed near the bottom of the lowest panel as illustrated in ***Figure 6, Page 24.*** The letters shall be clearly legible and not less than one inch nor more than two inches in height.

2. Barricade Warning Lights

Barricade warning lights are alerting devices used with other traffic control devices for advanced warning of unexpected restrictions, and to guide motorists when entering and driving through restricted areas. They shall be mounted on all signs, barricades, and channelizing devices, as specified in this *TBM.* Barricade lights shall be in operation during hours of darkness.

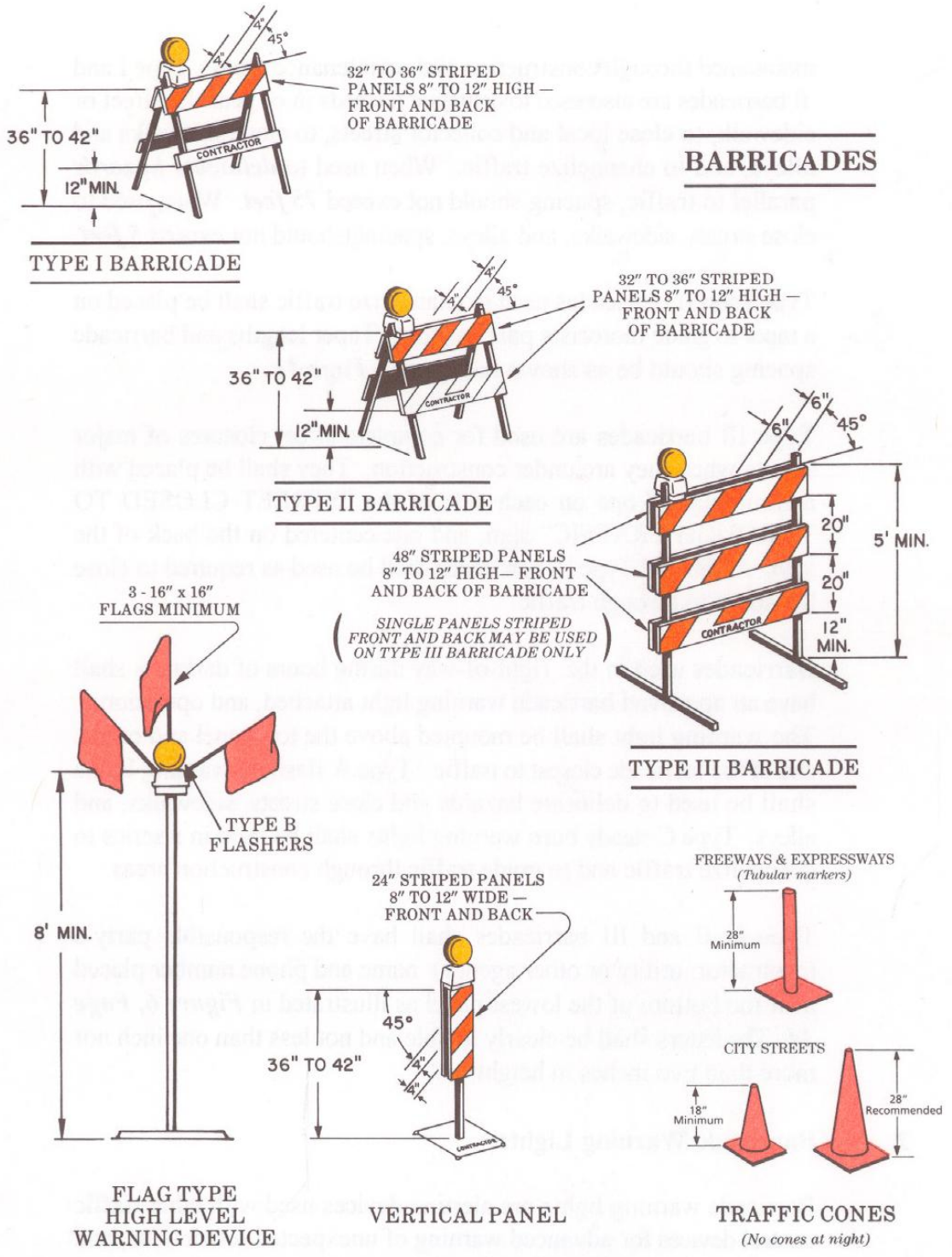


FIGURE 6

BARRICADES AND CHANNELIZING DEVICES

Barricade warning lights are portable, battery operated, lens directed enclosed devices, commonly referred to as either ***Type A Low Intensity Flashing Warning Lights, Type B High Intensity Flashing Warning Lights, or Type C Steady Burn Warning Lights.*** Warning lights shall have seven inch diameter lenses that emit a yellow light. They shall comply with the current Institute of Transportation Engineers Purchase Specifications for Flashing and Steady-Burn Warning Lights," as required in the *MUTCD.*

Barricade warning lights must be maintained so as to provide adequate advance warning to alert and guide motorists and pedestrians in restricted areas.

Type A Low Intensity Flashing Warning Lights shall be used on all signs that are mounted on portable supports, and barricades and vertical panel channelizing devices used to mark hazards and close streets. Type A warning lights shall not be used on devices intended to guide traffic.

Type B High Intensity Flashing Warning Lights shall be used on all advance warning signs for major street construction when mounted on street side supports and on all "Flag Type" High Level warning devices when used at night.

Type C Steady Burn Warning Lights shall be used on barricades and vertical panel channelizing devices used to guide traffic, form tapers, and delineate center lines, lane lines, and the edge of the traveled way. Type C warning lights may be used on devices to mark hazards, but are considered less effective than flashing lights for this purpose.

3. Channelizing Devices

Channelizing devices used in the City of Prescott are divided into the following three basic types:

a. Traffic Cones

Traffic cones are effective for ***daytime*** channelization of traffic and to delineate minor maintenance areas. When traffic cones are used, it is necessary to check them often as they are frequently moved by vehicles. Cones 28 inch or taller shall be used. 18 inch cones may be substituted only on Local streets during daytime hours. Cones are normally not suitable for nighttime use, except under emergency conditions, or special circumstances approved by the Transportation Services Division. When cones are used at night, they must have reflective sleeves as called for in the *MUTCD*. Cones 28 inches in height (with sleeves) have been approved for night use in Downtown Prescott where the cones are under direct police supervision, the lighting is sufficient, and traffic speeds are low.

Traffic cones shall be conical in shape and generally with a square weighted base. ***(See Figure 6, Page 24)***. The predominant color of the device shall be orange or fluorescent red-orange. For use on collector and arterial City streets, conical devices shall have a minimum height of 28 inches. Larger devices should be used on high volume streets when additional traffic guidance is needed and where smaller devices may be disturbed by vehicles.

When traffic cones are used to channelize traffic, they shall be placed on a taper to guide motorists past hazards. Taper lengths should be as shown in *Figure 5, Page 22. Spacing between cones used to channelize traffic should not exceed 25 feet, regardless of speed.*

Traffic cones are used to channelize traffic, divide opposing traffic lanes, divide traffic lanes when two or more lanes are open in the same direction, and delineate minor maintenance operations. When traffic cones are used to divide traffic lanes or delineate minor maintenance operations, spacing should not exceed *50 feet.*

b. Vertical Panel Channelizing Devices

Vertical panel channelizing devices are extremely effective for 24-hour channelization. Used instead of traffic cones for channelization during hours of darkness, they are versatile because their height and amount of retroreflective sheeting give them substantially more target value than normal pavement markings. They are portable, light weight, and use less street width than barricades. Professional experience indicates that vertical panels, when properly placed, dominate existing pavement markings, provide positive guidance, and permit existing pavement markings to remain on short term projects without driver confusion.

Markings on vertical panel channelizing devices shall be alternate orange and white stripes, sloping down at a *45* degree angle to the side on which traffic must pass. When used to divide two traffic lanes in the same direction, the stripes shall slope down to the side on which traffic is being diverted. ***(See Figure 26, Page 67 &68).*** Both stripes (orange and white) shall be reflectorized with smooth surface weatherproof retroreflective sheeting.

Vertical panel channelizing devices shall be constructed of suitable material in a professional manner to the dimensions shown in ***Figure 6, Page 24.*** The base and panel support shall be substantial, designed to prevent overturning and be crashworthy. Because the base can be an obstacle to traffic when overturned, the base and support should be designed to minimize damage to a vehicle if struck. The base and panel support shall be galvanized, aluminum, or white in color, except rubber bases, which may be black. The Permittee's name and phone number shall be placed on the top of the base or on the support. The letters shall be clearly legible and not less than one inch nor more than two inches in height.

Vertical panel channelizing devices are used to channelize traffic, divide opposing lanes of traffic, divide traffic lanes when two or more lanes are maintained open in the same direction, and in place of barricades where space is limited.

When vertical panels are used to channelize traffic, they shall be placed on a taper to guide motorists past hazards. Taper lengths and vertical panel spacing should be as shown in ***Figure 5, Page 22.***

When vertical panel channelizing devices are used in place of barricades to ***delineate hazards*** parallel to traffic, spacing should not exceed ***50 feet.*** When used to divide opposing lanes of traffic or divide two or more lanes traveling in the same direction,

spacing should not exceed ***75 feet*** for short distances and ***150 feet*** for extended distances.

Vertical panel channelizing devices used in the right-of-way during hours of darkness, shall have an approved barricade warning light attached, and in operation. The warning light shall be mounted above the marked panel. Type C steady burn warning lights shall be used in a series to channelize traffic, to divide opposing traffic, separate traffic lanes, and guide traffic through construction areas. Type A flashing warning lights shall be used to delineate hazards.

c. Drums

Drums are most commonly used to channelize or delineate traffic flow, but may be also used in groups to mark specific hazards. Drums are highly visible and have good target value, giving the appearance of being formidable obstacles, thereby commanding the respect of drivers. Their primary disadvantage is their size, which makes them difficult to use on City streets with narrow traffic lanes. Drum spacing used to delineate hazards, close streets, and channelize traffic shall be the same as specified for Type I and Type II barricades. Drums are portable enough to be moved from place to place in order to accommodate changing conditions. However, they are generally used in situations where they will remain in place for a prolonged period of time. When drums are placed in the roadway, appropriate advance warning signs shall be used.

Drums used for traffic warning or channelization shall be approximately 36 inches in height and a minimum of 18 inches in diameter. Drums shall be made of plastic or other flexible material that will not cause serious damage if struck.
Use of metal drums is strictly prohibited.

Markings on drums shall be horizontal, circumferential or orange and white alternating stripes, 4 inches to 8 inches wide. Both stripes shall be reflectorized with a smooth surface weatherproof sheeting, which will display the same approximate size, shape, and color, day and night. There shall be at least two orange and two white stripes on each drum. If there are non-reflectorized spaces between the horizontal orange and white stripes, they shall be no more than 2 inches wide.

Drums should not be weighted with sand, water or any material to the extent that would make them hazards to motorists, pedestrians, bicyclists or workers. Water shall not be used in times susceptible to freezing. Open drums should have drain holes in the bottom so water will not collect.

During hours of darkness, a flashing warning light shall be placed on each drum used to mark hazards, and steady burn warning lights should be placed on drums used for traffic channelization.

Arrow signs (W1-6) or vertical panels mounted above drums may be used to supplement drum delineation.

C. HIGH LEVEL WARNING DEVICES

High level warning devices (flag trees) are used to alert motorists of obstructions in streets. These devices are designed to ensure that they can be seen over the top of preceding vehicles.

The height is particularly effective in diverting traffic around obstructions.

High level warning devices are required in advance of all lane closures and can be helpful in other circumstances such as new construction, pavement patching, manhole work, surveying, cranes, excavations, etc. High level warning devices may be attached to a vehicle located at, or in advance of, the obstruction. On fixed location projects, required high level warning devices should be placed within or behind the channelization in the center of the area closed. Arrow panels are so dominant that they may take the place of high level warning devices, and where possible should be placed in the parking lane at the beginning of the taper. If this placement is not possible, ***arrow panels may be placed in the closed lane behind the channelization used to transition traffic.***

High level warning devices used in the City of Prescott are divided into three basic types:

1. Flag Type High Level Warning Devices

Flag type high level warning devices shall display three or more flags supported so that the lowest point of all three flags is 8 feet or more above the street. ***(See Figure 6, Page 24).*** The flags shall be orange or fluorescent red-orange in color, and 16 inches square or larger. The flag support and base shall be substantial, to resist overturning by wind. The flag support and base shall be galvanized, aluminum, or white in color.

During hours of darkness, each flag type high level warning device must be equipped with a minimum of one Type B High Intensity Flashing Warning Light mounted more than 8 feet above the street. If equipped with a remote battery, the battery shall be mounted at the base, at ground level, to provide additional stability.

One flag type high level warning device is required for each direction of traffic affected. The devices shall be placed within or behind the channelization, in the center of the area closed. Additional flag type high level warning devices may be used as sign supports. They shall be placed at the location required by the sign legend.

2. Rotating Flasher and Strobe Light Type High Level Warning Devices (typically vehicle-mounted)

Electrically operated, rotating Sealed Beam or halogen lamp flashers, or strobe light flashers, may be used instead of, or in addition to, flag type high level warning devices.

Rotating Sealed Beam flashers shall consist of one or more Sealed Beam units at least four inches in diameter, rated at a minimum of 30,000 candlepower each. They shall emit a yellow light with a flash rate of 70 to 110 flashes per minute.

Halogen lamp flashers shall consist of one or more halogen lamps with a minimum rating of 50 watts, generating 50,000 candlepower each, reflected in a rotating or alternating pattern by high quality parabolic reflectors. They shall emit a yellow light with a flash rate of 70 to 120 flashes per minute. Strobe light flashers shall be rated at a minimum of one million candlepower at the bulb. They shall emit a yellow light with a flash rate of 80 to 120 flashes per minute.

Rotating flashers or strobe lights shall be mounted on a vehicle or other substantial

support. When possible, they shall be mounted at a minimum height of 8 feet above the street.

The vehicle or other support with flashers in operation shall be positioned behind the required channelization, and in the center of the area closed, except when used on a moving service vehicle.

Use of rotating flashers or strobe light type high level warning devices is particularly desirable during hours of darkness. They should be used instead of the flag type high level warning device, with flasher attached, whenever possible.

3. Advance Warning Arrow Panel

Advance warning arrow panels, designed to flash directional arrows or chevrons, may be used instead of other types of high level warning devices. Arrow panels may be required by the Transportation Services Division. Arrow panels provide additional advance warning and directional information to assist in diverting traffic, and are especially effective under high volume traffic conditions and at night.

BECAUSE OF THEIR TARGET VALUE, USE OF ARROW PANELS ARE REQUIRED FOR NIGHTTIME LANE CLOSURES ON MAJOR STREETS (Major Arterial and Arterial Streets as identified on the latest official Street Classification Map). Exception to use are emergency situations, when otherwise determined by the Transportation Services Division, or when falling under the "short term criteria for service vehicles. *(See Chapter 9, Page 50).* Arrow panels may be approved or required by the Transportation Services Division when geometric conditions prevent the standard advanced warning and taper/tangent distances from being applied.

Advance warning arrow panels shall meet the following specifications from the MUTCD*:*

Type	Minimum Size	Minimum Number of Sealed Beams Lamps	Minimum Legibility Distance
A	24" x 48"	12	½ Mile
B*	30" x 96"	13	¾ Mile
C	48" x 96"	15	1 Mile

The minimum legibility distance for various traffic conditions is based on the decision sight distance concept.

Minimum legibility distances are those at which the arrow panel message can be comprehended by a driver on a sunny day or clear night. Also shown are the arrow panel sizes needed to meet the legibility distance needs.

Type A advance warning arrow panels are appropriate for use on low speed urban streets. Type B arrow panels are appropriate for intermediate speed facilities and for moving operations on high-speed roadways. Type C arrow panels are intended to be used on freeways and expressways, however, they may be used on City streets when additional warning is desirable.

*Arrow panels shall be rectangular, except Type B arrow panels used on moving service

vehicles, which may be arrow shaped. Arrow panels shall be of solid construction and finished with a non-reflective flat black surface. Arrow panels shall be mounted on a vehicle, trailer, or other suitable support with self-contained electrical source. Vehicle-mounted panels should be provided with remote controls.

Minimum mounting height should be 8 feet above roadway to the bottom of the panel, except on vehicle mounted panels, which should be as high as practicable.

Arrow panels should have the capability of the following mode selections: (1) left or right flashing or sequential arrows or left or right sequential chevrons, (2) double flashing arrows, and (3) caution mode. The caution mode shall be used when arrow panels are in operation when arrow or chevron indications would encourage vehicle conflicts, such as on two-lane streets.

The caution mode consists of four or more lamps arranged in a pattern, which will not indicate a direction

Arrow panels shall be capable of a minimum of 50% dimming from their rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.

Minimum lamp on time shall be 50% for the flashing arrow and 25% for the sequential chevron.

The arrow panel lamps shall be recess mounted or equipped with an upper hood of not less than 180 degrees. The color of the light emitted shall be yellow.

The arrow panel should be positioned on the shoulder or in the parking lane, and at the beginning of the taper, when possible. When width is restricted, the arrow panel should be positioned behind the required channelization near the start of the taper. The arrow panel must be in place for the duration of the restriction.

Since they can cause unnecessary lane changing, arrow panels should generally not be used for shoulder or roadside work activities, or on two lane highways.

D. PAVEMENT MARKINGS

Temporary markings may be used to guide traffic in temporary traffic control areas when clean, hard surfaced street or detour roadway surfaces exist. Temporary pavement markings must be kept clean at all times. Normally, they are used in combination with signs, barricades, and channelizing devices. Existing pavements markings that conflict with the vehicle path indicated by temporary markings shall generally be removed or obliterated. Upon project completion, temporary markings shall be removed and permanent markings replaced.

Reflective paint lines, pavement marking tape, or raised pavement markers may be used for temporary traffic control when approved by the Transportation Services Division. They are generally used on paved detours and on major street construction between asphalt layers. ***Unless specifically approved otherwise by the Transportation Services Division,*** when used on major street construction, temporary left-turn lanes shall be marked at all signalized intersections.

Reflective paint lines shall be applied with a suitable paint striping machine meeting City of Prescott specifications for traffic paint and reflective glass beads. Paint lines shall have a minimum wet film thickness of 15 mils with 6 pounds of glass beads applied per gallon of paint.

Reflective pavement marking tape, specifically manufactured for pavement marking, may be used in place of paint lines. Pavement marking tape shall be durable and have the appearance and reflectivity of paint lines. Application of short pieces of pavement marking tape to form dashed lines instead of pavement striping is not acceptable.

Centerline markings shall be two 4 inch wide yellow lines with a 5 inch space between. Lane line markings shall be 4 inch wide white lines, placed with 15 lineal feet of marking and 25 lineal feet of space between markings. ***Approaching marked crosswalks at unsignalized locations, the lane markings shall be 6 inches and solid rather than dashed.*** Other markings for barrier lines, edge lines, crosswalks, and school zones may be necessary to complete temporary marking installations. Edge lines shall be 4 inch wide, continuous, white lines. Barrier lines for mandatory turn lanes, pavement edge tapers, and lane transitions shall be 10 inch wide white lines. Crosswalk lines shall be 10 inches wide with 6 inch wide, solid white approach lines. School zone crosswalks shall be the same, except yellow in color.

Raised reflective pavement markers may be used instead of paint or tape markings. They should be used to supplement paint and tape pavement markings in unlighted areas, on lane changes, and on detours. Center line markers shall be yellow. Lane line and edge line markers shall be white. Spacing between markers used instead of center lines shall not exceed 10 lineal feet on straight alignments, and 5 lineal feet on curves. Lane lines shall be in groups of three markers, spaced 5 lineal feet apart, with 15 lineal feet space between groups on straight alignments and 10 lineal feet of space between groups on curves. ***Where reflective markers are used to supplement edge lines, their spacing should be at least twice as frequent as the adjacent lane lines to eliminate driver confusion.*** (without close spacing, some drivers may be led to believe that another lane exists beyond the markers). Spacing between markers used to supplement center lines, lane lines, and edge lines shall not exceed 40 lineal feet on straight alignments and 20 lineal feet on curves.

E. POLICE OFFICERS AND FLAGGERS

Police Officers (See Definition) and Flaggers (See Definition) perform a very important function as the human element in temporary traffic control situations. Other devices alert, advise and guide motorists and pedestrians, but cannot respond to the diverse traffic conditions that may occur during major restrictions. Police Officers and Flaggers can visually assess traffic conditions and respond accordingly. While Flaggers are limited by the *MUTCD* to flagging operations that can be accomplished from the edge of the traveled way, Police Officers are authorized by City Code to direct traffic as required. They can operate traffic signals, control multiple lanes of traffic, and permit specialized lane movements. They can also assist pedestrians and enforce traffic restrictions. In addition, Police Officers and Flaggers that are alert, visible and accommodating, can be valuable public relations assets.

The use of Police Officers or Flaggers is required at locations where equipment is intermittently blocking or crossing a traffic lane or where ***only one traffic lane*** is available for two directions of travel. Police Officers are required when traffic control equipment is within 300 lineal feet of a signalized multiple lane intersection where traffic is restricted to ***one through traffic lane*** in any one direction. Additionally, Police Officers and/or Flaggers may be required at signalized intersections when restricted to less than the normal number of lanes, or where a large volume of trucks enter and leave construction sites. Use of Police Officers is mandatory whenever manual control of traffic is necessary and such control cannot be done by Flaggers from the edge of the roadway. Police Officers or Flaggers shall

be provided for manual traffic control as required by the Transportation Services Division of the Pubic Works Department, as specified in this *TBM,* and as required by the Special Traffic Regulations.

1. Police Officers (See Definition)

The use of on-duty Police Officers is limited to assistance during emergency conditions and for traffic control during restrictions by City Departments when traffic conditions warrant.

The Permittee shall employ off-duty Police Officers for traffic control when required.

Off-duty Police Officers can be arranged for contractually by calling (928) 778-1444. Only uniformed City of Prescott, City of Prescott Valley, Yavapai County Sheriffs Department, or Department of Public Safety law enforcement officers within the City are allowed to control traffic in Prescott in order to expedite enforcement (citation writing), ready communication, enable performance feedback, and insure reliability. Police officers are to be paid at the current rate of off-duty compensation established by their employing agency.

2. Flaggers (See Definition)

Flaggers shall be alert, courteous, neat, and display a sense of responsibility for the safety of the public and work crews.

Flaggers shall wear an orange or fluorescent red-orange vest and hard hat and use a STOP/SLOW sign to control traffic. The STOP/SLOW sign shall be 18 inches wide and octagonal shape with 6 inch Series C letters. The STOP face shall have a red background with white letters and border. The SLOW face shall have an orange background with black letters and border. The sign shall be mounted on a suitable staff to support the sign a minimum of 5 feet from the ground when in use.

The use of flags for controlling traffic is limited to short duration or emergency use only. Flagging procedures are illustrated in ***Figure 7, Page 38.***

Flaggers shall be stationed at a readily visible location on the shoulder, or behind channelization, in advance of the restriction. Flagger stations shall be marked with a high level warning device. “FLAGGER AHEAD” and “BE PREPARED TO STOP” signs shall be used in advance of each station. At no time should a Flagger be allowed to stand in the traveled portion of the roadway or cross a traffic lane to stop more than one lane of traffic.

Each flagger station shall be illuminated during the hours of darkness. All traffic control devices, including the STOP/SLOW sign and the Flagger’s vest, shall be reflectorized. Signs, barricades and channelization in advance of each Flagger station shall have barricade warning lights attached and in operation.

EVALUATION GUIDE
WORK ZONE SIGNS

Acceptable

There are several abrasions on the surface but very little loss of lettering. There has been no touch-up of the lettering. This message is legible per the design criteria of the MUTCD.

Marginal

Of the many surface abrasions throughout the sign face, many are within the individual letters of the message. The sign surface is free of any residue. Although some color fading is evident, the background color and reflectivity are still apparent at night. This message is legible per the design criteria of the MUTCD.

Unacceptable

Signs with asphalt splatter or cement slurry of an amount similar to the abrasions that are evident throughout the face of this sign are unacceptable. Some letters have a loss of more than 50 percent. There is a noticeable color fading. The message is illegible per the design criteria of the MUTCD.

EVALUATION GUIDE TYPE I, II or III BARRICADE PANELS OR VERTICAL PANELS

Acceptable

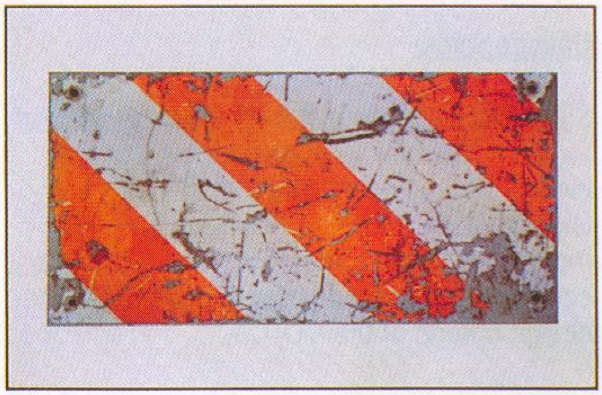
Panels not deformed to an extent so as to decrease the panels target value. There are several abrasions on the surface but very little loss of reflective sheeting. The orange is vivid and the stripes provide contrast.

Marginal

There are numerous surface abrasions through the panel surface. Some color fading is evident; however, it is free of large areas of residue or missing reflective material. The orange is vivid and the stripes provide contrast.

Unacceptable

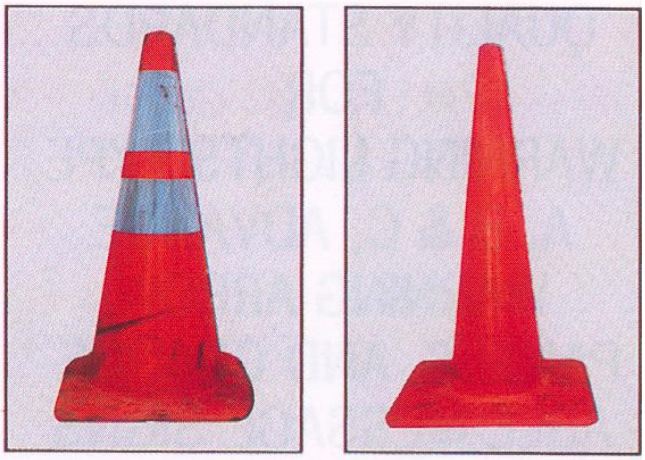
The surface is marred over a high percentage of the panel area. There is noticeable loss of reflectivity and obvious color fading. Panels with asphalt splatter and/or cement slurry, or any combination of missing and covered reflective material similar in area to that shown here would also make a panel unacceptable.



EVALUATION GUIDE
CONES

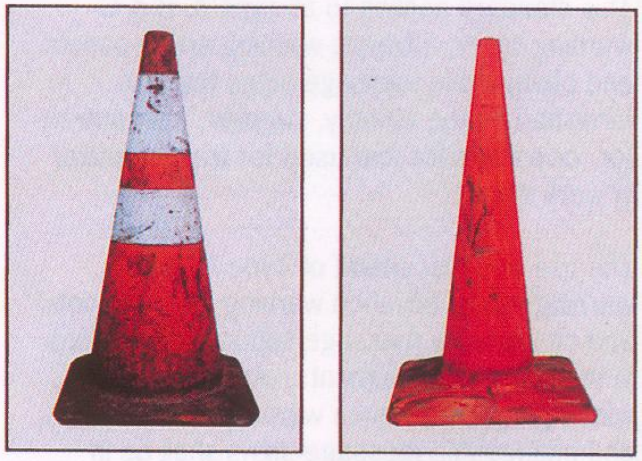
Acceptable

The conical shape should remain clearly identifiable with no significant distortion and must be free standing in its normal position. The surface is free of punctures and abrasions. The surface is free of asphalt splatter, cement slurry or other material and will readily respond to washing. The reflective bands, if required, have little or no loss of reflectivity, with only minor tears and scratches.



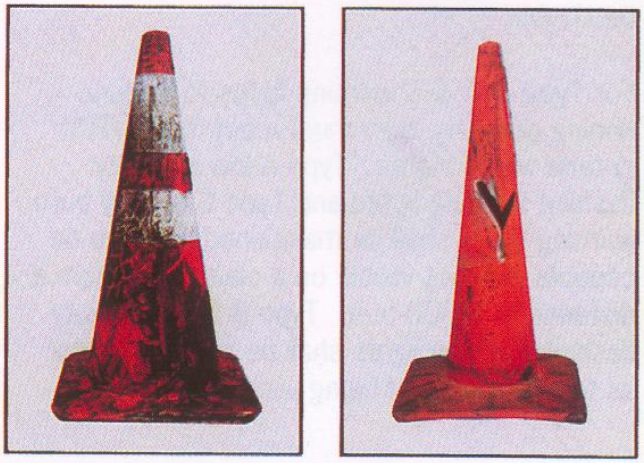
Marginal

The surface has some asphalt splatterings or cement slurry and may not be readily cleaned due to abrasion and discoloration. The reflective bands, if required, have numerous tears and scratches, but are free of large areas of residue or missing material.



Unacceptable

Punctures and large areas of staining asphalt splatter or cement slurry make these an unlikely candidate for improvement. Large areas of missing or stained reflective material make the cone unacceptable.



QUALITY STANDARDS FOR WARNING LIGHTS TYPE A, B & C, ADVANCE WARNING ARROW PANELS, AND CHANGE-ABLE MESSAGE SIGNS

This standard applies to all Type A, B & C warning lights, advance warning arrow panels, and changeable message signs that are furnished by the agency, supplier, subcontractor, or contractor and used for traffic control in work zones.

The use and placement of Type A, B & C warning lights, advance warning arrow panels, and changeable message signs are specified in the contract documents. All Type A, B & C warning lights, advance warning arrow panels, and changeable message signs shall be in accordance with the most current version of the Manual on Uniform Traffic Control Devices (MUTCD).

For Type A, B & C warning lights to be functioning properly, they must meet the MUTCD criteria which states: "Type A low intensity flashing warning lights and Type C steady burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B high intensity flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet".

The evaluation guide that follows is to be used to evaluate the appearance and function of Type A, B & C warning lights, advance warning arrow panels, and changeable message signs. Because of the different types of advance warning arrow panels approved for use, the evaluation guide will address each type (mode) of panel separately.

Any warning light, arrow panel, or changeable message sign which is out of alignment from the intended driver's line of vision, shall be considered to be "unacceptable".

F. Traffic Control Signals

A temporary traffic signal system may be used to control vehicular traffic movements at construction or maintenance work areas, when a traffic engineering study indicates it is necessary. Each use must be specifically approved by the Transportation Services Division.

All traffic signal control equipment shall meet the applicable standards and specifications prescribed in Parts IV and VI of the *MUTCD.* "TRAFFIC SIGNAL AHEAD" (W3-3) signs shall be placed in advance of all approaches to temporary traffic control signals.

The Permittee shall prepare a detailed traffic control plan showing the location, use, timing, and hours of operation at each location for approval prior to implementation. Signal controller phasing and timing must be pre-approved by the Transportation Services Division. Only Police Officers or properly trained Police Assistants under the direct on-site supervision of a Police Officer may manually control permanent or temporary traffic signals, unless otherwise approved by the Transportation Services Division.

G. Portable Barriers

Portable barriers are usually precast reinforced concrete units, commonly referred to as "Jersey Barriers" approximately 36 inches high and tapering from a wide base to a narrow top. They are designed to be physical barriers placed parallel to traffic lanes to prevent vehicles from leaving the traveled way and to protect workers. They are generally used to guide traffic on curved detour alignments, replace bridge rails during reconstruction, and separate traffic from construction areas on long term, fixed location projects. They may also be used to separate opposing traffic lanes.

Portable barriers shall only be used in combination with required signs, barricades, and channelizing devices. Barriers may serve the additional function of channelizing traffic. When serving this function, barriers shall be light in color and equipped with vertical panel markings and barricade warning lights. The first two warning lights at the start of a continuous barrier shall be Type B flashing warning lights. All other warning lights shall be Type C steady burn warning lights. Spacing for barricade warning lights and vertical panel markings shall be as required for vertical panel channelizing devices in this Manual. The traffic approach ends of all portable barriers shall be protected from vehicle impact by the use of impact attenuators or flaring the ends away from the traveled way. When space permits, approach ends shall be flared at a 45-degree angle to a minimum of 10 feet from the traveled way. When space does not permit, barrier ends shall be protected with impact attenuators, as required in the *MUTCD.*

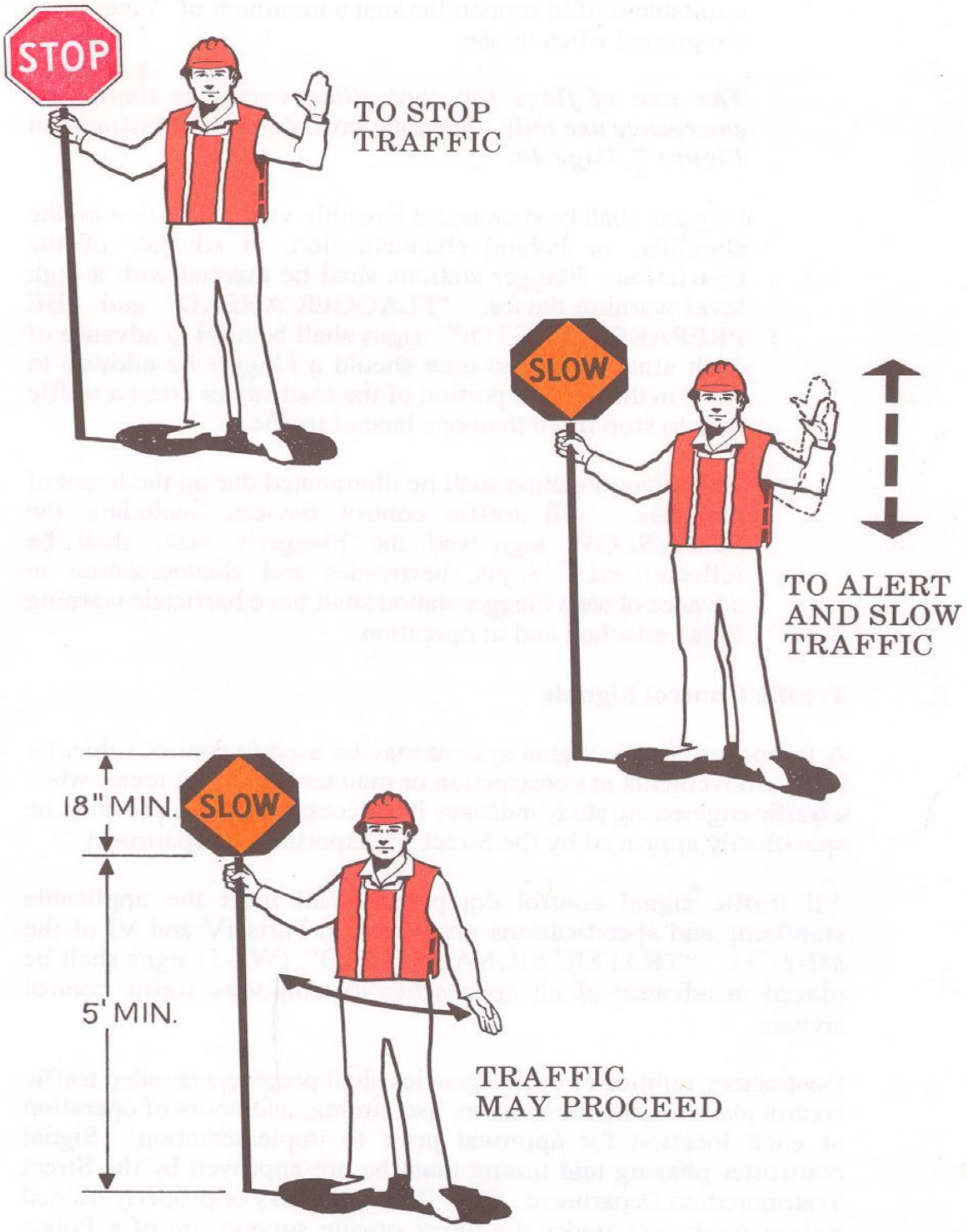


FIGURE 7 **FLAGGING PROCEDURES**

CHAPTER 7

PEDESTRIAN ACCOMMODATION

The City of Prescott requires ***strict compliance*** with the **Americans with Disabilities Act of 1990 (ADA),** especially those relating to temporary traffic control. Using proper barricading devices to make walkways accessible or affording accessibility by the proper placement of devices is necessary.

A. IMPORTANCE OF GIVING SPECIAL CONSIDERATION TO PEDESTRIANS

Proper planning for pedestrian movement through and around construction areas, especially for those with disabilities or vision impairments is as important as planning for vehicular traffic. Maintaining access to bus stops, local merchants, facilities and crosswalks, must be an integral part of each project. The provisions for public protection in this manual are applicable to all persons, contractors, utilities and other agencies, including City forces, doing the work within the City.

Each and every crosswalk and pedestrian walking area, whether paved or unpaved, shall be maintained by the Permittee at all times, unless otherwise provided for in this *TBM* in City plans or specifications, or by prior approval of the Transportation Services Division (except in emergency conditions). Pedestrians need protection from potential injury by providing a smooth, clearly delineated, travel path.

A minimum, accessible walkway width of 36 inches is required by ADA. The only exception to this is on the rare occasion when a walkway has to be ***totally*** closed for safety reasons.

When construction requires the closing of crosswalks and walkways, provisions shall be made by the Permittee to provide temporary walkways that direct pedestrians through a safe and convenient route. An applicant requesting a complete or partial walkway closure on one side of the street must first diligently try to accommodate pedestrians on accessible alternative paths on the same side of the street. Temporary walkways will avoid:

- pedestrians having to cross streets twice
- disruption of transit service
- interference with business access

Walkway closures should only occur after it is determined that, because of the work being done, the walkway physically cannot be maintained, or the work procedures require the pedestrians to be rerouted for their own protection.

Temporary walkways may be designated using portions of the existing sidewalk, either side of the existing sidewalk, or on rare occasions in the adjacent parking lane if conditions and capacity permit. If a moving traffic lane is authorized, extraordinary care must be taken to shield and protect the walkway.

Walkways shall be clearly identified wheelchair usable, protected from motor vehicle traffic, and free of pedestrian hazards such as holes, debris, dust and mud. Unless a covered walkway or construction fence is required, barricades, cones and signs may be used, where appropriate. **(See *Figures 8(a) and 8(b), Page 41 and 42.***

When pedestrian paths are re-directed on the same side of the street, the "PEDESTRIAN" sign, with an appropriate direction arrow, shall be used to direct pedestrians to the alternate walkway.

When a segment of a pedestrian path remains open in advance of a closure, the SIDEWALK CLOSED AHEAD" sign should be placed at the appropriate end(s) of the block where pedestrians have the last opportunity to use a crosswalk to cross the street. Sign placement is required to make it prominently visible to the pedestrians, yet not in conflict with the 36 inch minimum, accessible walkway past the sign. Additionally, care needs to be taken to assure that adequate maneuvering room exists adjacent to the sign so that disabled users can make an informed decision of whether it is best to cross to the other side of the street or continue on the accessible path to their destination. ***(See Figures 8 (a), 8 (b) and 10 on Pages 41, 42 and 46)***

For complete sidewalk closures, "SIDEWALK CLOSED CROSS HERE" signs shall be provided at the crosswalk nearest each end of the closure. Where there is no pedestrian landing area on the far side of an intersection, "near-side" signs with the same message, should be placed so as to clarify that the sidewalk on the far side is inaccessible. "SIDEWALK CLOSED" signs shall also be placed adjacent to the actual sidewalk closure.

During construction or demolition of buildings adjacent to sidewalks or other pedestrian areas, a covered walkway shall be provided for pedestrian protection when the building wall is within six feet of the walkway, when the distance of the walkway from the building is less than one-half the height of the exterior wall, or pedestrians would otherwise be hazarded by falling objects. When the walkway is a greater distance than one-half of the height of the exterior wall from the building, a construction fence shall be provided. Before any work commences, a fence is always required at construction and demolition sites.

The Permittee shall submit a professionally prepared traffic control and walkway plan to the Transportation Services Division for approval, prior to commencing any building construction or demolition that may affect streets or sidewalks.

Except where hazard striping is required, all covered pedestrian walkways and construction fences shall be painted white, or another approved light color. They shall be maintained in good condition and be clean and fresh appearing at all times. Damaged walkways and fences shall be repaired by the Permittee immediately.

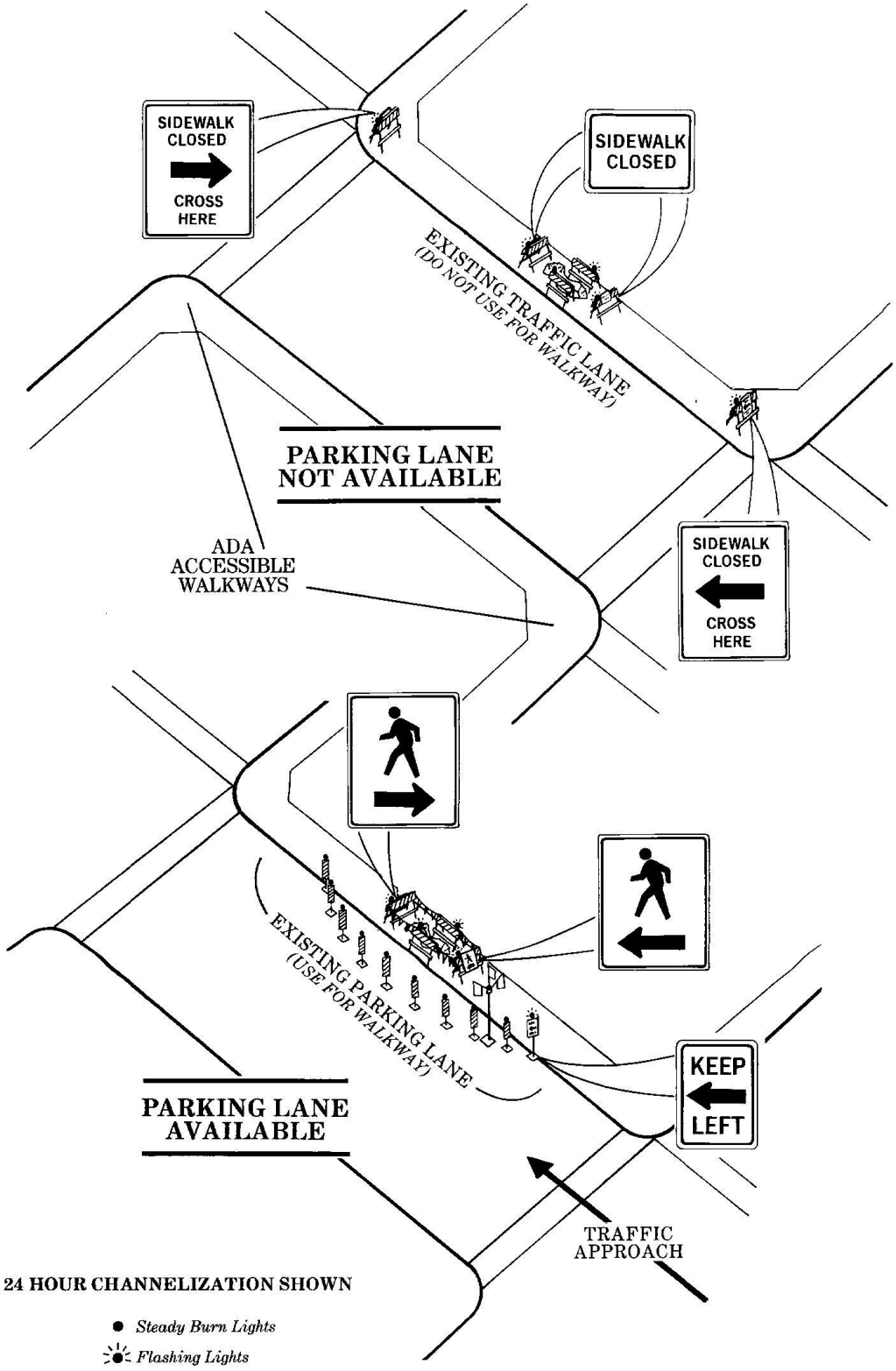
No loading or unloading of materials, staging or stopping of vehicles, will be allowed on the street side of walkways and fences without a street closure permit.

Gates for access to a construction site shall not open out into the street or pedestrian walkways. Access to fire hydrants, traffic signal control boxes, manholes, and other utilities shall be maintained at all times.

B. COVERED PEDESTRIAN WALKWAYS

A permit is required from the One-Stop Permit Center in City Hall to construct a covered pedestrian walkway in City street right-of-way. Covered walkways shall be constructed of suitable material to support the loads to be imposed upon the structure. Minimum design requirements for the structure shall be determined in consultation with said permit center.

The walking area shall be at least 5 feet wide and 8 feet high. The walking surface shall be paved or covered with plywood or wood planking. Ramps shall be provided for wheelchair access, per ADA requirements. The building side of the walkway shall consist of tight boards or plywood, except where chain link sight distance panels are required. The roof shall be tightly boarded.



SIDEWALK CLOSURES

FIGURE 8a

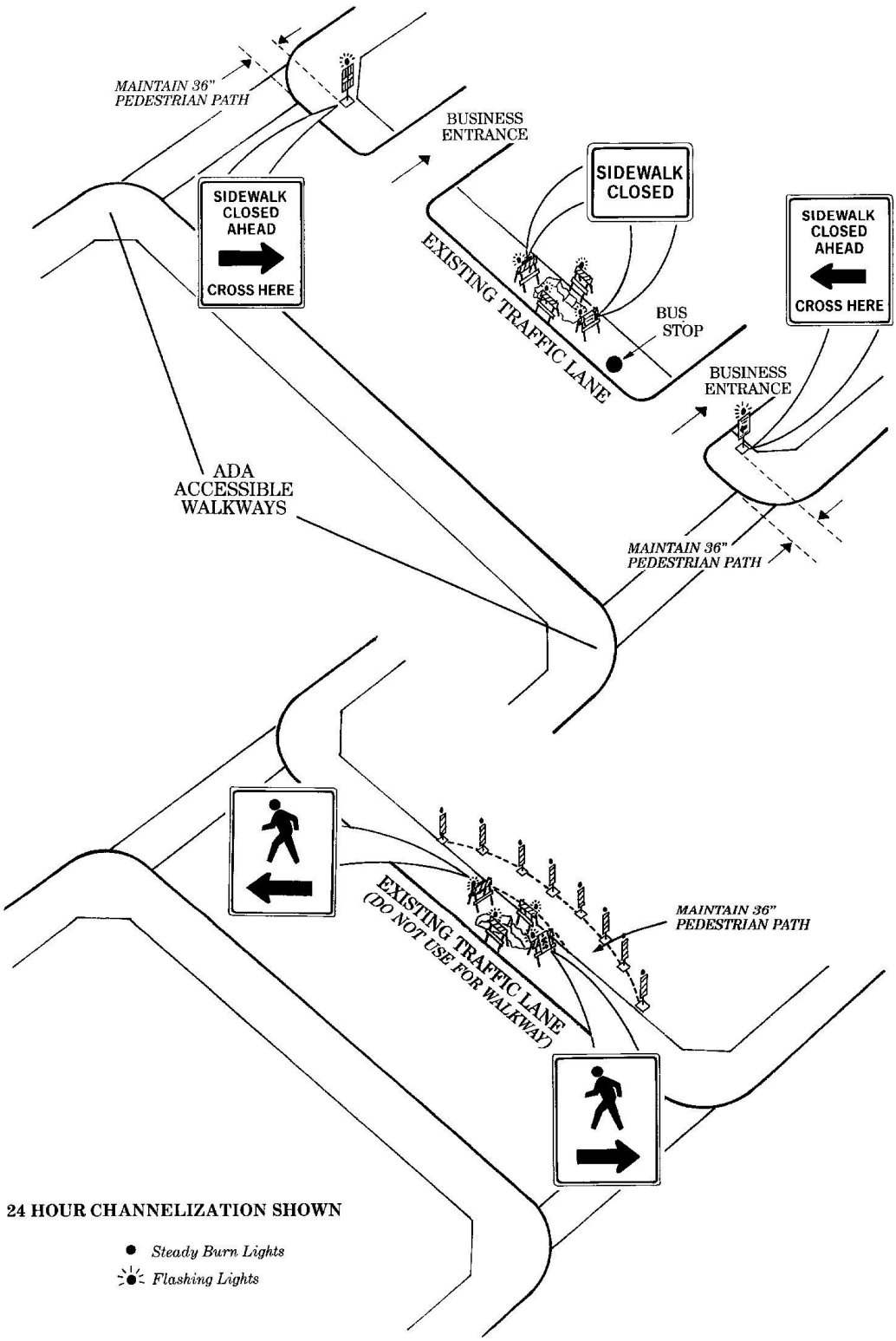


FIGURE 8b **SIDEWALK CLOSURES**

A 3 foot high enclosure and a 4 foot high railing shall be attached on the street side of the covered walkway. ***(See Figure 9, Page 45).*** All interior surfaces of the walkway shall be smooth and free of protruding nails and splinters. The covered area of the walkway, including entrance, shall be brightly illuminated during hours of darkness with 110-volt, 100-watt electric lamps in vandal resistant fixtures, mounted on 30 foot centers, along the inside of the back wall, near the roof line.

Each walkway shall be inspected daily and maintained clean and free of dirt, debris and hazards at all times.

Covered walkways located in the street shall include the following devices. ***(See Figure 9, Page 45)***

1. A high level warning board, 2 feet high with a width equal to that of the walkway, shall be mounted above the walkway on all traffic approaches. The warning board shall be striped with 12 inch orange and white hazard markings, sloping downward at ***45*** degrees toward the side on which traffic must pass. Two 110-volt, 75-watt flashing yellow lights in vandal resistant fixtures shall be mounted on the warning board, one on the lower right, and one on the lower left corner.

2. The traffic approach end of the walkway at mid-block locations shall have a fixed handrail, extending from the curb to the traffic side of the walkway. The area from rail to pavement shall be covered and striped with 12 inch orange and white hazard markings, sloping downward at 45 degrees toward the side on which traffic must pass. A minimum of three 110-volt, 75-watt steady burning yellow lights in vandal resistant fixtures shall be equally spaced at railing height.

3. Steady burning 110-volt, 75-watt yellow clearance lights in vandal resistant fixtures shall be mounted on 30 foot centers along the traffic side of the walkway, when the walkway' is either in the street, or within 18 inches back of the curb. They shall be installed at railing height.

4. A continuous bumper rail, consisting of one 2 inch x 16 inch board, shall be mounted on the street side of the structure, at a height of 10 inches from the pavement to the bottom of the rail.

C. CONSTRUCTION FENCES

A permit is required from the One-Stop Permit Center in City Hall for construction of fences in the street right-of-way. Construction fences located adjacent to a pedestrian walkway, separating pedestrians from construction or demolition work, shall be 8 feet high, and substantially constructed of tight boards or plywood, ***except where chain link sight distance panels are required.***

Construction fences at locations where the walkway is a distance greater than the height of the exterior wall from the building, or where the adjacent walkway has been closed to pedestrians, may be constructed entirely of chain link fencing 8 feet high.

Construction fences located in the street shall include the following traffic warning devices. ***(See Figure 10, Page 46).***

1. At all approaches, install 12 inch orange and white hazard markings sloping downward at 45 degrees toward the side on which traffic must pass. The marked area shall extend from the pavement to a minimum of 8 feet above the pavement, except as required for sight distance panels.

2. On all traffic approaches, include hazard markings of two rows of 110-volt, 75-watt flashing

yellow lights in vandal resistant fixtures (one row 3 feet 6 inches above pavement level, and one row 8 feet minimum above pavement), with not less than 2 flashers per row, mounted on 8 foot centers.

3. Steady burning 110-volt, 75 watt yellow clearance lights in vandal resistant fixtures shall be mounted on 30 foot centers along the traffic side of all fences that are in the street, or within 18 inches back of the curb. They shall be mounted 3 feet 6 inches above the pavement.

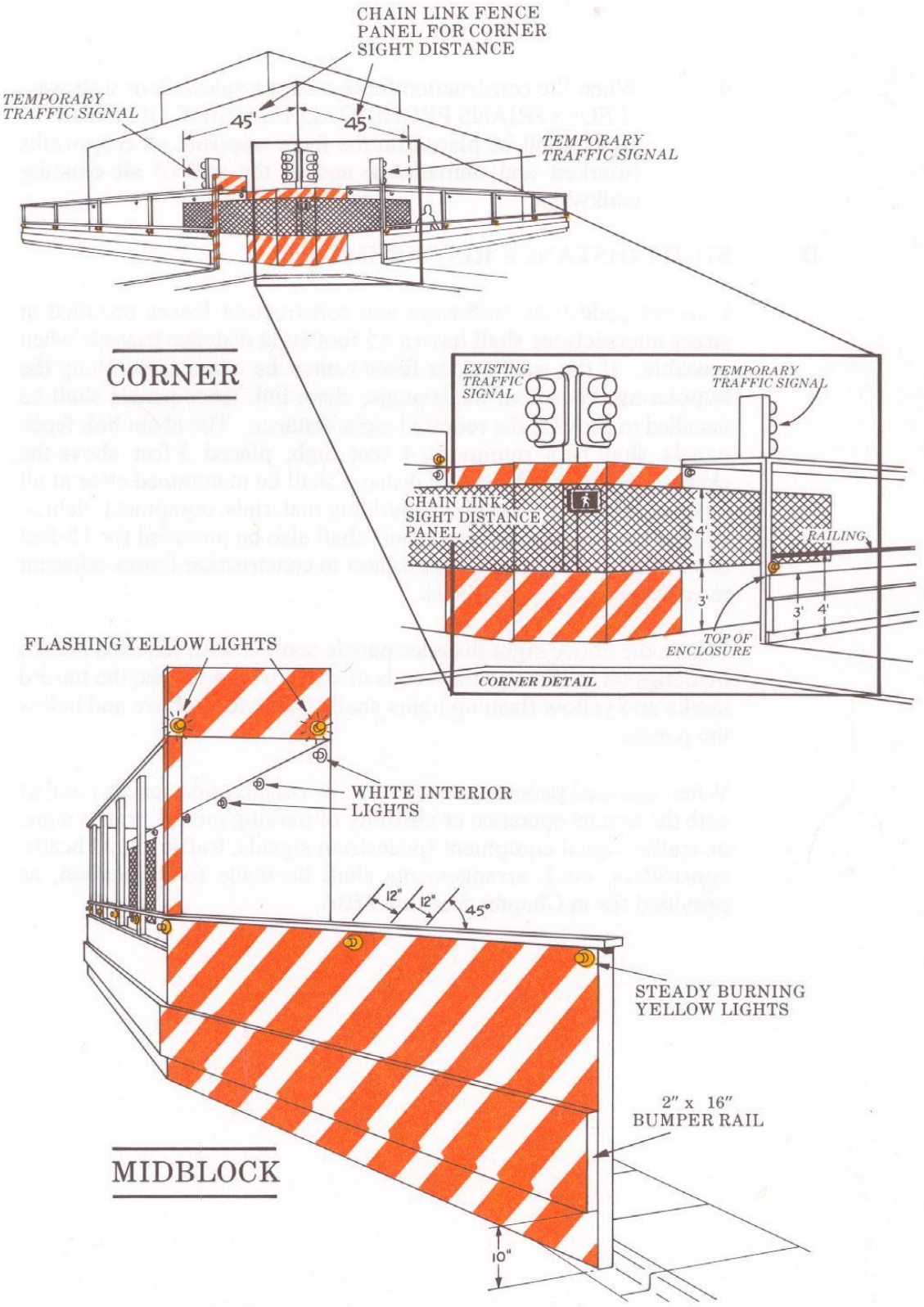
4. When the construction fence closes a sidewalk or walkway, "PEDESTRIANS PROHIBITED THIS SIDE OF STREET" signs shall be placed on the fence opposite all crosswalks (marked and unmarked), and at the end of all existing walkways.

D. SIGHT DISTANCE REQUIREMENTS

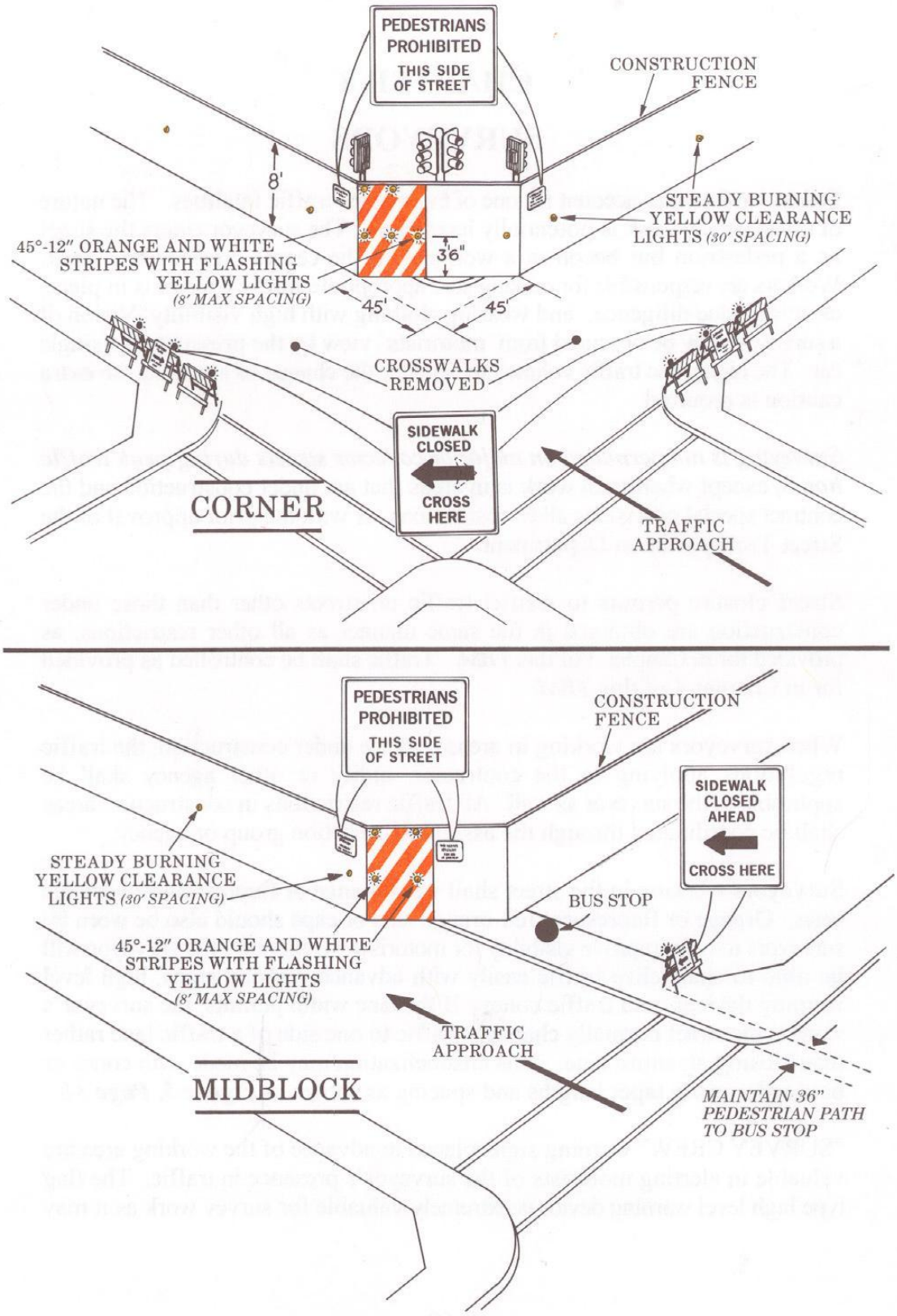
Covered pedestrian walkways and construction fences installed at street intersections shall have a 45 foot sight distance triangle when possible. If the walkway or fence cannot be constructed along the hypotenuse "base" of the triangle, chain link fence panels shall be installed to provide the required sight distance. The chain link fence panels shall be a minimum 4 feet high, placed 3 feet above the existing pavement. This sight distance shall be maintained clear at all times of temporary buildings, building materials, equipment, debris, and the like. Sight distance panels shall also be provided for 15-feet on each side of all vehicle access gates in construction fences adjacent to walkways and traffic lanes.

The hazard marks and yellow flashing lights shall be provided above and below the panels where the above sight distance panels conflict with required hazard markings on traffic approach ends of construction fences.

When covered pedestrian walkways or construction fences conflict with the normal operation or visibility of parking meters, traffic signs or traffic signal equipment (pedestrian signals, traffic signal heads, controllers, etc.), arrangements shall be made for relocation, as provided for in Chapter 5 of this *TBM*.



COVERED PEDESTRIAN WALKWAY FIGURE 9



CONSTRUCTION FENCES FIGURE 10

CHAPTER 8

SURVEYORS

Urban land surveying is potentially hazardous. The surveyor enters the street as a pedestrian but becomes a worker. Workers are responsible for deploying adequate traffic control measures, exercising due diligence, and wearing clothing with high visibility. Viewing a working Surveyor may be obscured from motorists by the presence of a single car. The higher the traffic volume, the greater the chance of a mishap, requiring caution.

Surveying is not permitted on arterial or major collector streets during peak traffic hours, except when such work is in areas that are under construction and the contract special provisions allow restrictions, or with the prior approval of the Transportation Services Division.

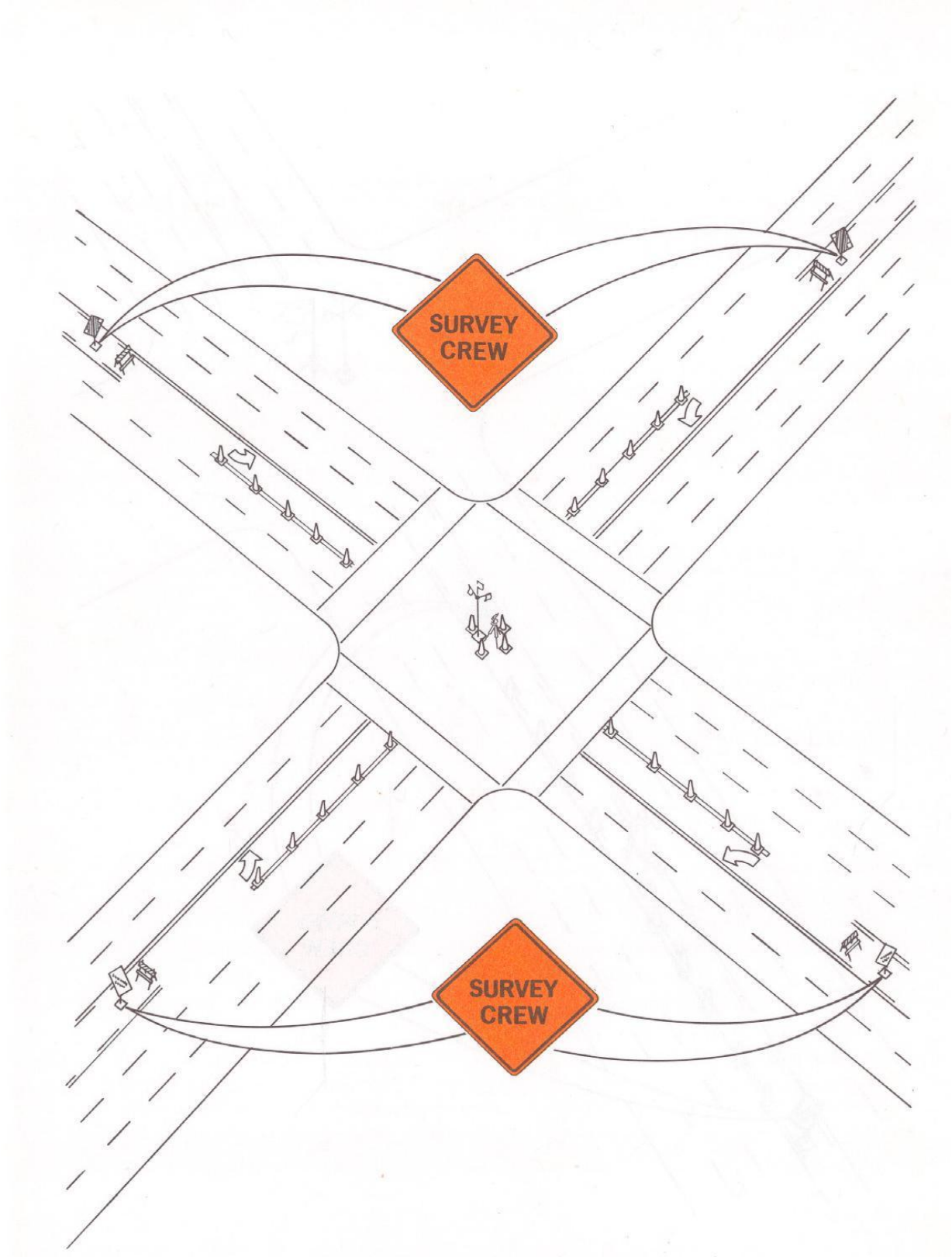
Street closure permits to restrict traffic on streets other than those under construction are obtained in the same manner as all other restrictions, as provided for in Chapter 3 of this *TBM* Traffic shall be controlled as provided for in Chapter 4 of this *TBM*

When surveyors are working in areas that are under construction, the traffic regulations applying to the contractor, utility or other agency shall be applicable to the surveyor as well. All traffic restrictions in construction areas shall be coordinated through the assigned inspection group or agency.

Surveyors working in the street shall wear orange or fluorescent red-orange vests. Orange or fluorescent red-orange hats or caps should also be worn by surveyors to help improve visibility for motorists. Generally, the surveyor will be able to channelize traffic easily with advance warning signs, high level warning devices, and traffic cones. If the lane width permits, the surveyor's work in the street normally channels traffic to one side of a traffic lane rather than closing an entire lane. This channelization may be made with cones or barricades using taper lengths and spacing as shown in ***Figure 5, Page 22.***

"SURVEY CREW" warning signs placed in advance of the working area alert motorists of the surveyor's presence in traffic. The flag type high level warning device is beneficial for survey work as it may be seen over the top of preceding vehicles. ***Use of high level warning devices is mandatory.*** A high level warning device must be used any time an instrument is set up in the street and used when a range pole is placed in a signalized intersection. Typical daytime traffic control illustrations are shown in ***Figures 11*** and ***12, Pages 48 and 49.***

When survey work requires restricting a full traffic lane, or when restricting traffic during hours of darkness, traffic control devices (signs, barricades, and channelization) shall be provided as required elsewhere in this *TBM* for those conditions.



SURVEYING-INTERSECTION FIGURE 11

FIGURE 12 **SURVEYING-MIDBLOCK**

CHAPTER 9

SERVICE VEHICLES

Vehicles covered in this section are those required by the nature of their work to travel slowly or stop for brief periods in City streets. These may include, but are not limited to, minor pavement patching, sanitation pickup, sweeping, street painting, or traffic sign or signal maintenance.

Service vehicle operations are prohibited on arterial and major collector streets during peak traffic hour, except when authorized by the Transportation Services Division or under emergency conditions. During other times, to optimize safety operators need to plan their work to avoid stopping in the traveled portion of the street whenever possible and, when stopped, minimize the time required.

When service vehicles must travel slowly or stop for brief periods, they shall display one of the following operating high level warning light systems. ***(See Figure 13, Page 52).***

- ***Two Rotating Flasher or Strobe Light High Level Warning Light Devices***

  These devices are to provide additional service vehicle conspicuity and warn motorists of necessary lane shifts, due to hazards related to workers and/or equipment on or near the roadway. They may be used in combination and incorporated into a "light bar" for added visibility.

- ***One Advance Warning Arrow Panel***

  Arrow panels shall be used in combination with rotating flashers or strobe lights to provide 360 degree visibility.

Flashing lights shall be located on service vehicles so that they remain in full view, front and rear, at all times and are not obscured by dump beds, mounted equipment, or work activities. Minimum mounting height is 8 feet. The arrow panel shall be mounted on a vehicle, a trailer, or other suitable support. A vehicle-mounted panel should be provided with remote controls. Minimum-mounting height is 8 feet from the roadway to the bottom of the panel, except on vehicle-mounted panels, which should be as high as practicable.

The State licensing process requires service vehicles to be equipped with and operate certain warning devices while conducting required work in the street. For service vehicles that stop frequently in traffic, or may need to be unusually positioned, within portions of the traveled way, additional warning devices are essential.

When it is necessary for service vehicles to park for brief periods, it shall be standard operating procedure to display the special warning devices, and the vehicle's four-way hazard warning flashers. Additionally, at least two traffic cones shall be placed a minimum of 10 feet from each rear corner. A short taper of cones (minimum 50 feet with 6 cones) at the rear of the vehicle may be used in high volume traffic areas to improve visibility, and if geometric conditions allow for sufficient distance to do so. Placing flags on the upper rear corners of the vehicle is encouraged, as it is a relatively inexpensive way to enhance visibility.

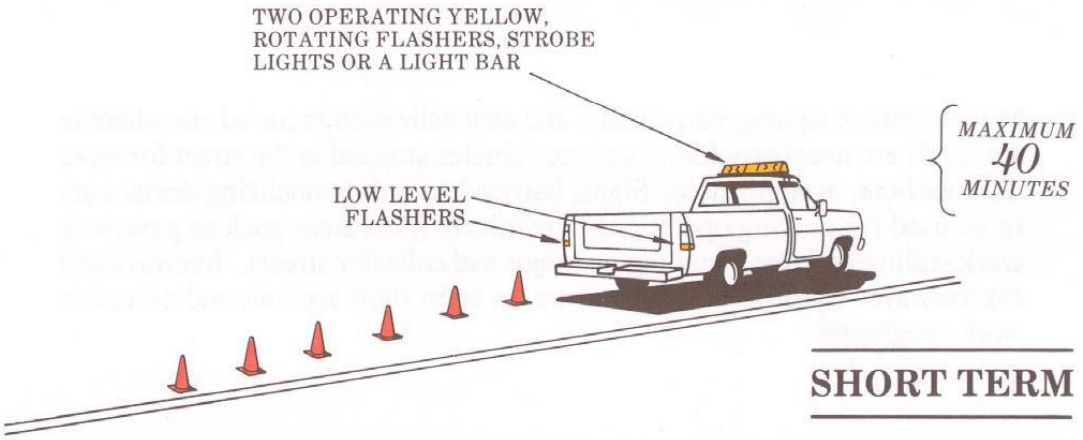
Advance warning arrow panels provide additional warning and directional information to motorists when the restriction causes traffic to change lanes. Because they are more effective than flashing lights, vehicles equipped with an arrow panel are certainly preferable and in some cases mandatory to support construction activities.

It is important that service vehicle operators, when required to slow or stop within streets, minimize the duration thereof. Setting up and taking down the full array of barricades and signs normally associated with longer term construction, often would require streets/lanes to be closed longer than to perform the actual work that needs to be done. It is for that reason service vehicles performing short-duration work may use abbreviated procedures. The equipment specified at the beginning of this Chapter is acceptable for service vehicles performing short duration work to stop in the street for:

- ***Up to 40 minutes*** for vehicles equipped with two rotating flashing or strobe light high level warning devices

- ***Up to 60 minutes*** for vehicles equipped with advance warning arrow panels.

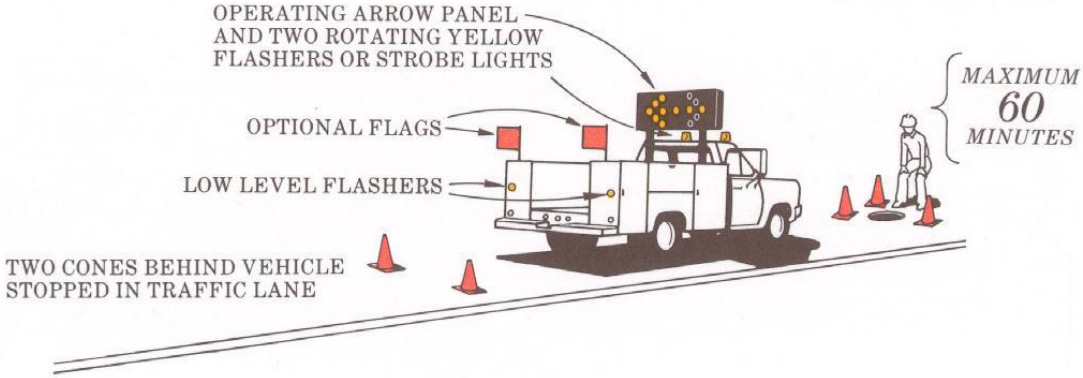
More extensive signing, barricading, and channelization required elsewhere in this *TBM* are necessary for all service vehicles stopped in the street for more than one hour, as applicable. Signs, barricades, and channelizing devices are to be used for moving operations in relatively fixed areas such as pavement crack sealing and tree trimming on major and collector streets. Usually, these devices are set up in short sections and moved as work progresses.



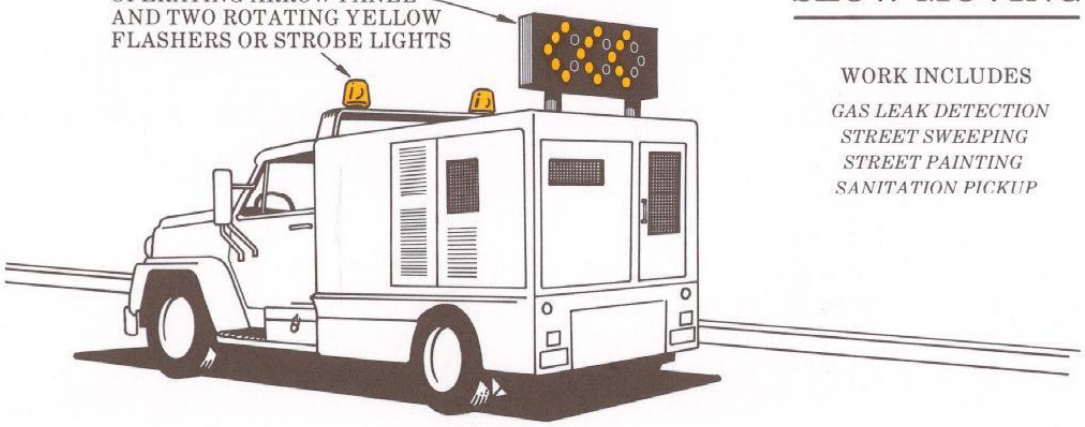
SHORT TERM

WORK INCLUDES

MANHOLE INSPECTION
CROSSWALK PAINTING
STREET LIGHT REPAIR
TRAFFIC SIGNAL REPAIR
PAVEMENT PATCHING



SLOW MOVING



WORK INCLUDES

GAS LEAK DETECTION
STREET SWEEPING
STREET PAINTING
SANITATION PICKUP

FIGURE 13

SERVICE VEHICLE FLASHER REQUIREMENTS

CHAPTER 10

BARRICADING ILLUSTRATIONS

The traffic channelization and barricading illustrations on the following pages are presented to show typical applications of signs, barricades, and channelizing devices. They illustrate the methods required for uniform application of standard traffic control devices, as set forth in this *TBM*. Other situations not specifically illustrated must be handled in conformance with the general methods and applications described and depicted. The following illustrations are varied to show both daytime and 24-hour channelization.

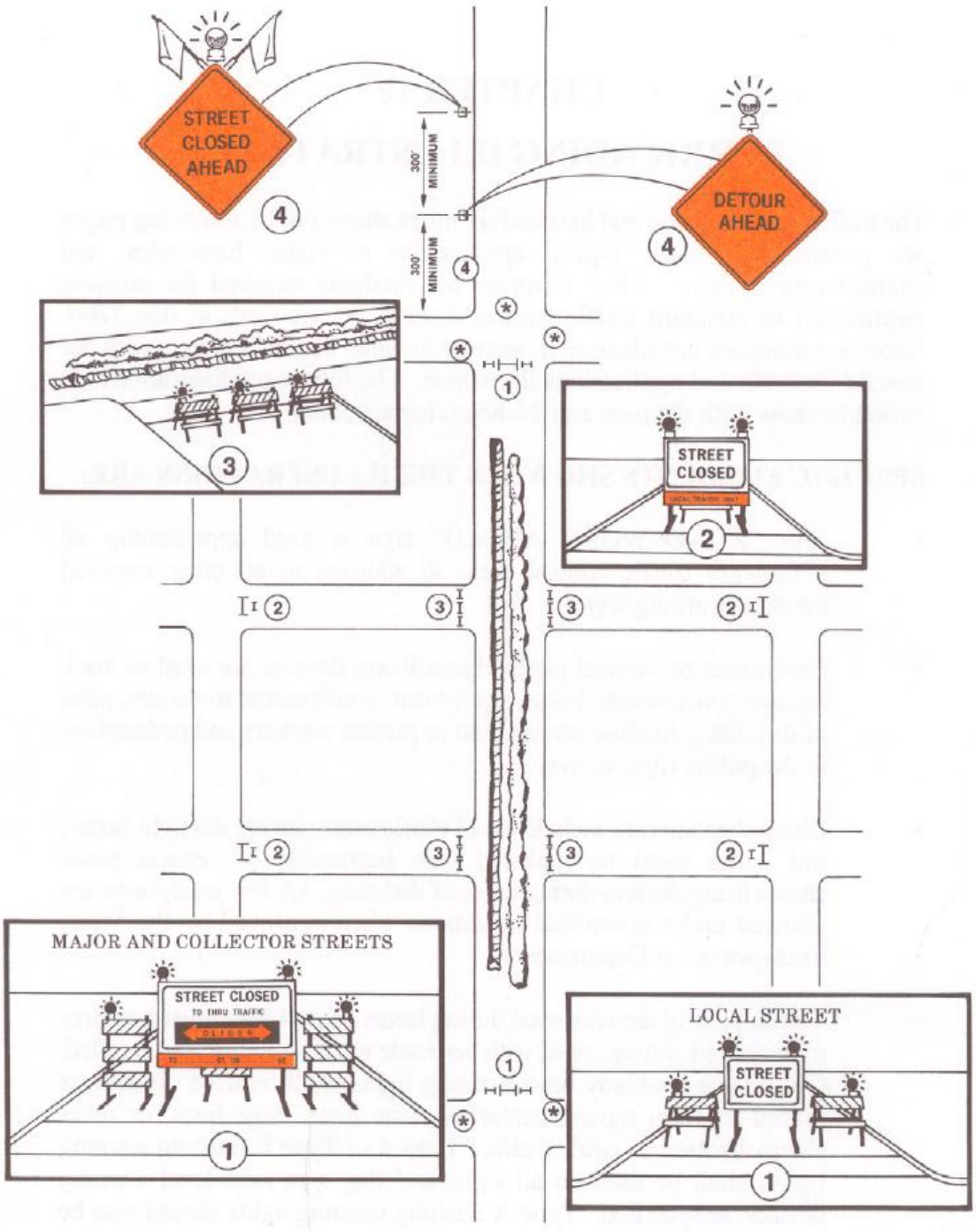
SPECIFIC ELEMENTS SHOWN IN THE ILLUSTRATIONS ARE:

- The "ROAD WORK AHEAD" sign is used approaching all temporary traffic control areas in addition to all other required advance warning signs.

- Barricades or vertical panel channelizing devices are used to mark hazards (excavations, holes, equipment, construction materials, piles of dirt, etc.), to close streets, and to protect workers and pedestrians in the public right-of-way.

- Channelization may include use of traffic cones during daylight hours, but cones must be replaced with barricades or vertical panel channelizing devices during hours of darkness. (A few exceptions are allowed under controlled conditions when approved by the Transportation Services Division).

- Traffic control devices used during hours of darkness must be retroreflectorized and equipped with barricade warning lights, as specified. Only Type C steady burn warning lights shall be used on devices placed to form tapers, centerline, lane lines, edge lines, or other channelization to guide traffic. Type A or Type B flashing warning lights shall be used on all signs and flag type high level warning devices, as specified. Type A flashing warning lights should also be used on all devices marking hazards because they are more effective for this purpose than Type C steady burn lights.



① STREET CLOSED. THE LARGE SIGN WITH THE DETOUR ARROW AND DETOUR DIRECTIONS SHALL BE USED FOR ALL MAJOR AND COLLECTOR STREET CLOSURES.

② STREET CLOSED SIGN, EXCEPT FOR LOCAL ACCESS, ON CENTER LINE OF STREET.

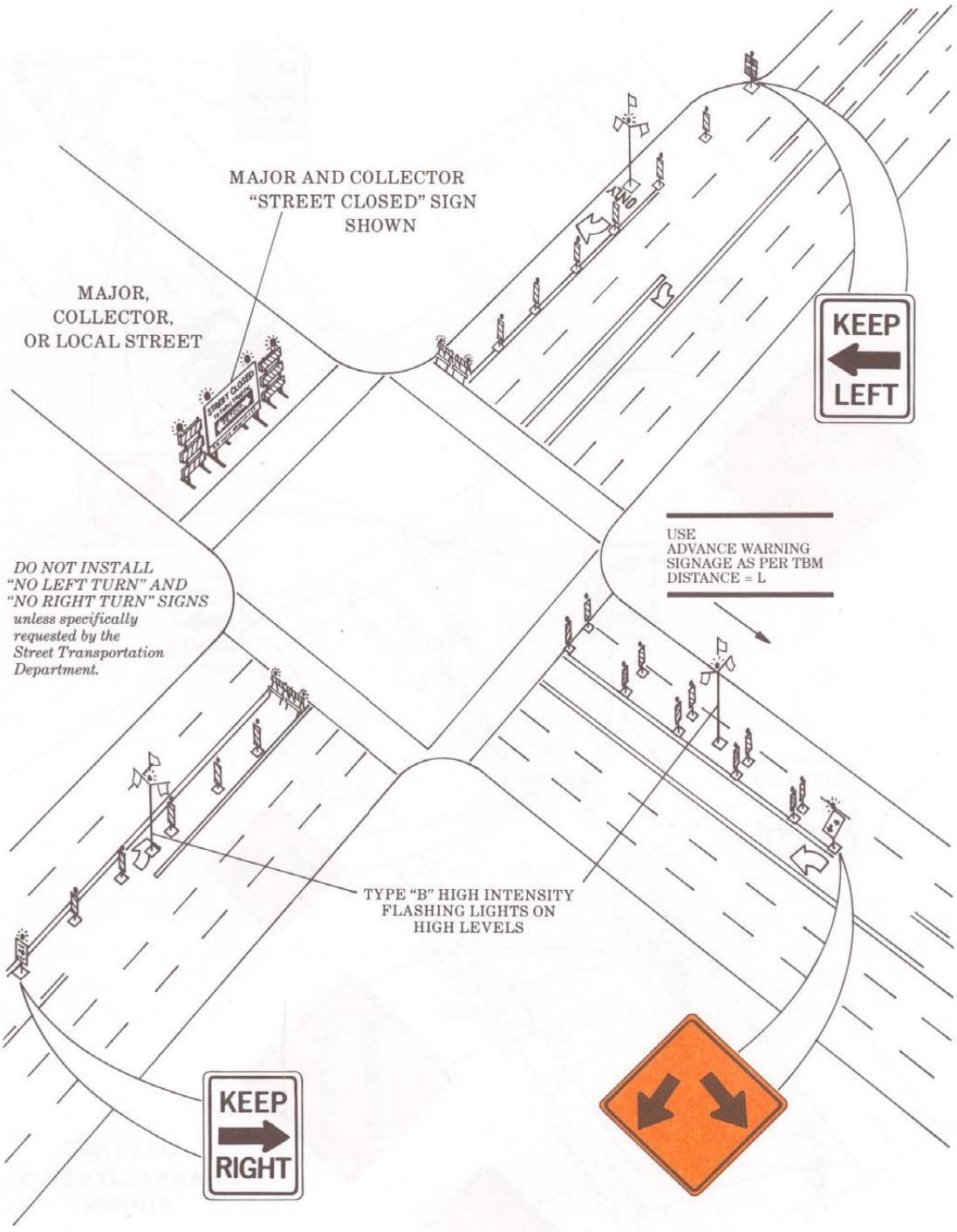
③ STREET BARRICADED AT CONSTRUCTION AREA.

④ ADVANCE WARNING SIGNS SHALL BE USED ON MAJOR AND COLLECTOR STREETS.

✱ EXISTING MANDATORY TURN LANES APPROACHING CLOSURES SHALL BE CLOSED (SEE FIG. 15)

Flashing Lights

FIGURE 14 **COMPLETE STREET CLOSURES**

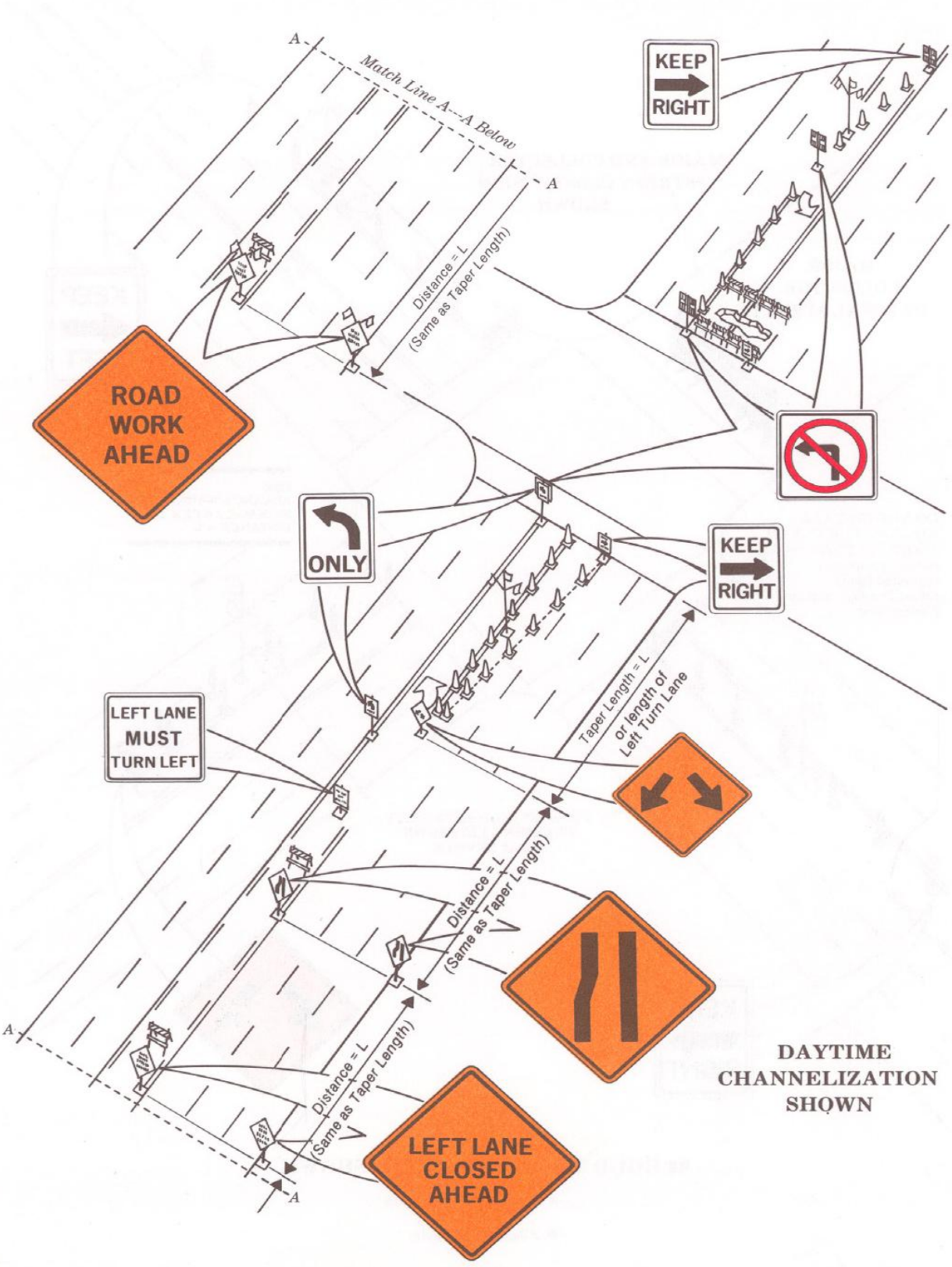


24 HOUR CHANNELIZATION SHOWN

- *Steady Burn Lights*
- *Flashing Lights*

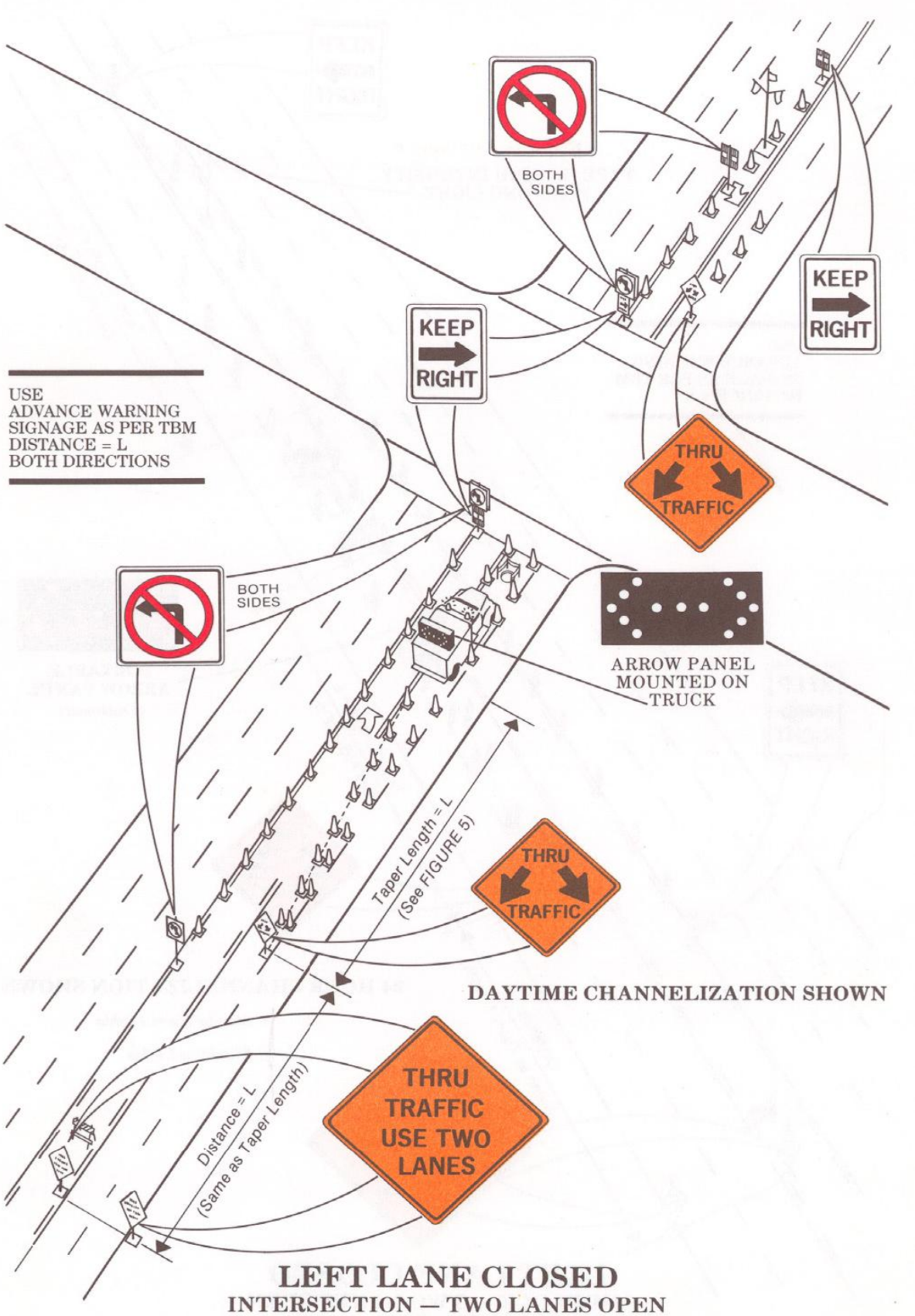
MANDATORY TURN LANE CLOSURES

FIGURE 15



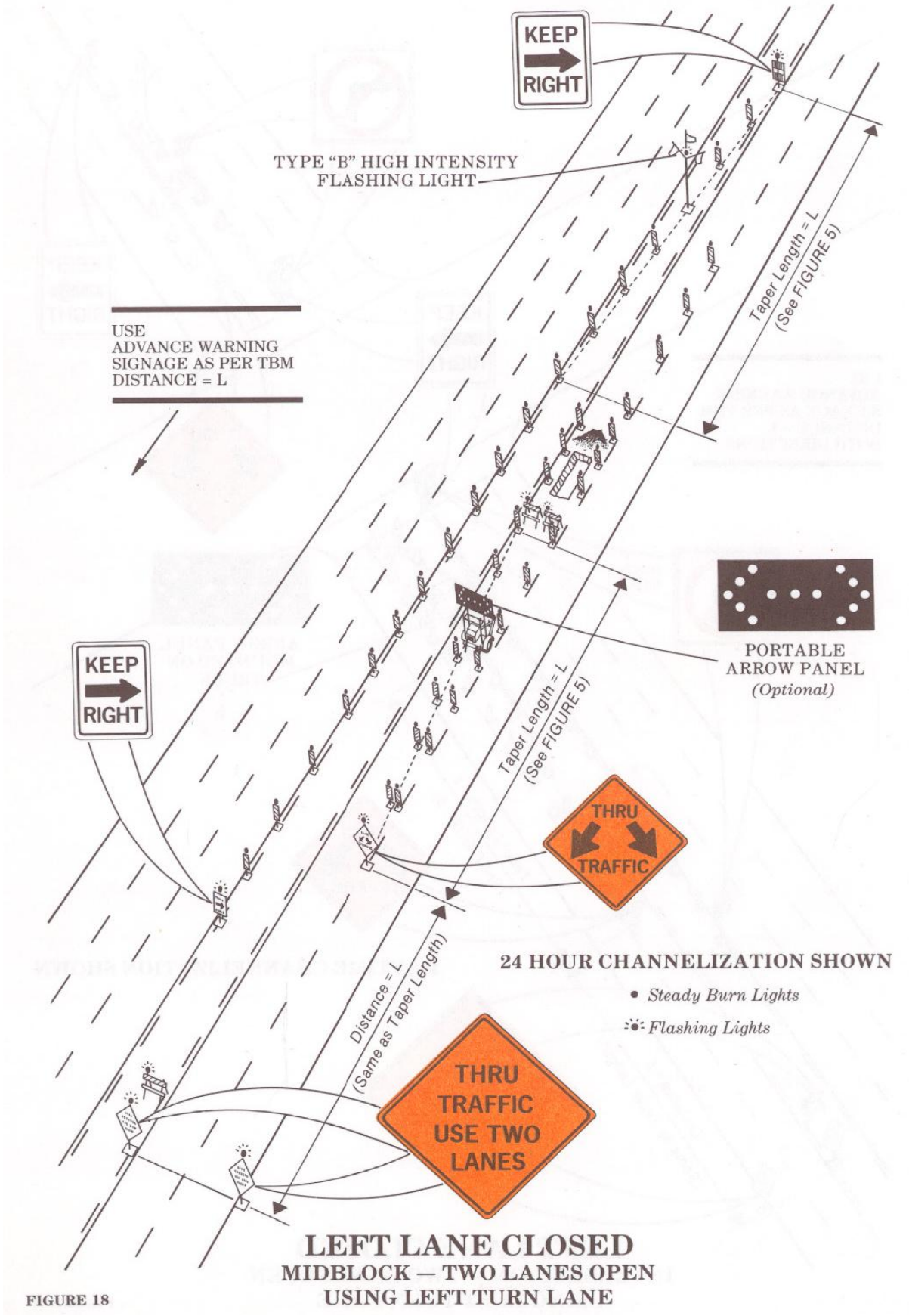
LEFT LANE CLOSED
INTERSECTION-LEFT TURN LANE OPEN

FIGURE 16



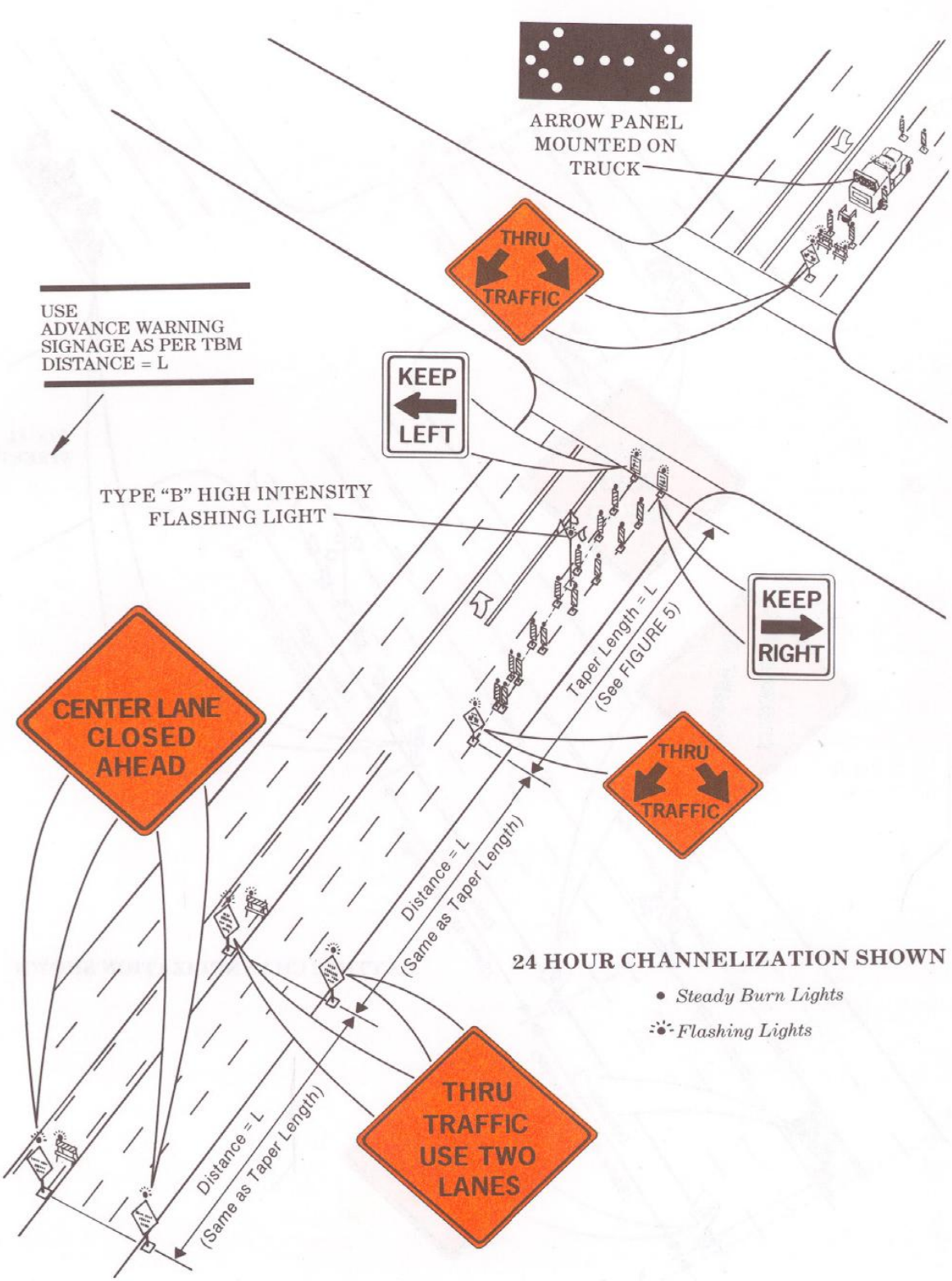
LEFT LANE CLOSED
INTERSECTION — TWO LANES OPEN
USING LEFT TURN LANE

FIGURE 17



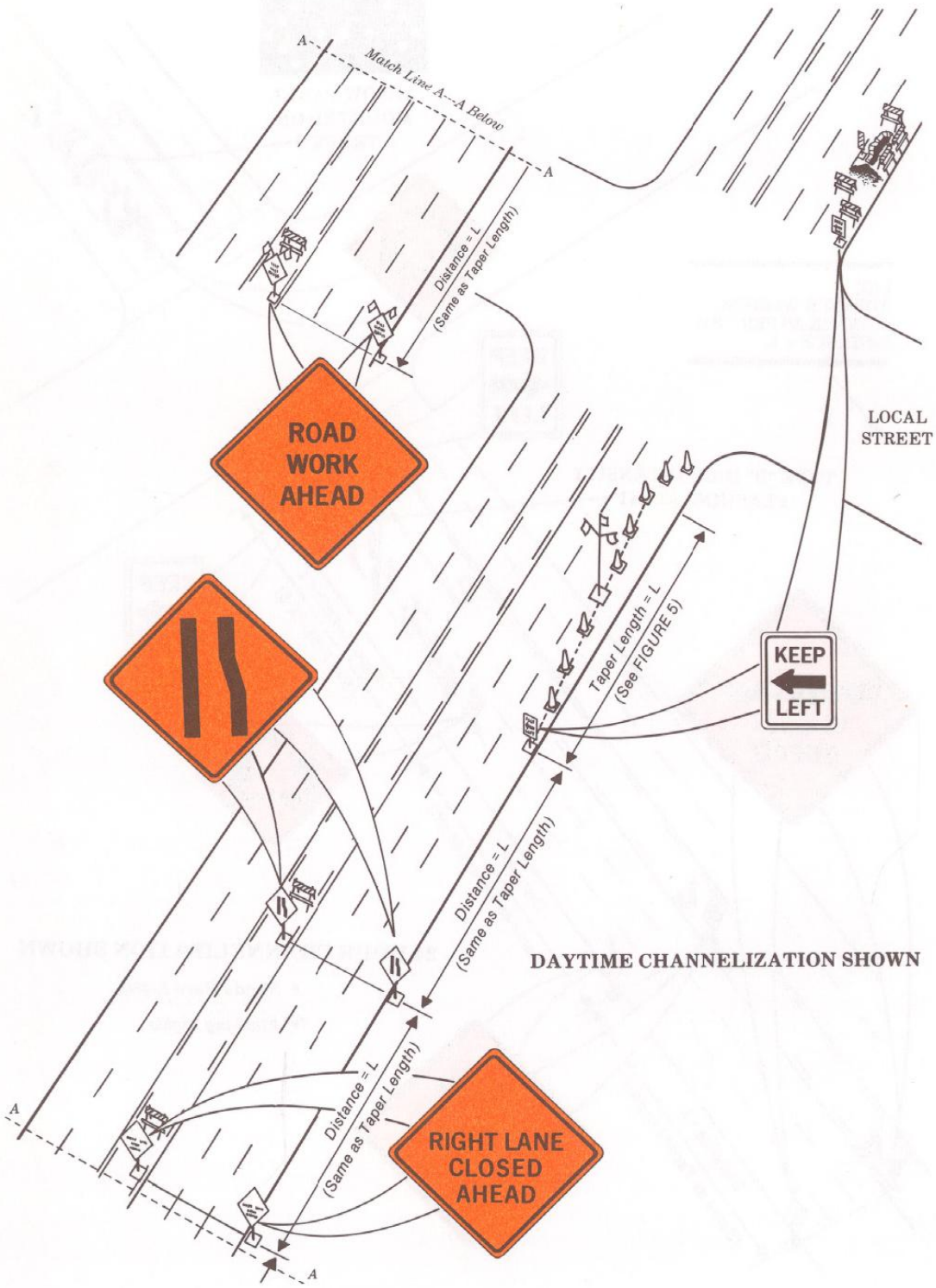
LEFT LANE CLOSED
MIDBLOCK — TWO LANES OPEN
USING LEFT TURN LANE

FIGURE 18



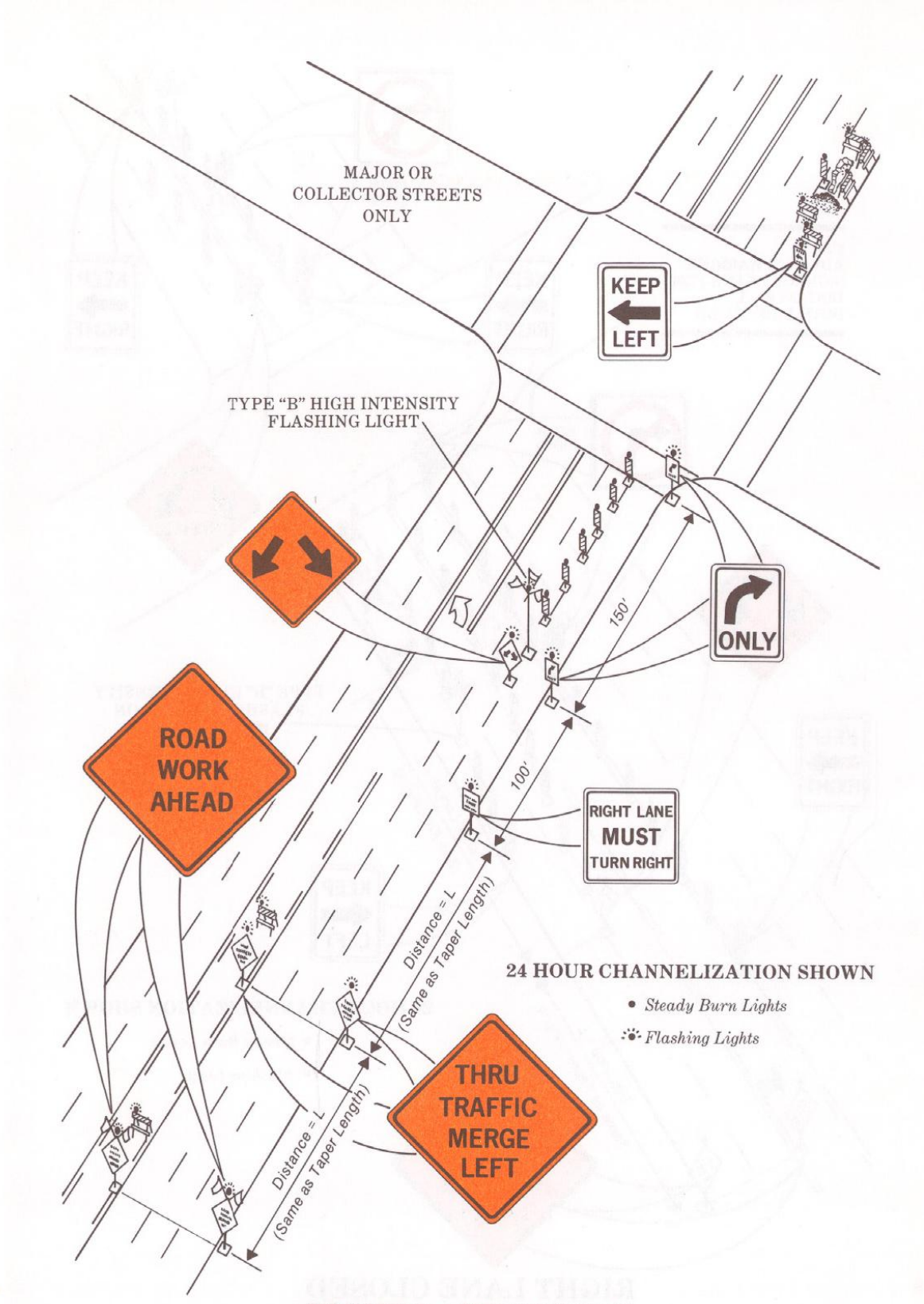
CENTER LANE CLOSED
INTERSECTION — TWO LANES OPEN

FIGURE 19



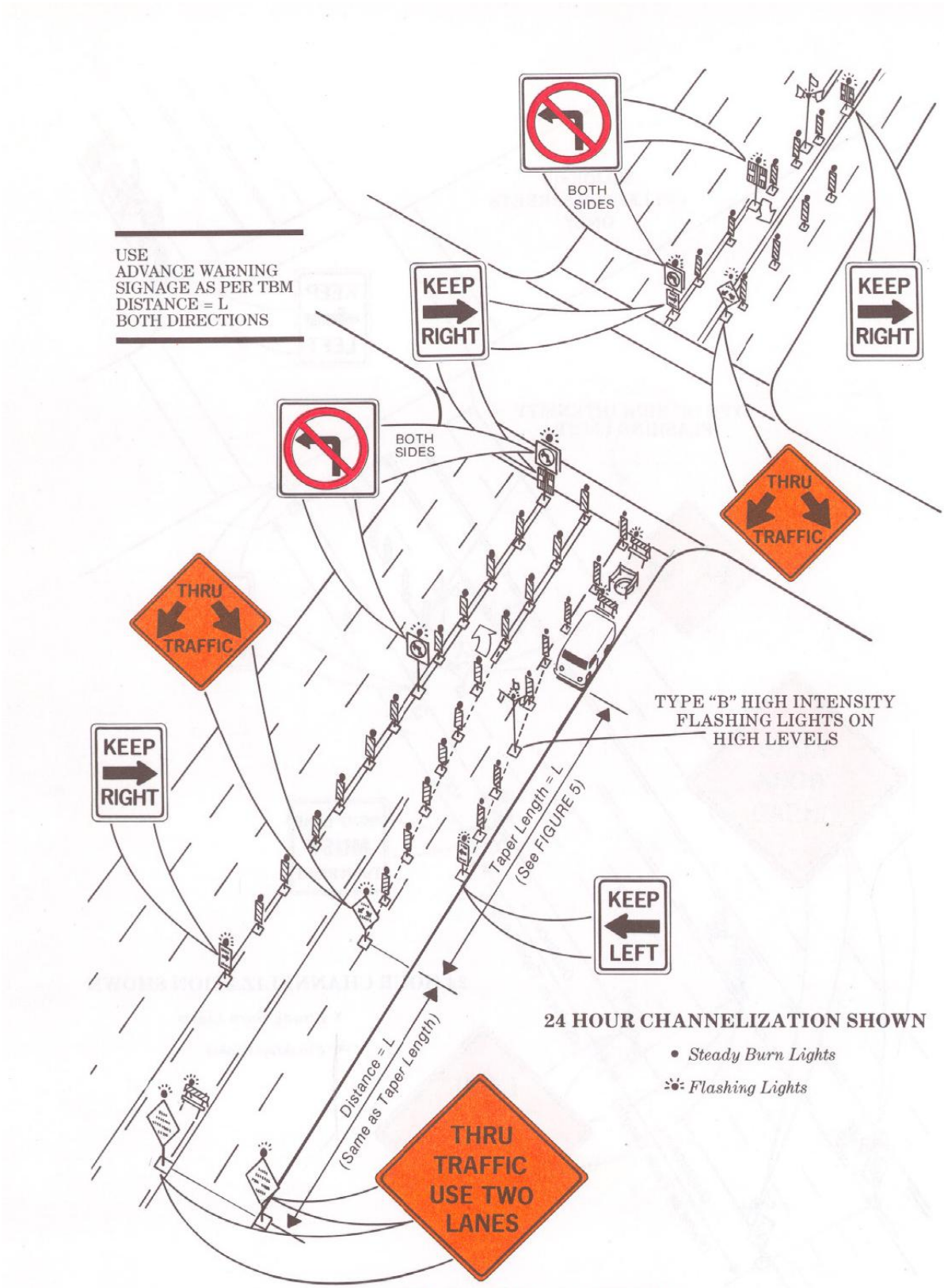
RIGHT LANE CLOSED
INTERSECTION — TWO LANES OPEN

FIGURE 20



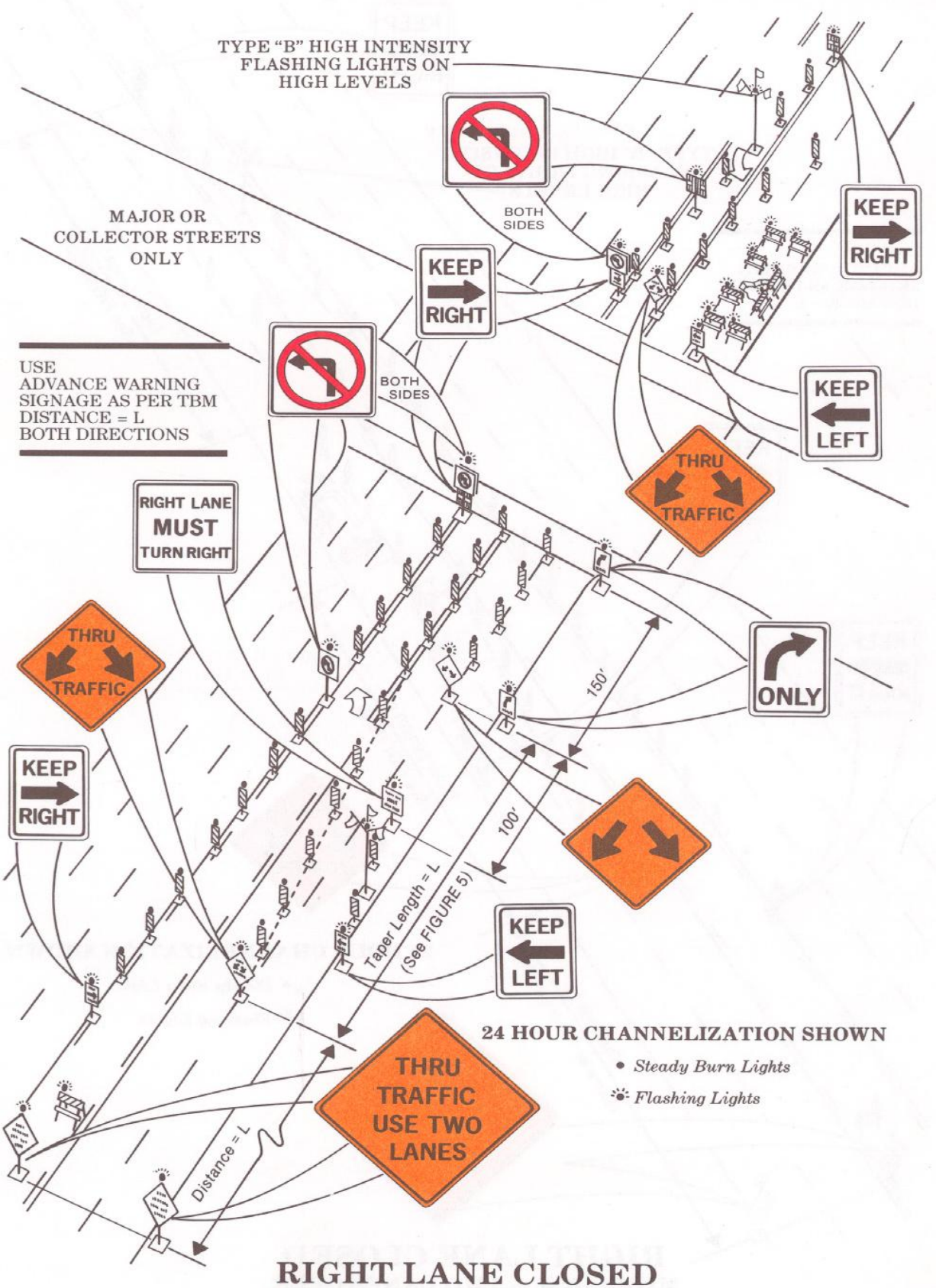
RIGHT LANE CLOSED
INTERSECTION — RIGHT TURN LANE OPEN

FIGURE 21



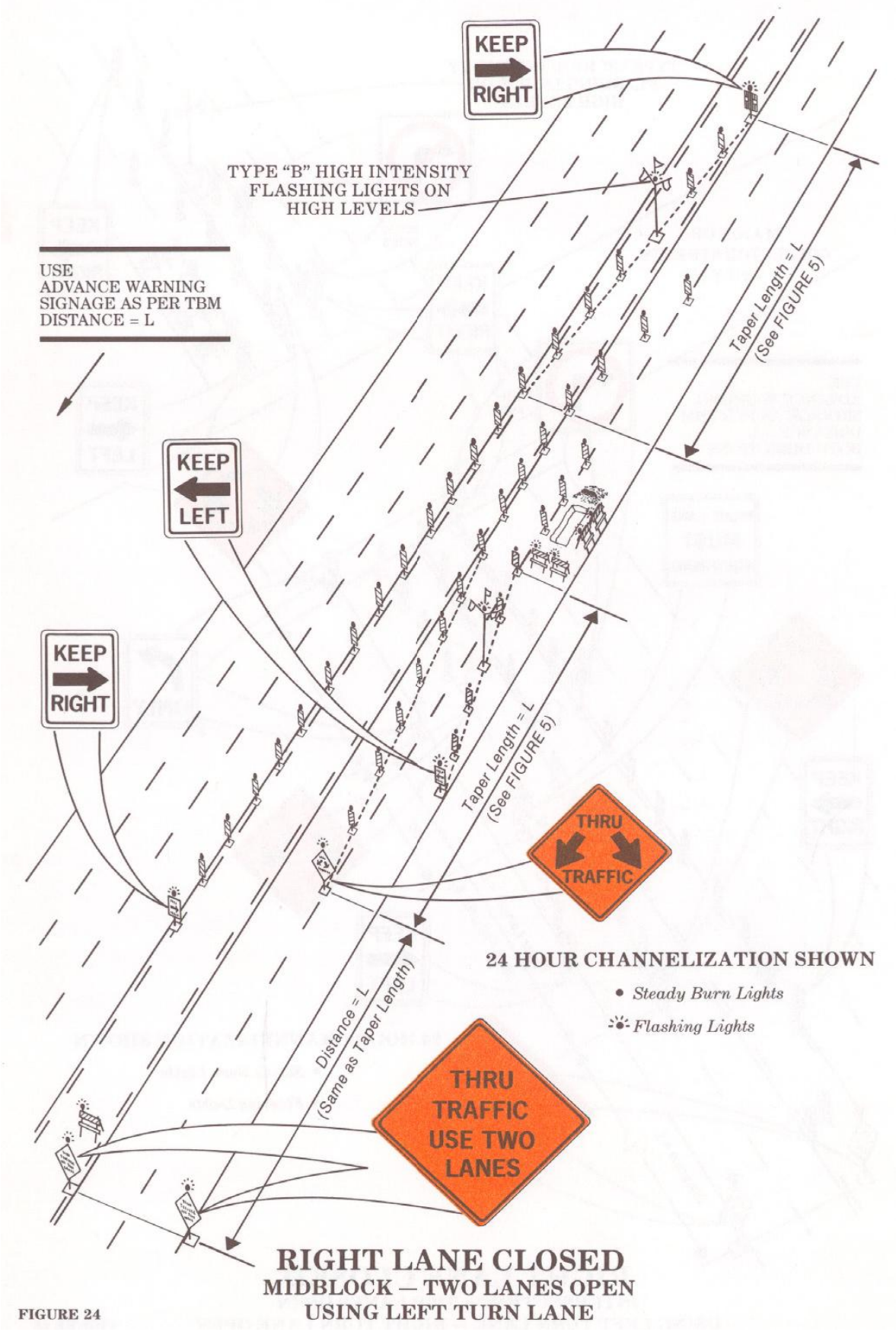
RIGHT LANE CLOSED
INTERSECTION — TWO LANES OPEN
USING LEFT TURN LANE

FIGURE 22



RIGHT LANE CLOSED
INTERSECTION — TWO LANES OPEN
USING LEFT TURN LANE — RIGHT TURN LANE OPEN

FIGURE 23



RIGHT LANE CLOSED
MIDBLOCK — TWO LANES OPEN
USING LEFT TURN LANE

FIGURE 24

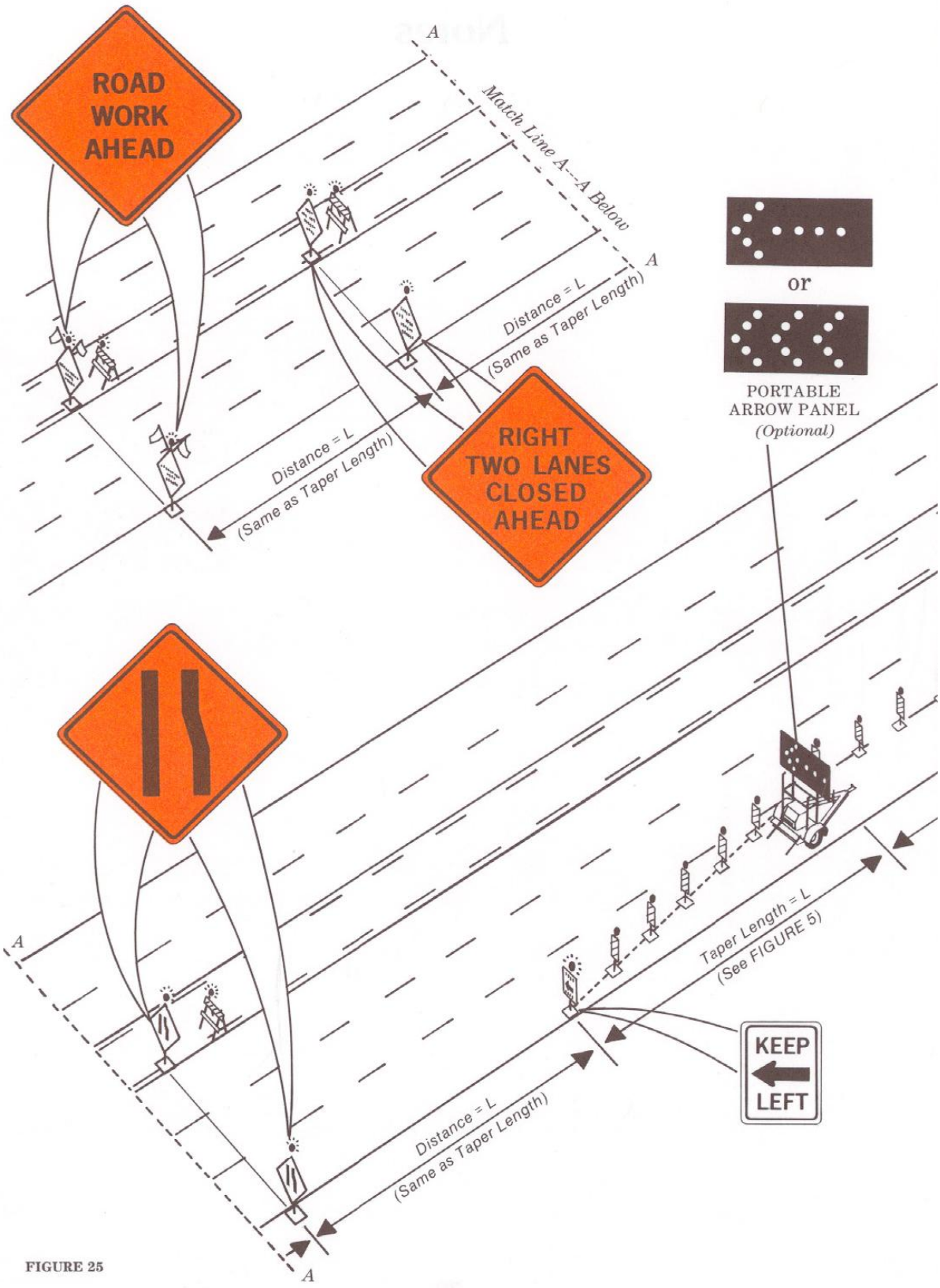
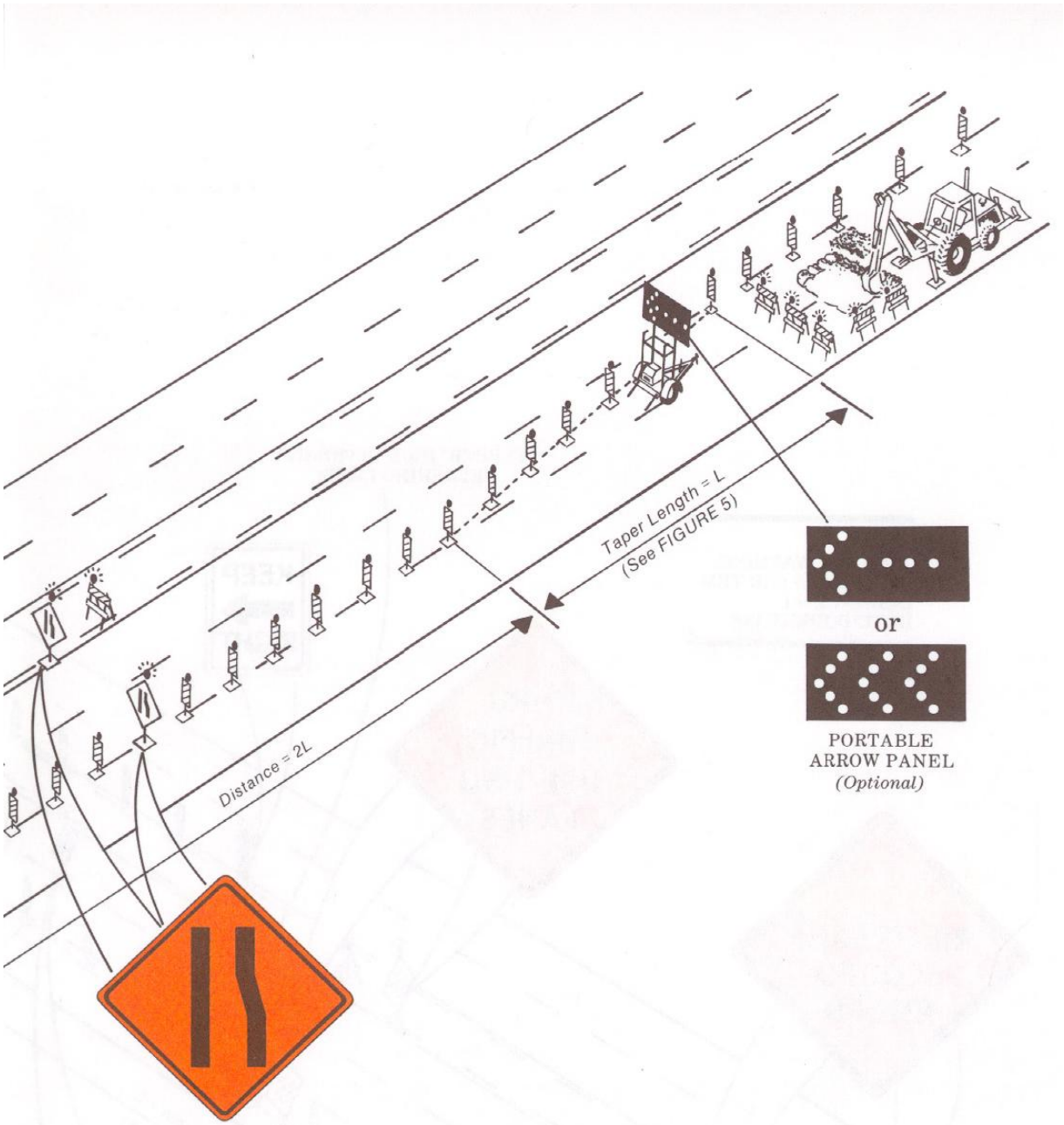

ROAD WORK AHEAD
A
Match Line A--A Below
A
Distance = L
(Same as Taper Length)
RIGHT TWO LANES CLOSED AHEAD
Distance = L
(Same as Taper Length)
or
PORTABLE ARROW PANEL
(Optional)
A
Taper Length = L
(See FIGURE 5)
KEEP LEFT
Distance = L
(Same as Taper Length)
A

FIGURE 25



24 HOUR CHANNELIZATION SHOWN

- *Steady Burn Lights*
- *Flashing Lights*

TWO RIGHT LANES CLOSED
MIDBLOCK

FIGURE 25

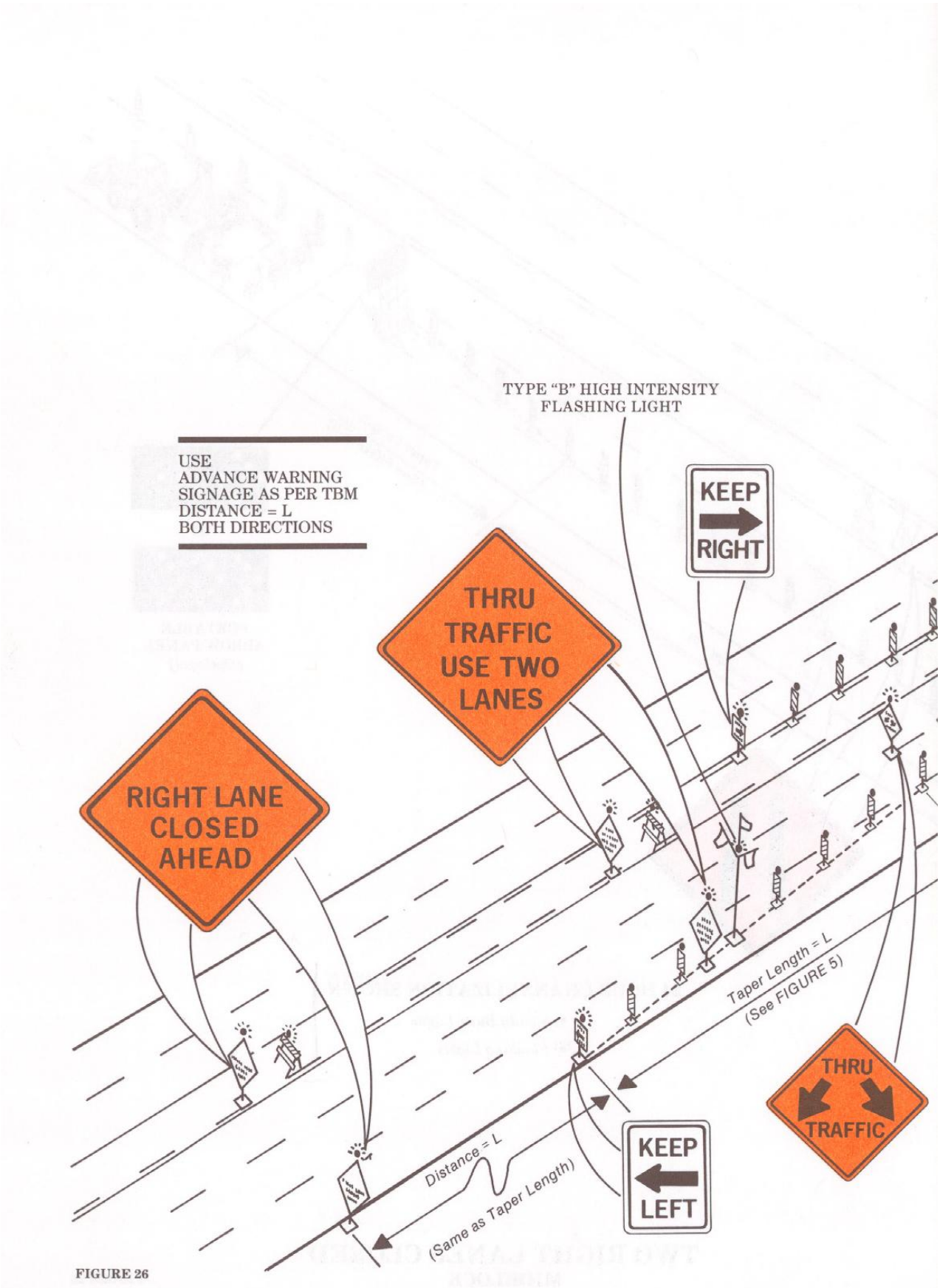
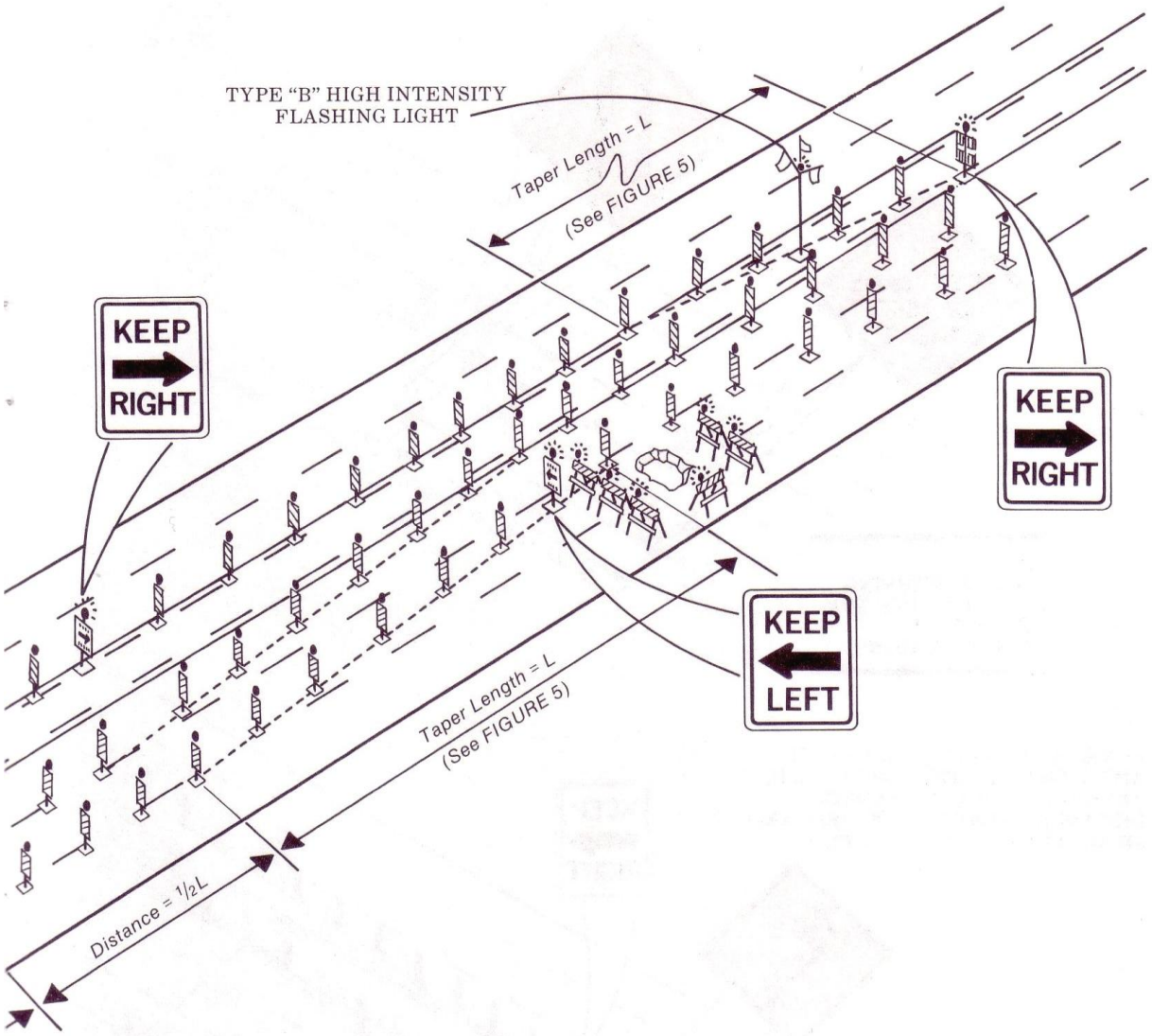

TYPE "B" HIGH INTENSITY
FLASHING LIGHT
USE
ADVANCE WARNING
SIGNAGE AS PER TBM
DISTANCE = L
BOTH DIRECTIONS
KEEP
RIGHT
THRU
TRAFFIC
USE TWO
LANES
RIGHT LANE
CLOSED
AHEAD
Taper Length = L
(See FIGURE 5)
THRU
TRAFFIC
KEEP
LEFT
Distance = L
(Same as Taper Length)

FIGURE 26



24 HOUR CHANNELIZATION SHOWN

• *Steady Burn Lights*

Flashing Lights

TWO RIGHT LANES CLOSED
MIDBLOCK — TWO LANES OPEN USING LEFT TURN LANE

FIGURE 26

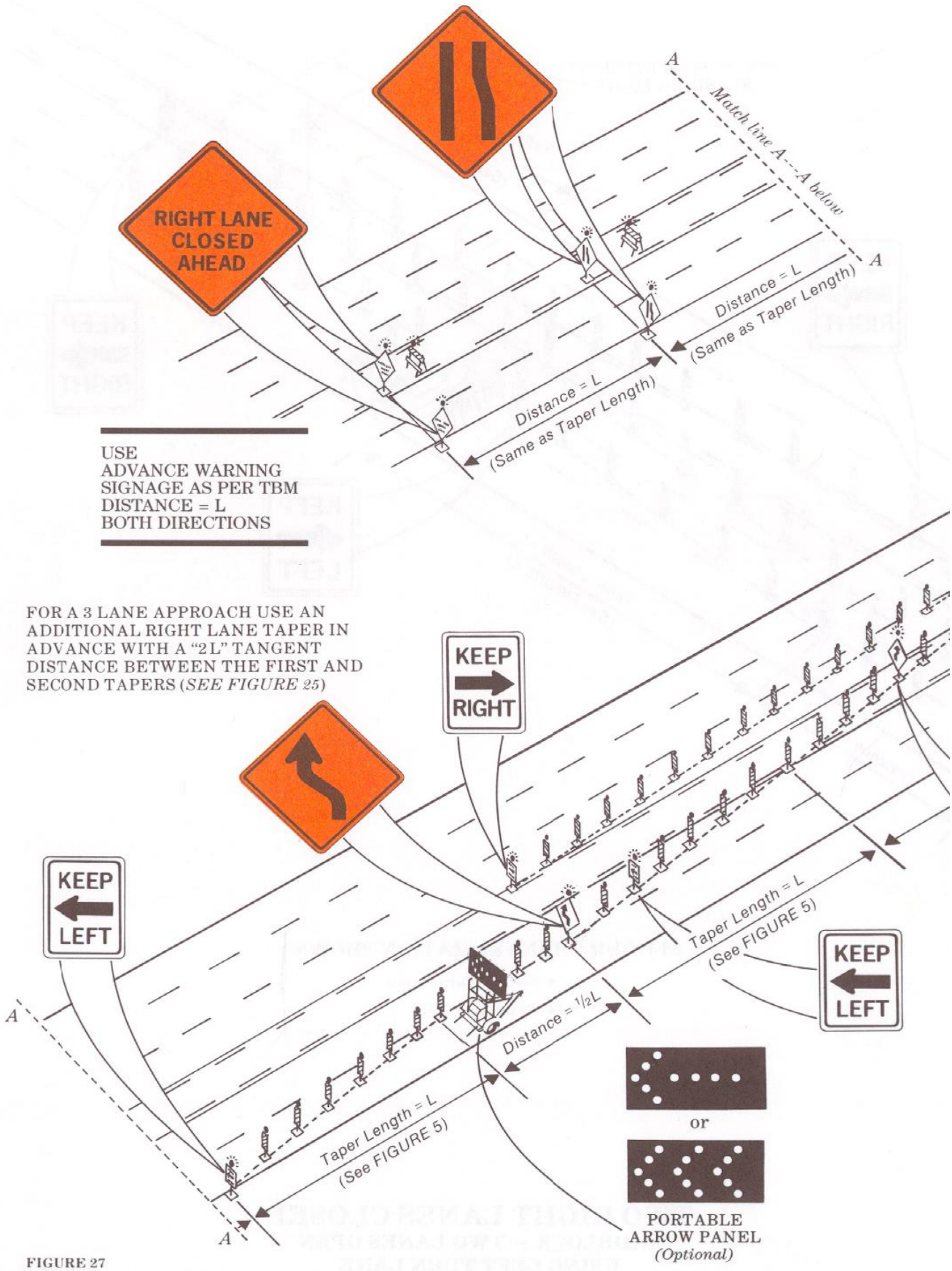
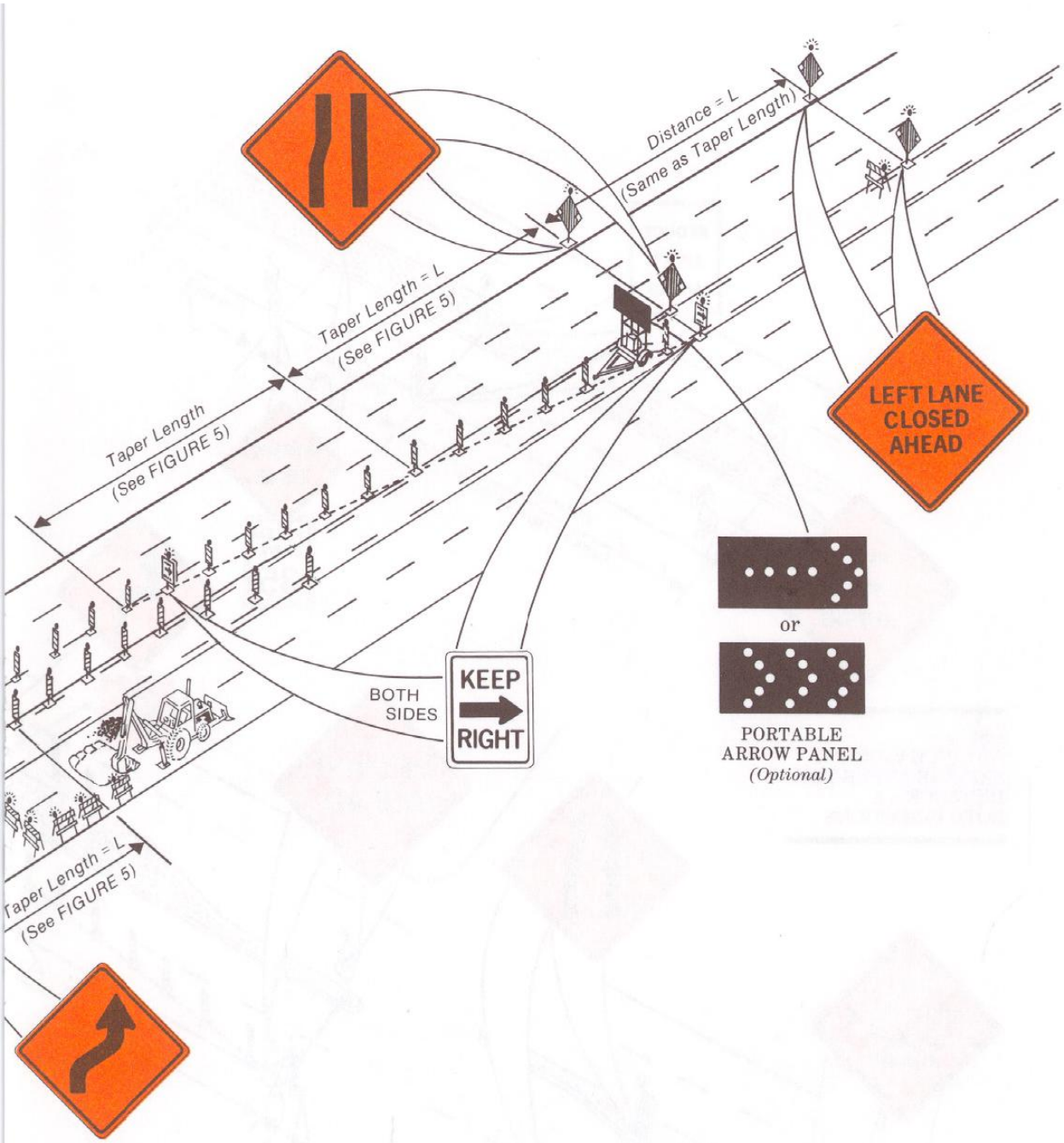

RIGHT LANE CLOSED AHEAD
A
Match line A - - A below
A
Distance = L
(Same as Taper Length)
Distance = L
(Same as Taper Length)
USE
ADVANCE WARNING
SIGNAGE AS PER TBM
DISTANCE = L
BOTH DIRECTIONS
FOR A 3 LANE APPROACH USE AN ADDITIONAL RIGHT LANE TAPER IN ADVANCE WITH A "2L" TANGENT DISTANCE BETWEEN THE FIRST AND SECOND TAPERS (SEE FIGURE 25)
KEEP
RIGHT
KEEP
LEFT
KEEP
LEFT
Taper Length = L
(See FIGURE 5)
Distance = 1/2L
Taper Length = L
(See FIGURE 5)
A
A
or
PORTABLE
ARROW PANEL
(Optional)

FIGURE 27



24 HOUR CHANNELIZATION SHOWN

• *Steady Burn Lights*

☼ *Flashing Lights*

HALF STREET CLOSED
TRAFFIC ACROSS CENTERLINE

FIGURE 27

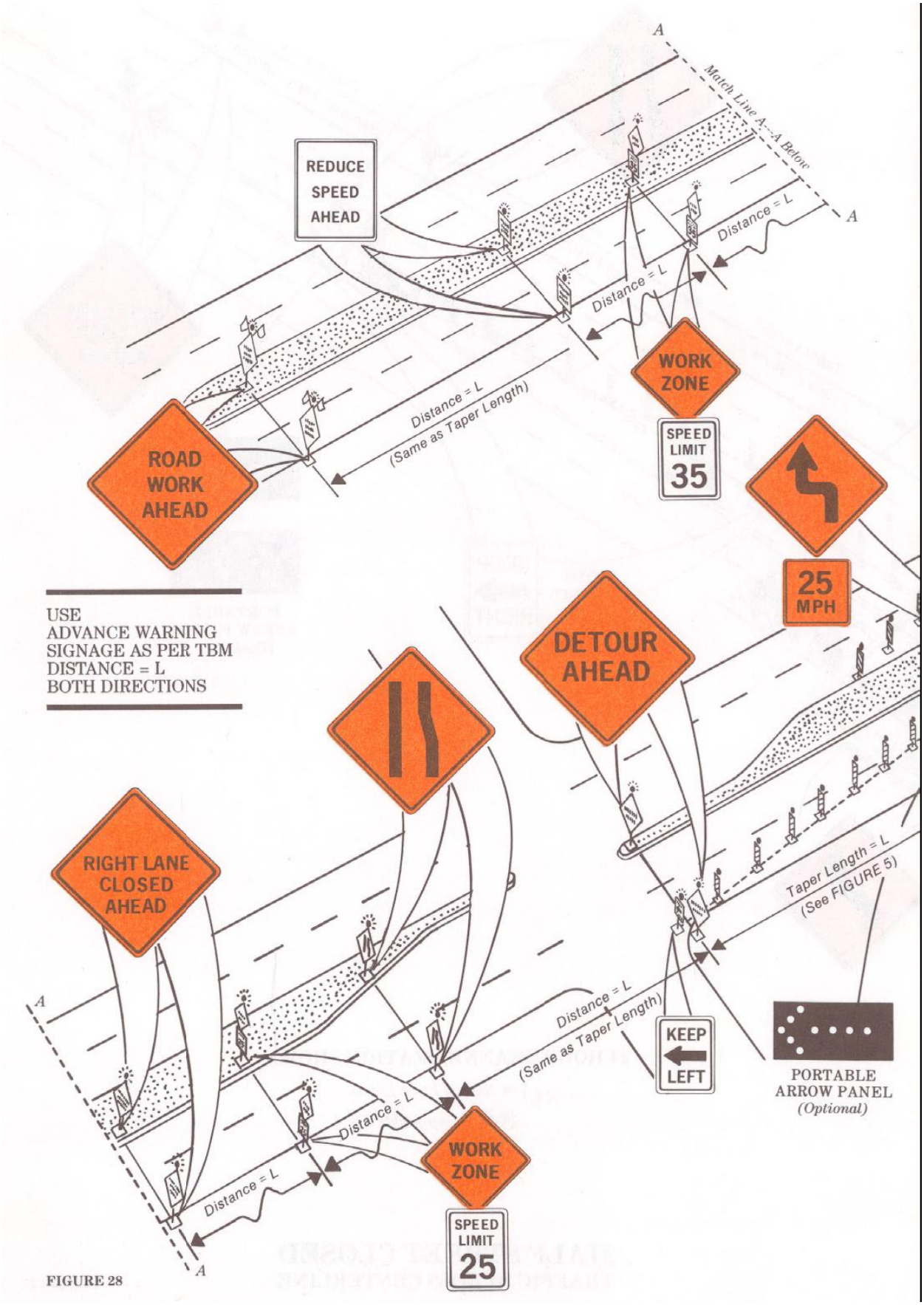
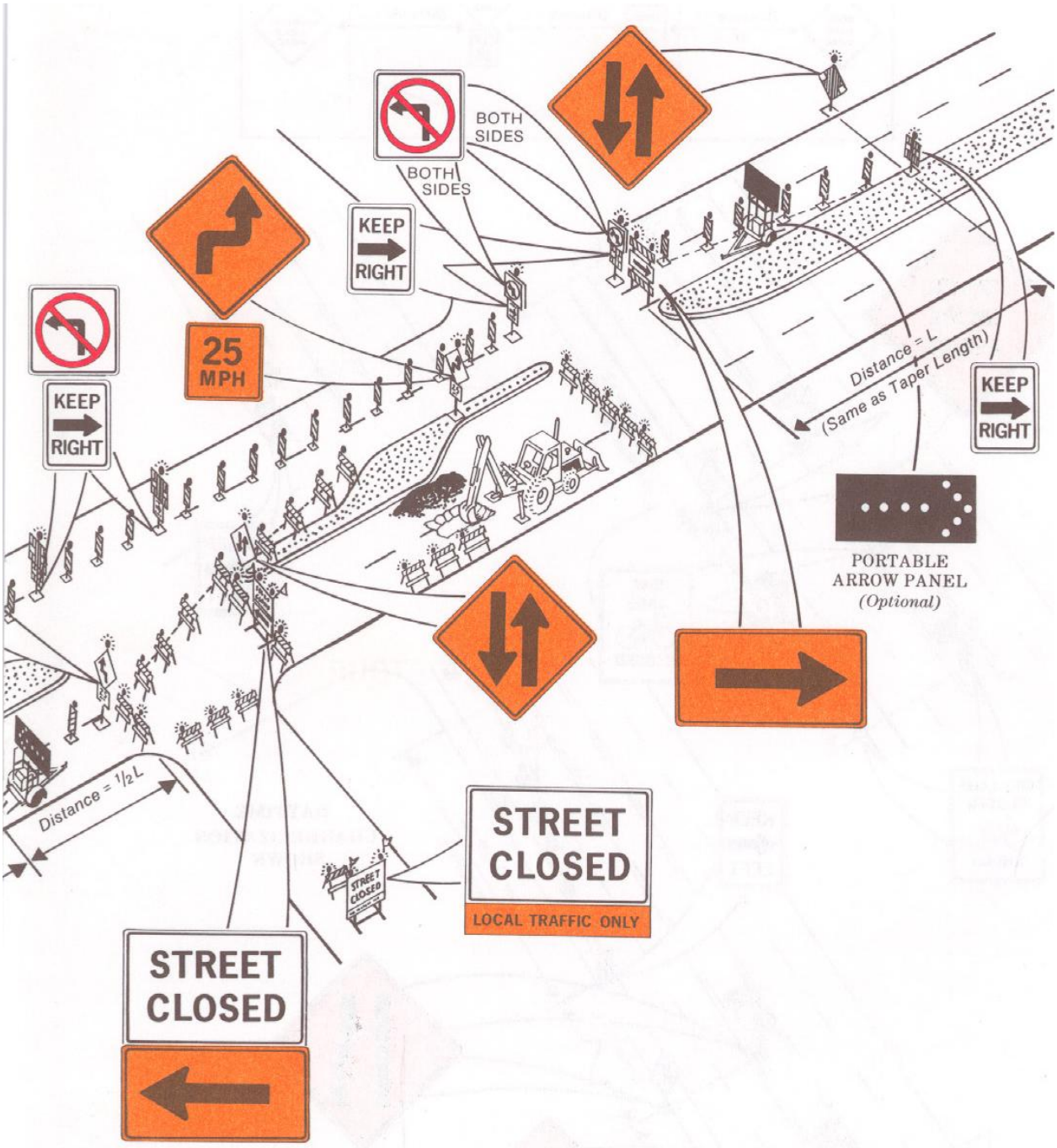

A
Match Line A--A Below
A
REDUCE SPEED AHEAD
Distance = L
Distance = L
Distance = L
(Same as Taper Length)
WORK ZONE
SPEED LIMIT 35
ROAD WORK AHEAD
25 MPH
USE
ADVANCE WARNING
SIGNAGE AS PER TBM
DISTANCE = L
BOTH DIRECTIONS
DETOUR AHEAD
RIGHT LANE CLOSED AHEAD
Taper Length = L
(See FIGURE 5)
A
Distance = L
(Same as Taper Length)
KEEP LEFT
PORTABLE ARROW PANEL
(Optional)
Distance = L
Distance = L
WORK ZONE
SPEED LIMIT 25
A

FIGURE 28



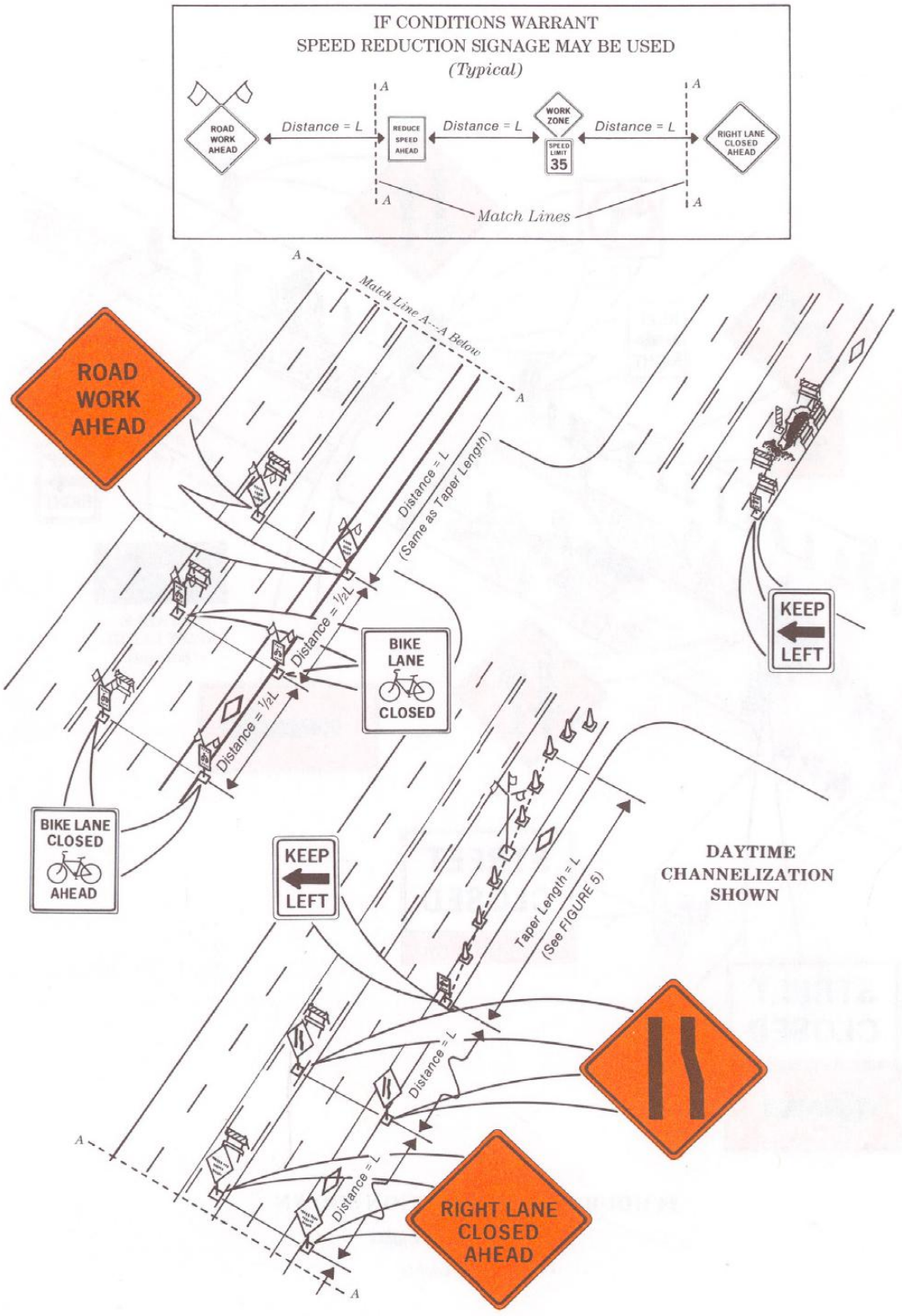
24 HOUR CHANNELIZATION SHOWN

• *Steady Burn Lights*

Flashing Lights

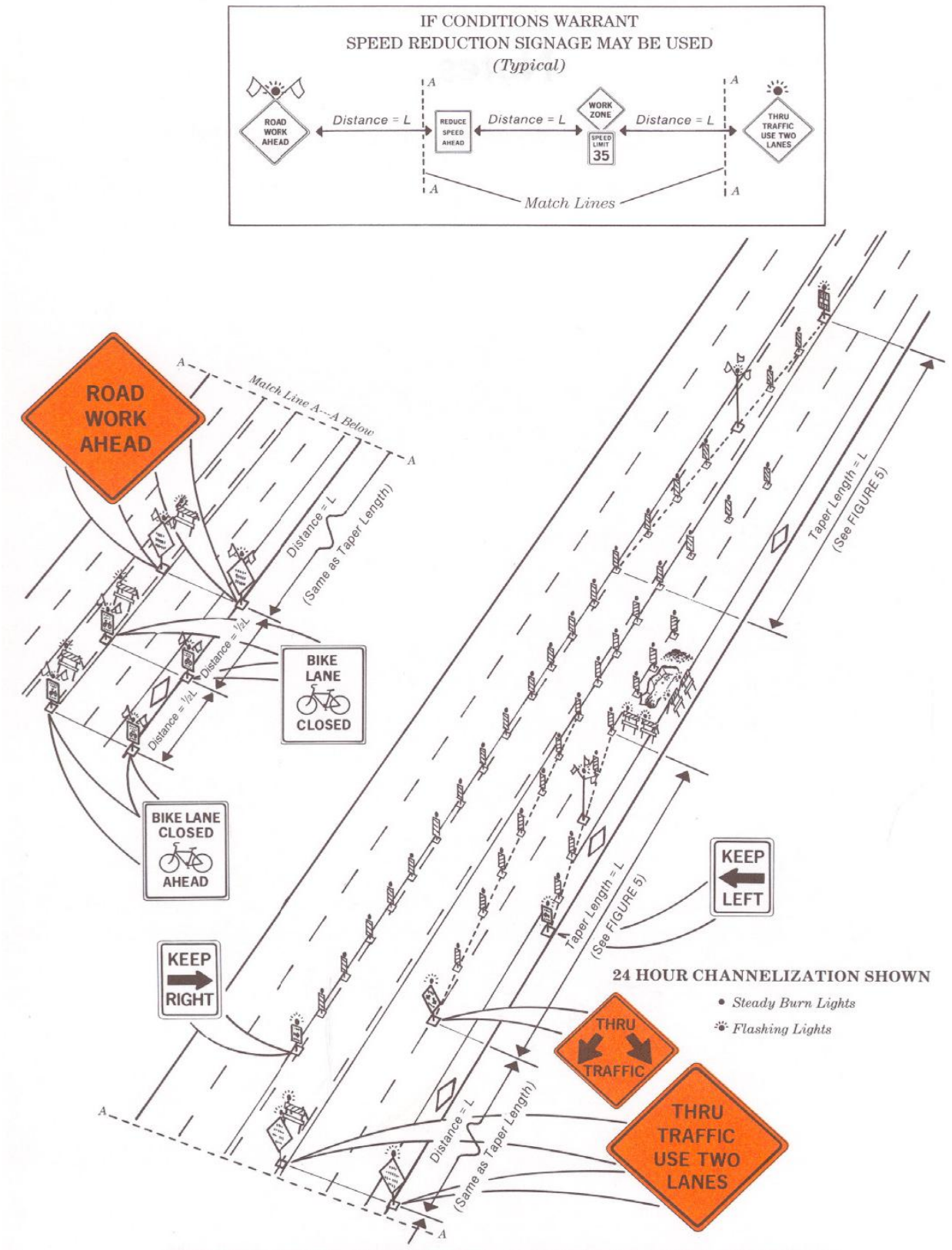
HALF STREET CLOSED
TRAFFIC THROUGH RAISED MEDIAN

FIGURE 28

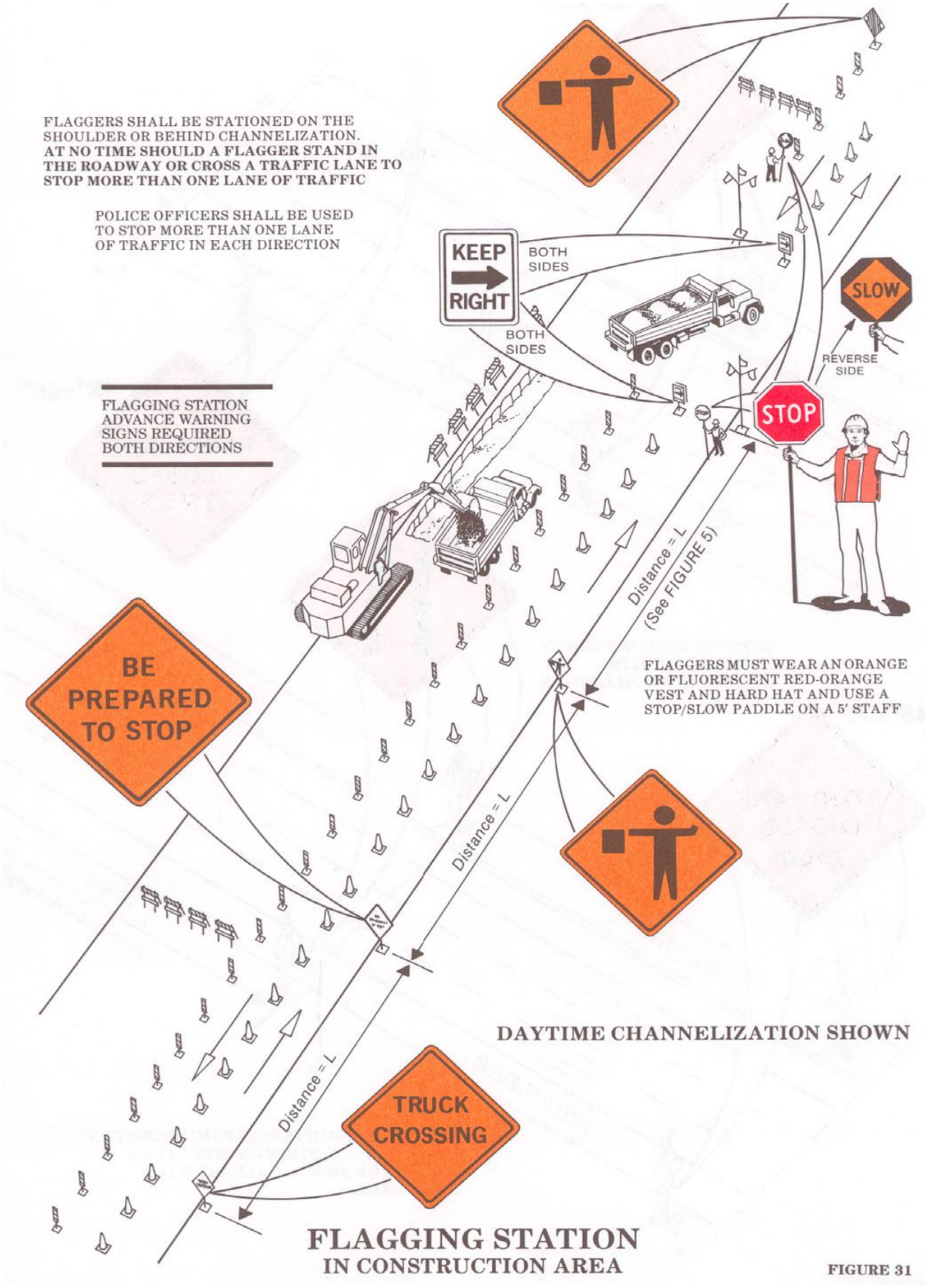


BIKE LANE CLOSURE - RIGHT LANE CLOSED
INTERSECTION WITH BIKE LANE

FIGURE 29



BIKE LANE CLOSURE - RIGHT LANE CLOSED
MID BLOCK - TWO LANES OPEN USING LEFT TURN LANE **FIGURE 30**



FLAGGING STATION
IN CONSTRUCTION AREA

FIGURE 31

CHAPTER 11

DEFINITIONS

ADVANCE NOTICE (24 HOURS), (48 HOURS): One or two normal working days in advance, as specified. Saturdays, Sundays, and holidays excepted.

ALLEY, COMMERCIAL: Lanes or passageways for use as a means of access to the rear of lots or buildings in commercial areas.

ALLEY, RESIDENTIAL: Lanes or passageways for use as a means of access to the rear of lots or buildings in residential areas.

CHANNELIZATION: A series of traffic control devices erected to divert traffic around temporary obstructions and guide traffic through restricted areas.

CITY: The City of Prescott, Arizona.

CITY FORCES: All employees and/or work crews of the City of Prescott doing work in the public right-of-way.

CITY PERMIT: A permit issued by the City of Prescott One-Stop Permit Center in City Hall.

CITY PROJECT: A project performed under contract with the City of Prescott.

CITY STREETS (STREETS): Major, collector, and local streets in the City of Prescott.

CONTRACTOR: A company conducting work in public right-of-way.

COLLECITOR STREETS: All streets designated as Collector Streets on the latest City of Prescott Street Classification Map on file at the office of the City Clerk.

DAYLIGHT HOURS (DAYTIME): The hours from sunrise to sunset.

FLAGGER: A person wearing an orange or fluorescent red-orange vest and hard hat, using a STOP/SLOW paddle, stationed to assist with traffic control in restricted areas.

HOURS OF DARKNESS (NIGHT) (NIGHTTIME): The hours from sunset to sunrise.

INTERSECTION: All of the area within the right-of-way of intersecting streets, and the area 300' beyond the intersected right-of-way on all legs of the intersection.

LOCAL STREETS: All streets designated as Local Streets (generally known as residential streets) on the latest City of Prescott Street Classification Map, which is on file at the office of the City Clerk.

MAJOR SHOPPING CENTER: A large, high-volume shopping center such as Prescott Gateway.

MAJOR STREETS (Major Arterial or Arterial): All streets designated as Major Streets on the latest City of Prescott Street Classification Map, which is on file at the office of the City Clerk.

MULTIPLE LANES: Two or more through traffic lanes in any one direction.

OFF-PEAK TRAFFIC HOURS: All times not defined as "peak traffic hours"

PEAK TRAFFIC HOURS: The hours of 6:00 a.m. to 8:30 am. and 4:00 p.m. to 7:00 p.m. Monday through Friday.

PERMITTEE: Any individual, utility, agency, or other party applying for a City permit or otherwise authorized by code, regulation, or statute to perform work in public right-of-way.

POLICE DEPARTMENT: The City of Prescott Police Department.

POLICE OFFICER: A uniformed City of Prescott, City of Prescott Valley, Yavapai County Sheriffs Department, or Department of Public Safety law enforcement officer, either on-duty or off-duty, duly authorized to enforce the *Arizona Revised Statutes.*

PUBLIC RIGHTS-OF-WAY: All land in the City of Prescott dedicated and/or expressly reserved for the use of vehicular and pedestrian traffic and/or utilities.

RESTRICTION (STREET RESTRICTION/TRAFFIC RESTRICTION): Any reduction to the normal flow of vehicular or **pedestrian traffic in the public right-of-way or** any reduction of vehicular or pedestrian access to the public right-of-way, including any act or item that causes said reductions.

SANITATION DIVISION: The Sanitation Division of the City of Prescott Public Works Department.

SPECIAL TRAFFIC REGULATIONS: The "Special Traffic Regulations" included in the City Project specifications, or attached to City Permits, prepared by the Transportation Services Division for the specific traffic situations detailed therein.

STATE: The State of Arizona.

TRANSPORTATION SERVICES DIVISION: The City of Prescott Public Works Department Transportation Services Division.

TRAFFIC CONTROL DEVICES: Signs, parking meters, traffic signals, barricades, and channelizing devices, existing or temporary, as defined and illustrated in this *Manual* or in the Federal ***Manual on Uniform Traffic Control Devices.***

TRAFFIC SIGNAL SHOP: The Traffic Signal Shop of the Public Works Department, Transportation Services Division**.**

WEEKDAYS: The days of the week starting at 5:00 am. on Monday and **ending at 10:00 p.m. on** Friday.

WEEKENDS: The days of the week starting at 10:00 p.m. Friday and ending **at** 5:00 a.m. on Monday.