2011 TRAFFIC CONTROL MANUAL

for in-street work

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City of Seattle

LETTER FROM THE CITY TRAFFIC ENGINEER

This manual is the result of input from our traffic engineers, construction inspectors, safety office, crew chiefs, contractors, and the public. We have incorporated ideas from all agencies that work in the roadways, and those performing day to day activities in the street who have to cope with sometimes unpredictable traffic.

We intend to provide everyone who has to work in the street with the information necessary to carry out their tasks safely. It is our desire that all crews who work in the public right of way set up safe work zones that consistently and clearly convey to motorists, pedestrians and cyclists that work is being performed. All users must receive a clear message from signs, cones, delineators, and barricades indicating where to travel and to slow down, creating a safer environment for them and the people working in the street.

Please use this manual to help make your work zones safer and encourage others to participate in a safe working environment. A special thanks to all who contributed to the 2011 edition, making this a manual that works for all.

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Brian Kemper, P.E.
Acting City Traffic Engineer

SDOT	SDOT Director's Rule **-2011

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I. Background

Seattle's street rights of way are an important public resource. They must safely accommodate multiple modes of travel, offer access around and through the city, provide access to private property, and allow for the delivery of utility services. Temporary construction activities and special events that occur in the right of way impede access. The placement of traffic control devices (e.g., signs, cones, delineators) gives the traveling public advance notice that they are nearing a construction zone. This helps provide for a safer working environment. The traffic control devices are also used to route traffic through or around the work zone as safely and efficiently as possible. Effective traffic control recognizes the priority to accommodate all modes of travel.

Since the 1970's, the City has published a Traffic Control Manual (TCM) for In-Street work to provide guidance in interpreting application of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) for Seattle's specific urban conditions. The TCM provides an easy-to-read, all encompassing guide for City crews and private contractors on how to keep work zones and the traveling public safe in construction and special event conditions. The TCM considers the access and mobility needs of all users of the street rights-of-way, including pedestrians, non-motorized vehicles, automobiles, transit and freight.

II. Authority and Rule

This Rule formally adopts the Traffic Control Manual for In-Street Work consistent with the provisions of Seattle Municipal Code (SMC) 11.16.320, which authorizes the Director of Transportation to adopt a Traffic Control Manual for In-Street Work. The Traffic Control Manual (TCM) establishes the City guidelines for the methods and devices to be used for safeguarding and controlling traffic during temporary traffic conditions at and near work in streets, bike paths and trails, pedestrian paths and trails, and in alleys.

The provisions of the TCM are consistent with the authority of the City Traffic Engineer to determine the placement of official traffic control devices as may be deemed appropriate to regulate, warn, or guide traffic for construction, detours, emergencies, and special conditions, as provided by SMC 11.16.340. The guidance and requirements set forth in the TCM are intended to be incorporated in all permits granted for work within and use of the right of way. Such permits are issued by the SDOT Street Use Division and the City of Seattle Special Events Committee.

III. Ease of Use and Location

The full text and illustrations of the Traffic Control Manual can be found on the SDOT web site at: http://www.seattle.gov/transportation/trafficcontrolmanual.htm. The TCM can be downloaded in PDF format, with sketches available in CAD format for use in developing specific traffic control plans.

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INTRODUCTION

This Traffic Control Manual shall be utilized in conjunction with and is intended to supplement the Manual on Uniform Traffic Control Devices (MUTCD), as published by the U.S. Department of Transportation, Washington D.C. The basic principles embodied in the MUTCD have been adapted to urban conditions to provide a user's guide for work within the City of Seattle right of way, under the authority of the Seattle Municipal Code (SMC 11.16.120).

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I. GENERAL INFORMATION

A. Purpose and Intent

The purpose of this manual is to set forth the basic principles and standards to be observed by all those who perform work in a public street so as to provide safe and effective work areas and to warn, control, protect and expedite vehicular, bicycle and pedestrian traffic.

If proper traffic control techniques are effectively utilized, it will be possible to:

1. Minimize or prevent the potential for vehicular, bicycle and pedestrian collisions.
2. Minimize or prevent injury to workers and the public.
3. Minimize or prevent damage to private and public property.
4. Minimize or prevent the possibility of litigation involving all affected parties.
4. Maximize traffic flow and reduce delay and congestion by lessening the confusion to the road user.
6. Improve public relations.

In an effort to increase the road user's comprehension and facilitate traffic flow, it is desirable to standardize the type and placement of traffic control devices as much as possible. This Manual attempts to accomplish this objective by:

1. Utilizing standard techniques for the design and placement of traffic control devices.
2. Including typical examples of proper signing and channelizing techniques.

Although each situation should be dealt with individually, conformity with the general provisions and techniques established herein is necessary. In particular situations not adequately covered by the provisions of this Manual, the protection of the traveling public and the worksite will dictate the measures to be taken, consistent with the general principles set forth herein. The obligation of complying with the requirements of this Manual and the liability for failing to do so are hereby placed upon the persons, entities, or agencies doing work within or infringing upon the public street right-of-way.

B. Responsibility

All persons or agencies doing work within or infringing upon the street right of way shall conduct said work to acceptable standards of safety and efficiency and, except where specified in their Contract, shall be responsible for the following:

1. Obtaining all necessary permits and/or permission to perform work in the street right-of-way from the Seattle Department of Transportation, Street Use Division (see Section III and web link http://www.seattle.gov/transportation/stuse_home.htm).
2. Obtaining approval for haul route or routes from the City Supervisor of Commercial Vehicle Enforcement.

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3. Supplying, installing, and maintaining all traffic control devices and equipment as outlined in this Manual unless specific instructions to the contrary are included in the contract documents.
4. Supplying flaggers and proper equipment when required.
5. Scheduling and expediting the work to minimize inconvenience to the public.
6. Providing adequate safeguards for the worksite and the general public as outlined herein.
7. Calling before digging. Utilities Underground Location Center (UULC) 1-(800)-424-5555 or 811; www.callbeforeyoudig.org
8. Contacting SDOT Signal Operations 10 days prior to any work that may affect SDOT signal operations.

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Glossary

Definitions

Advance Notice	Unless otherwise specified, 72 hours minimum notice for an arterial closure and 24 hours for any other right of way closure, Saturdays, Sundays and Holidays excepted
Bicycle Facility or Bicycle Way	Any bicycle lane, bicycle trail, shared lane, or a street or sidewalk commonly used by bicyclists identified on the Seattle Department of Transportation's current "Seattle Bicycling Guide Map"
Business Day	A day other than Saturday, Sunday, or Holiday
CAM	Client Assistance Memo
Central Business District	Within this document, that area bounded by Denny Way, Elliott Bay, I-5, and South Royal Brougham Way
Central Retail District	Within this document, the area bounded by Virginia Street, Denny Way, I-5, Seneca Street, and First Avenue
Contract	Contract manual and plan set
Contractor	Anyone authorized to work in the street right of way
High Level Warning Device	High level warning devices shall consist of either three flags, a Type "B" warning light or vehicle mounted flashing yellow light (see Figure IV-1).
High Impact Area	An area where all streets may have traffic significance regardless of classification, as determined by the Traffic Management Division of the Seattle Department of Transportation. Hot Zones may change according to change in construction intensity at the time of permitting.
Hours of Darkness	(Other references – Night, Nighttime) The hours from sunset to sunrise
Hours of Daylight	(Other reference – Daylight Hours, Daytime) The hours from sunrise to sunset
Pioneer Square	Within this document, that area bounded by Columbia Street, 2nd Avenue, 2nd Avenue South, South King Street, Alaskan Way South

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Public Works Contract	A written agreement between the City and the Contractor covering the performance by both parties and enforceable by law
Traffic Engineer	The City Traffic Engineer, including staff authorized to represent him or her
Uniformed Police Officer (UPO)	An officer commissioned to write traffic citations within the State of Washington
Work Area	The public right of way within or adjacent to the construction zone

. . .

Shall	A mandatory condition. Where certain requirements in the design or application of the device are described with "shall" stipulation, it is mandatory when an installation is made that these requirements be met.
Should	An advisory condition. Where the word "should" is used, it is considered to be advisable usage, recommended but not mandatory.
May	A permissive condition. No requirement for design and application is intended.

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Acronyms

MUTCD	Manual of Uniform Traffic Control Devices (U.S. Department of Transportation Federal Highway Administration)
ROW	Right of Way

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II. GENERAL REQUIREMENTS

A. General

All traffic control devices shall conform in both design and usage to specifications contained in this Manual. Traffic control for in street work shall follow this Manual unless otherwise stipulated in the contract or permit. In the case of emergency work requiring traffic control refer to Section IX.

Additional requirements for public convenience and safety are in the City of Seattle Standard Specifications for Road, Bridge and Municipal Construction, Sections 1-07.23 and 1-10.

B. Planning

Advanced planning for the work area and affected vicinity is a basic requirement, and shall always be undertaken prior to any type of in-street work activities in order to keep traffic obstruction public inconvenience, to a minimumwhile providing maximum safety. The Contractor shall not have under construction a greater length or amount of work than can be completed in a continuous and expedient manner.

In order to achieve these goals the Contractor should visit the job site before starting the job in order to evaluate:

1. Traffic conditions (motorized, bicycle and pedestrian)
2. Existing traffic controls
3. Traffic lane requirements (one lane each way is never less than 11' when each lane is adjacent)
4. Physical features
5. Visibility restrictions
6. Problems of access to abutting property
7. Business access and activities
8. Type, number and location of signs, and channelizing devices, including any specially worded signs or other special devices which may be necessary
9. Adjacency to other jurisdictions. Traffic control for the construction work adjacent to the Seattle city limit shall be coordinated with the appropriate jurisdiction: the King County Traffic Engineer, 206-344-2696; WSDOT – CTCO office, 206-440-4471; City of Shoreline, 206-801-2461; City of Tukwila, 206-431-2448.

C. Time of Work

No work shall be scheduled on arterial streets and sidewalks during peak traffic hours without written authorization from the City Traffic Engineer. The peak traffic hours are from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m., unless otherwise specified. Peak traffic hours for the Central Business District are from 6:00 a.m. to 9:00 a.m., and 3:00 p.m. to 7:00 p.m., unless otherwise specified.

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There is a Holiday Moratorium for construction. No work shall be scheduled on streets or sidewalks within the Central Retail District and Pioneer Square from Thanksgiving Day through New Year's Day.

The City of Seattle Noise Ordinance allows work as follows:

Weekdays 7:00 a.m. - 10:00 p.m.
Weekends 9:00 a.m. - 10:00 p.m.
Impact tool work weekdays 8:00 a.m. to 5:00 p.m.
Impact tool work weekends 9:00 a.m. to 5:00 p.m.

Questions concerning the Noise Ordinance can be addressed to the Department of Planning and Development at 206-684-7843 or:
www.seattle.gov/dpd/Enforcement/Noise_Abatement/Overview/

The contractor may be required to temporarily discontinue work if possible conflict exists with special events such as parades, sporting events, miscellaneous rallies, and large public meetings or with seasonal conditions such as Christmas. Information may be found at:
http://www.seattle.gov/specialevents/default.htm

All work scheduled within the right of way requires a Street Use permit. A site-specific traffic control plan is required for Street Use permits located on arterial streets, as well as non-arterial streets within designated high impact areas. Arterial designation is shown on CAM 2110 at: http://www.seattle.gov/transportation/stuse_docs.htm.

The approval of a traffic control plan is limited to the specific work submitted. If another contractor wishes to use the plan, or subsequent work develops at a later time, the plan shall be resubmitted.

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D. Work Area

In general, unless the section of street is to be completely closed to vehicular traffic, work shall be accomplished such that as few traffic lanes as possible are affected. Work shall be scheduled and work areas laid out to permit:

1. The maximum number of traffic lanes normally available to be opened in the direction of the heaviest flow of traffic during the peak hours.
2. Maintenance of two-way traffic at all times except on one-way streets, unless otherwise granted a specific exception. Additional width for facilitating traffic flow may be obtained by prohibiting on-street parking adjacent to the work zone.
3. No personal vehicles shall be within the work zone or the buffer zone, or any other area controlled by temporary traffic control.
4. Traffic should be maintained on a paved surface whenever possible. However, in the event that a graveled or dirt surface must be used as a detour, the Contractor shall

maintain a smooth surface and shall control dust. The Contractor shall use flaggers through the off-pavement detour.
5. Spillage from trucks on the sidewalk or driving surface adjacent to the work area shall be cleaned up immediately.
6. Provision for safe and protected pedestrian and bicycle ways.
7. The placement of construction equipment so as not to create an unnecessary sight or other obstruction to vehicular, bicycle or pedestrian traffic.
8. The Contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment, and any other needed actions to protect the life, health, and safety of the public, and property in connection with the performance of the work covered by the contract. The Contractor shall perform any measures or actions the City Traffic Engineer may deem necessary to protect the public and property.

Following placement of all necessary traffic control devices, those responsible should drive and walk through the entire work area in the same manner as the public. Particular attention should be given to visibility of all signs including advance warning signs, smoothness of transitions, and placement of any devices which may cause confusion or indecision on the part of the unfamiliar driver, bicycle rider or pedestrian.

The Contractor shall maintain all work area traffic control devices in a proper condition on an around the clock basis whether or not work is actively being pursued. In addition, the Contractor shall assure that tools and equipment are properly stored and excavation bridging is secure and adequately covering the excavation.

E. Placing Signs and Equipment

Proper placement of signs, channelizing devices, and construction equipment is essential to safe, smooth traffic operation around and/or through the construction area.

The following procedures shall be adhered to:

1. No traffic control equipment, other than parking prohibition signs, which must be installed ahead of time, shall be installed except immediately before the work begins. However, if such signs need to be installed as a matter of convenience in advance of the scheduled work, they shall be effectively covered until work begins.
2. Any traffic control equipment not required at any time during the job shall be removed from view during such period.
3. All traffic control devices shall be installed so that they are readily visible to approaching traffic. Traffic control devices should be placed such that they allow the driver to see from one device to the next and are in the same position on successive days unless changes in construction work dictate otherwise.
4. Truck and construction equipment which encroaches onto the traveled roadway for any reason shall be equipped with flashing or roatating yello/orange warning lights. Unless one of more flaggers are present to control traffic, supplementary traffic control devices shall be place to warn, slow down, and if necessary divert traffic

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around such equipment. Truck and equipment movement during peak hours is prohibited without approval from the Engineer.

5. Wherever practical, trucks and equipment should be placed between workers and oncoming traffic to afford added protection to the workers should a driver fail to observe the traffic control devices. The use of such vehicles shall only be considered supplemental to and not a substitute for proper traffic control and warning devices as outlined in this Manual.
6. When a steel plate is necessary to cover an excavation, each side of the plate shall have a minimum of 12 inches bearing on the sides of a cut, and shall be anchored by steel pins. Plates shall be bedded on temporary pavement patch material and shimmed to prevent movement, oriented to be perpendicular to traffic, and the bedding shall be tapered on all sides to provide smooth transition for all users. Plates shall be textured to provide a non-skid surface in dry and wet conditions acceptable to the City Traffic Engineer. All plates shall be highlighted with paint at the edges, and an advance warning sign shall be used to identify the presence of the plate. Plates shall not be left on an undisturbed roadway unless in an approved storage area.
7. When exposed utility manholes or lids are necessary, the Contractor shall ensure minimal exposure to traffic with tapered asphalt mix or equivalent along all sides to minimize hazard, and spray painted or highlighted.
8. Signs shall not be placed such that they obstruct pedestrian access, unless the signs are related to sidewalk closure.
9. Signs shall be made according to City of Seattle specifications.

F. Short Duration and Mobile Work

It is often necessary for certain vehicles to stop for a few minutes within the roadway area in order to perform routine service, such as relamping and manhole inspection. In such cases, specifications for the use of temporary traffic control devices need not be complied with to the extent specified herein, however:

1. Such vehicles shall be equipped with approved flashing or rotating yellow / orange warning lights, or arrow boards.
2. Appropriate warning devices shall be mounted on the vehicle as high as necessary to be seen by approaching motorists.
3. Supplemental traffic cones (or other suitable channelizing devices) shall be used to channelize or divert traffic around the vehicle. Such devices shall remain in place until all work has been completed and the vehicle is ready to be moved.
4. If necessary to interrupt traffic flow or if the vehicle obstructs a lane on an arterial street, flagger control shall be provided.
5. Signs, barricading and channelization, as required elsewhere in the Manual, are required for all vehicles stopped in the street for more than a few minutes, as determined by the City Traffic Engineer.
6. A narrative shall be provided as part of the traffic control plan to describe the moving operation, including duration, for all permitted and approved mobile work.

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G. Speed Control

In those areas where construction operations have changed road conditions, such additional hazards as reduced lane width, open trenches, temporary roadway, etc., may be considered as evidence of need for an alteration of the legal (or posted) speed limit. Requests for alteration of the legal speed limits on City streets must be submitted to the Traffic Engineer.

Normally, proper traffic control plans are designed based on the assumption that motorists will reduce their speeds if they clearly perceive a need to do so. Reduced speed zoning should be avoided as much as practical. However, warning advisory speed plates may be installed with warning signs.

H. Parking Control

Parking restrictions shall be established within construction and maintenance areas where parked vehicles may contribute to hazardous road conditions and restrict traffic flow. In areas where parking pay stations or parking meters are present, the Contractor shall apply to the Traffic Management Division (206-684-5086) at least 24 hours in advance for installation of signs and/or paystation/meter covers restricting such parking. In areas with parking pay stations and sidewalks with related informational parking signage and numbered base plates, the Contractor shall apply to SDOT for temporary “NO PARKING” signs that attach to the base plates, in lieu of hoods. Do not restrict pay stations nor hood meters for work performed exclusively outside the normal time period of the meters, such as night time or Sunday work; instead, place “NO PARKING” (T-39) easel signs 48 hours in advance according to the City’s on-line verification system for temporary no parking, which can be found here: *http://www.seattle.gov/transportation/parking/tempnoparking.htm*. The Traffic Management Division requires notice ten (10) working days in advance for requested removal of meters, pay stations, pay station base plates, or related informational parking signs. The Contractor shall not park private vehicles within the work zone. The only vehicles within the work zone shall be vehicles necessary for the work, and care shall be used such that sight distance and access is not blocked, and such vehicles shall be properly marked and equipped with flashing lights for ingress/egress.

Where no parking pay stations or meters are present, the Contractor may install "NO PARKING" (T-39) easel signs as discussed above. Carpool parking shall be noted and replaced in kind with agreement from SDOT Carpool Services at 206-684-0816. Consul Parking (R-444) shall be noted and replaced in kind with a location satisfactory to the affected Consulate. Load zones and disabled parking zones shall be noted and replaced in kind to satisfy users. The necessary substitutions may be made by replacing general purpose parking with temporary signing for the loading or disabled zones.

"NO PARKING" easel signs shall conform in message, dimension and color as indicated in Part V of this Manual. Spacing of such signs shall be appropriate to conditions. “NO PARKING” signs shall have clearly identified the name and phone number of the permit holder restricting the street. “NO PARKING signs shall have both a start date and time and an end date and time clearly marked on the signs.

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"NO PARKING" (T-39) easel signs should be installed at an approximate interval of 50' - 75', with a minimum of four units per each full block. (See Figure V-I)

I. Existing Traffic Control Devices

Street name signs, traffic signs, signals and other traffic control devices are erected by the City to safeguard vehicular, bicycle and pedestrian traffic. A conflict could exist between these devices and construction and repair work.

Since conditions may vary greatly with different projects, no attempt will be made in this Manual to designate a specific course of action for each situation. The Contractor shall confer with the Traffic Engineer prior to beginning work and as necessary throughout the job. Unless previous arrangements have been made, the Contractor shall not revise existing traffic control devices.

J. Maintenance of Traffic Control Devices

In order to function most efficiently and retain their authority, traffic control devices must be well maintained. The Traffic Engineer may determine adequacy of signing and require removal of any sign or channelizing device.

Signs and channelizing devices shall be kept in proper position, clean, and legible at all times. Damaged, defaced or dirty signs shall be cleaned, repaired or replaced. Signals and flashers shall be kept clean. Signs shall not be placed where they obstruct bicycle or pedestrian movement.

Special care shall be taken to see that weeds, shrubbery, parked vehicles, construction materials or equipment, soil and snow are not allowed to obscure any sign, light or channelizing device.

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III. PROCEDURE FOR OBTAINING PERMISSION TO WORK IN CITY STREETS

All persons performing work within the street right of way (except as discussed in II-F) shall obtain approval to partially or completely restrict any City street, sidewalk, or alley. Such restrictions include lane closures, parking restrictions, sidewalk closures, detours, complete street closures, shoulder work, and pedestrian rerouting, as well as the placing of building materials or equipment on city streets, sidewalks or alleys. Persons performing any work which results in such restrictions shall notify the Seattle Department of Transportation (SDOT), Traffic Management Division. If the work to be performed involves the issuance of a permit, the SDOT Street Use Division will perform this function. Street Use personnel are responsible for routing the permit to all affected City departments and are responsible for contacting all governmental agencies. City staff will input all work into the City's database to populate the City's GIS.

There are several intents of this notification process: to provide for emergency response access; to avoid the conflict of two or more agencies from performing work in the same place at the same time or in conflict of special events; and, to monitor and assist construction and maintenance activities on the street right of way which impacts vehicular, bicycle and pedestrian movement.

Traffic control plans are required for submittal by the Contractor and approval by the Traffic Engineer as part of the Street Use permit process when:

a) The project will involve an arterial street or Hot Zone street closure
b) Moving traffic lanes will be closed during peak hours (6:00 a.m. - 9:00 a.m. and 3:00 a.m. - 6:00 p.m. in the Central Business District; 7:00 a.m. - 9:00 a.m. and 4:00 p.m. - 6:00 p.m. elsewhere)
c) Traffic control cannot be made to match sketches within this document
d) Other special circumstances exist as determined by the City Traffic Engineer

Traffic Control Plans may take up to 10 working days for the Engineer to review and approve.

The Contractor shall notify King County Metro Transit in advance of any construction that may disrupt transit service according to the following schedule:

A. Five working days advance notice for any work requiring a temporary bus stop
B. Ten working days advance notice for relocation of a bus shelter
C. King County Metro Transit is unable to motorize trolley routes except on weekends. Construction shall be planned accordingly. This requires advance notice to King County Metro Transit by no later than 10:00 a.m. on the Tuesday before. The South Lake Union Street Car has limited hours of closure, as does Sound Transit Link Light Rail, and will not modify hours of operation for construction.
D. No two consecutive transit stops may be closed.

Contact King County Metro Transit at Construction.Coordination@kingcounty .gov or 206-684-2732 for all transit scheduling issues.

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IV. MATERIALS AND PERSONNEL FOR TRAFFIC CONTROL

A. Channelizing Devices

1. General Application

The primary function of channelizing devices is to warn and alert drivers, riders, and pedestrians of worksites in or near the traveled way, and to guide and direct them safely past. The effectiveness of the device is determined by position and visibility. Channelizing devices are used:

a) To protect the work site.
b) To provide for pedestrian movement around the work site.
c) To channel and divert traffic in advance of the work site.
d) To define the traveled way through and around the work site.
e) To define a change in the position of the existing lanes around the work site.
f) To define curves and the edges of the roadway on detours.
g) To separate opposing lanes of traffic.

Channelizing devices shall conform to the following requirements:

a) They shall be constructed of material that will withstand impact without appreciable damage to the device by a striking vehicle or passing traffic.
b) They shall comply with the requirements of the National Cooperative Highway Research Program Report 350.
c) All channelizing devices used at night shall be reflectorized unless otherwise specified herein.
d) The predominant color for the devices shall be orange.

2. Vehicular Barricades

a. General Requirements

Barricades are channelizing devices used primarily for enclosing a work area, for road closures and detours, for pedestrian control, for marking obstructions and where warranted, for guiding traffic around the work area. All barricades shall be constructed of durable materials in conformance with the dimensions and standards indicated on Table IV-1 and Figure IV-1:

Markings for all barricade rails shall consist of weatherproof reflectorized sheeting with alternate orange and white stripes.

Both orange and white stripes shall be reflectorized. The presence of warning lights mounted on the barricade shall not lessen this requirement, nor shall paint containing glass beads be used to provide the reflective surfaces. The 6" wide reflectorized stripes shall slope downward at an angle of 45 degrees in the direction traffic is to pass. Where barricades extend entirely

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across a roadway, the stripes should slope downward in the direction toward which traffic should move. Where both right and left turns are provided, the chevron striping shall slope downward in both directions from the center of the barricade. Barricades shall be posted in such a manner so as to clearly indicate the extent of the obstruction of excavation.

Barricades shall never be placed in an active lane of traffic, including bicycle lanes and shoulders used by bicycles, without advance warning including an arrow sign or arrow board, and appropriate delineation and advance warning signing.

If it is necessary to ballast barricades to maintain them in an upright position due to high winds or passing vehicles, sand bags or other non-rigid material should be used.

When barricades are used during the hours of darkness an operable flashing or steady burning light shall be attached to each barricade.

When used for the purpose of road blockage, barricades should be no further apart than five feet to prevent vehicles from driving between them. If it is necessary to provide space for special traffic, (i.e., local residents, construction vehicles, buses, etc.) signs reading “EXCEPT TRUCKS,” “EXCEPT BUSES,” “CLOSED TO THRU TRAFFIC,” "LOCAL ACCESS ONLY" or whatever message is appropriate shall be displayed to approaching traffic.

Generally, barricades shall be one of three types: Type I, Type II, or Type III. Characteristics and dimensions for these three types are shown on Table IV-1 and illustrated in Figure IV-1. The Contractor’s name or identifying number shall appear on the barricade but not on the uppermost reflective panel. While each situation should be evaluated for the most desirable application, generally, the different type barricades should be used as follows:

b. Type I and II Barricades (Figure IV-1)

Type I and Type II barricades are generally considered portable barricades. Their primary use is to outline work areas, excavations, spoil piles, and similar obstacles. A Type I or Type II barricade may be used to protect pedestrians from vehicular movements. Type II barricades may be used for street closures only in emergency situations or for very short durations.

c. Type III Barricade (Figure IV-1)

Because of their high visibility and more permanent nature ,Type III barricades shall be used whenever it is necessary to close any street for an extended period of time, to protect work areas of prolonged construction projects, or to close a lane or divert traffic from one lane to another on high-speed, high-volume facilities where Type II barricade could be easily overturned by passing traffic.

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TABLE IV-1

TYPE	I	II	III
Width of Rail	8" min. - 12" max.	8" min. - 12" max.	8" min. - 12" max.
Length of Rail	2' min. - var. max.	2' min. - var. max	4' min. - var. max.
Number of Rail faces reflectorized	2 (one each direction)	4 (two each direction)	3 if facing traffic in one direction. 6 if facing traffic in two directions.
Width of Stripes *	4 inches / 6 inches	4 inches/ 6 inches	6 inches
Height	3 ' minimum	3' minimum	5' minimum

* For rail less than 3' long, 4" wide stripes shall be used. For rails 3' or longer, 6" wide stripes shall be used.

Street closures require a minimum of 270 square inches of retroreflectivity facing drivers per barricade.

3. Vertical Panels (Figure IV-1)

A vertical panel is a channelizing device that aids the driver in determining the location and alignment of the traffic lane. Vertical panels may be used to divide the opposing streams of traffic at night, to divert a traffic lane, or to outline the edge of a hazard along the roadway. When a vertical panel is used to divide opposing flows of traffic, both sides of the barricade shall be striped with proper angle slashes.

4. Cones (Figure IV-1)

Cones may be used to channel and divert traffic in advance of work sites and to define the travel way through the work site. Traffic cones may be used during daylight hours, but alone are not sufficient for nighttime use.

Minimum height for traffic cones shall be 18". Where traffic speeds are high (greater than 40 mph) or where increased target value is needed, 28" – 36" high cones shall be used. Because they are easily knocked over by wind or by passing vehicles, cones may be doubled up to increase their weight and should be checked frequently (minimum of once per shift and once after shift) to ensure that they are in the intended position.

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For nighttime use, cones shall be at least 28" and retroreflectorized. Retroreflectorization shall be provided by a minimum 6" white band placed at a maximum of 3" from the top and an additional 4” wide white band located approximately 2” below the 6” band.

Cones shall be predominately orange.

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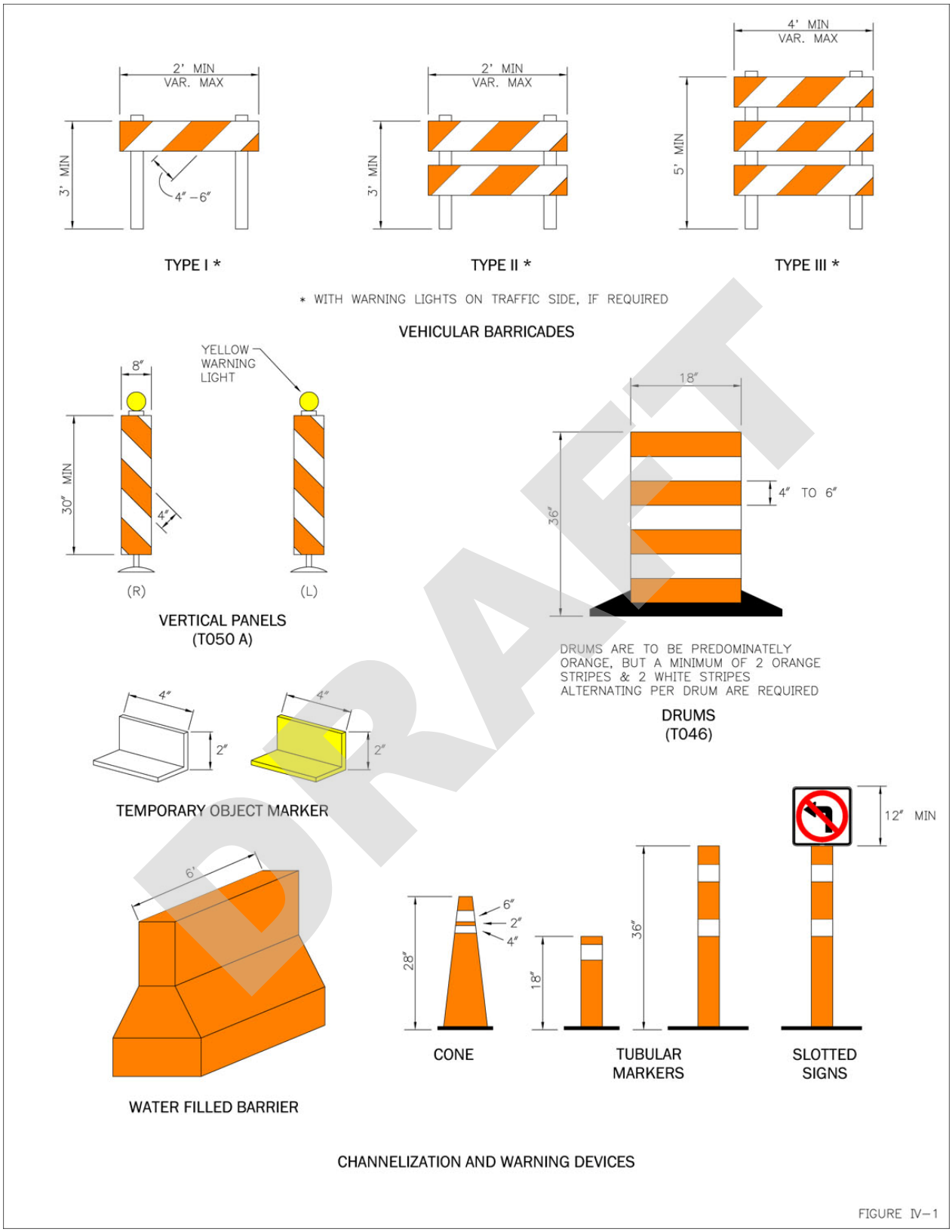
2' MIN
VAR. MAX
3' MIN
4" – 6"
TYPE I *
2' MIN
VAR. MAX
3' MIN
TYPE II *
4' MIN
VAR. MAX
5' MIN
TYPE III *
* WITH WARNING LIGHTS ON TRAFFIC SIDE, IF REQUIRED
VEHICULAR BARRICADES
YELLOW
WARNING
LIGHT
8"
30" MIN
4"
(R)
(L)
VERTICAL PANELS
(T050 A)
18"
36"
4" TO 6"
DRUMS ARE TO BE PREDOMINATELY ORANGE, BUT A MINIMUM OF 2 ORANGE STRIPES & 2 WHITE STRIPES ALTERNATING PER DRUM ARE REQUIRED
DRUMS
(T046)
4"
2"
4"
2"
TEMPORARY OBJECT MARKER
12" MIN
6'
WATER FILLED BARRIER
6"
2"
4"
28"
CONE
18"
36"
TUBULAR
MARKERS
SLOTTED
SIGNS
CHANNELIZATION AND WARNING DEVICES
FIGURE IV–1

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5. Tubular Guideposts (Figure IV-1)

Tubular guideposts cover a wide range of devices, all of which can be effectively used to channelize and divert traffic in the same application as cones. Generally, these devices consist of a round or rectangular plastic tube fastened to a base plate of similar material as shown in Figure IV-1. Reflectorization shall be provided by a minimum of two 3" white bands, placed a maximum of 2" from the top with a maximum of 6" between the bands.

6. Drums (Figure IV-1)

Because of their universal nature, drums can usually be used in the same application as other channelization devices including Type I and Type II barricades (i.e., to define work areas, divert traffic, protect workers and support signs.) The predominant color on drums shall be orange with at least two horizontal, circumferential white and orange stripes 4” to 6” wide. Drums shall be retroreflectorized and shall never be placed in the roadway, including bicycle lanes and shoulders commonly used by bicyclists, without advance warning signs and/or proper delineation. A flashing warning light should be added when drums are used singly or at night. Steady burning warning lights or arrow warning signs should be added when they are used for ballast when it is necessary to prevent overturning such as when signs are attached. Use of double collars is recommended in high speed applications or whenever stability is a concern.

7. Others

Various other approved channelizing devices may be used such as temporary flex beam guardrails and median barriers. Glue-down delineators may be used with approval for locations that require longer-term or low-maintenance application. Caution tape is not recommended except in emergencies.

B. Channelizing Device Placement

For maximum effectiveness, the following rules shall be observed in placing channelizing devices for the purpose of channeling and/or diverting traffic:

1. Place channelizing devices in continuous rows. For each row the devices should be of the same type.
2. The channelizing devices should be placed and anchored if necessary to prevent being knocked out of position by passing traffic. Where used to define traffic lanes, sufficient lane width should be provided so that trucks and buses will not strike them. Additional lane width and clearance may be required on curves and at intersections, where the "tracking effect" of wide swinging semi-trucks tend to knock over or crush improperly placed devices.
3. The channelizing devices shall be placed with their broadsides, lamps, and reflectors facing traffic.
4. Where used to close a traffic lane and to transition oncoming traffic, the minimum taper length and spacing between the devices shall be as indicated in Table X-1. The

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minimum desirable length indicated in Table X-1 applies to roadway conditions of relatively flat grades and straight alignment. Adjustments may be necessary to provide adequate sight distance on the approach to the channelization. Similarly, the proximity of interchange ramps, crossroads, etc., to the work site may dictate the need for adjustments. In general, improved traffic flow will result when the adjustments consist of increasing the length of the taper rather than reducing the length below the minimum as stated in Table X-1.

C. High Level Warning Device

The primary use of a high level warning device is to provide advance warning of a work area by being visible to a driver even when the work area is obstructed from view by other vehicles or construction equipment.

High level warning devices shall consist of either three flags, a Type "B" warning light or a vehicle mounted flashing yellow warning light for daytime use. For nighttime use, a Type "A" light may be substituted for a Type "B" light; flags alone shall not be used.

High level warning devices with flags or warning lights shall be a minimum of 8' high and shall be designed to resist overturning by the wind while minimizing vehicular damage should they be inadvertently struck. Flags should be 16" square or larger and iridescent red or orange in color.

High level warning devices are optional for all temporary work in the roadway and may be used to supplement warning signs, except when replaced by an advance warning arrow panel in appropriate locations (see section D-6.). Depending on the situation, high level flags may be attached to a service vehicle or placed directly on the roadway in advance of the obstruction. The device should be placed in the middle of the closed lane and shall always be placed behind appropriate channelizing devices as indicated in the illustrations. Normally, one unit should be used for each lane closed; however, additional units may be used if appropriate.

D. Illumination and Lighting Devices

Often, persons working in the right-of-way only see the job site during the daytime. It is also necessary to protect the public and the job site during the hours of darkness.

During the day obstructions may be clearly visible, and channelizing devices may be merely of secondary importance. However, at night the work area may not be visible, and the public is reliant upon properly illuminated warning devices. Barricades, signs and other traffic control devices are useless and can be potential hazards unless they can be seen after dark.

All traffic control devices, except parking and pedestrian control signs, used during the hours of darkness shall be properly reflectorized as described elsewhere herein. In addition to these requirements, other devices may be applied during the hours of darkness.

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1. Torches and Lanterns

Torches include the entire single unit, portable, constant-burning, low-intensity type lights of either the battery powered or open flame variety. Lanterns include all enclosed flame type units. Because they are undependable and provide little illumination, these devices shall not be used.

2. Flashing Yellow Warning Light (vehicle mounted)

Flashing or rotating yellow/orange warning lights for mounting on vehicles shall cast a yellow/orange light radially through 360 degrees. Such lights should be approximately 5” high and 5” in diameter and shall be rated at a minimum 750-candle power. Strobe type LED flashers may be a lesser dimension.

When mounted on equipment they shall be positioned such that maximum visibility from all sides is achieved. Lights shall be such that a minimum sustained flash rate of 60 flashes per minute is produced. Light pulsations may be achieved by either rotation of the light source or a strobe-type unit.

3. Steady Burning Electric Lamps

As used herein, steady burning electric lamps shall mean a series of low wattage yellow electric lamps. Where lights are needed to delineate the traveled way through and around obstructions or to separate opposing traffic in a construction or maintenance area, the delineation should be accomplished by use of steady burning lamps.

4. Floodlights

Electric lights can be used for floodlighting hazardous conditions, signs, channelizing devices, and flagger stations. Lights used for illuminating signs or channelizing devices shall be sufficient in size and number to provide effective illumination and legibility under normal atmospheric conditions. Precautions shall be taken when placing lights to insure the prevention of glare.

5. Warning Lights

As used in this Manual, barricade warning lights are portable, lens directed, enclosed lights. The color of the light emitted shall be yellow and may operate either in the flash or steady burn mode. These devices shall meet the current Institute of Transportation Engineers (ITE) purchase specification for flashing and steady burning warning lights.

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WARNING LIGHTS

	Type A Low Intensity	Type B High Intensity	Type C Steady Intensity
Lens Directional Faces	1 or 2	1	1 or 2
Nighttime Visibility	3000’		3000’
Daytime Visibility		1000’	
Minimum Height	36”	36” – 96”	36”
Hours of Operation	Dusk to Dawn	24 Hours a Day	Dusk to Dawn

Type A Low Intensity Flashing Warning Lights are most commonly mounted on advance warning signs, Type II barricades, vehicle panels, or on independent supports, and are generally used to warn road users of an extremely hazardous situation.

Type B High Intensity Flashing Warning Lights are normally mounted on advance warning signs or high level warning devices. Extremely hazardous site conditions within the construction area may require that the lights be mounted on Type I and Type II barricades, signs, or other supports. As these lights are effective in daylight as well as dark, they are designed to operate 24 hours per day.

Type C Steady Burn Lights are intended to be used to delineate the edge of the traveled way on lane changes, on lane closures and on other similar conditions. When mounted on vertical panels they may be used to separate opposing flows of traffic.

6. Advance Warning Arrow Panel

Advance warning arrow panels are sign panels with a matrix of lights capable of either flashing or sequential displays. Advance warning arrow panels shall be used on roadways with speed limits of 40 mph or greater, and should be used within the Central Business District and roadways with speed limits of 35 mph. Advance warning arrow panels are intended to supplement other traffic control devices. Arrow panels will not solve difficult traffic problems by themselves, but they can be very effective when properly used to reinforce signs, barricades, cones, and other traffic control devices. Necessary signs, barricades, or other traffic control devices shall be used in conjunction with the advance warning arrow panel.

Arrow panels provide additional advance warning and directional information where traffic must be shifted laterally along the roadway. Arrow panels are effective in encouraging drivers to leave the closed lane sooner. They assist in diverting and controlling traffic around

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construction or maintenance activities being conducted on or adjacent to the traveled way and give traffic positive guidance about a roadway path diversion that they might not otherwise expect.

Arrow panels are generally used for day or night lane closures, roadway diversions, and slow-moving maintenance and construction activities on the traveled way. They are particularly effective under high-speed and high-density traffic conditions. At night, they are effective where other traffic control devices cannot provide adequate advance warning of a roadway path diversion. During daylight, arrow panels are effective under high-density traffic conditions that might block the road user's advanced view of construction or maintenance activities ahead.

E. Pavement Markings

The City Traffic Engineer shall review with the Contractor situations that merit either the removal of existing pavement markings or the application of temporary markings. Where existing pavement markings conflict with the temporary markings, consideration shall be given to their removal depending upon the extent of conflict and the relative hazard produced. The City Traffic Engineer shall make the final determination. All pavement markings shall be removed and/or applied by the Contractor as approved or directed by the Traffic Engineer. Upon completion of construction, all pavement markings and channelization removed or damaged shall be replaced by the Contractor.

F. Flaggers

1. Qualifications

Since flaggers are responsible for human safety and typically make the greatest number of public contacts of all construction personnel, it is important that qualified personnel be selected. All flaggers must possess a card certifying that they have completed the flagger's course as approved by the State of Washington Department of Labor and Industries. In addition, all setups involving flaggers must adhere to the Washington State Safety Laws (WAC Ch. 155-305 part E) and/or Ch. VI of the MUTCD.

2. Equipment

While flagging during daylight hours, a flagger must at least wear as an outer garment:

- A high-visibility safety garment designed according to Class 2 specifications in the ANSI/ISEA 107-2004, American National Standard for High-Visibility Safety Apparel, consisting of at least 775 square inches of background material that are fluorescent yellow-green, fluorescent orange-red or fluorescent red in color; and 201 square inches of retroreflective material that encircles the torso and is placed to provide 360 degrees visibility around the flagger.
- A high-visibility hard hat that is white, yellow, yellow-green, orange or red in color (WAC 296-155-305).

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Jackets or vests shall be properly worn and buttoned or zipped for maximum 360 degree visibility and effectiveness.

The flagger shall also be equipped with a standard STOP-SLOW hand paddle or pole-type paddle. Sign paddles shall be at least 18” wide with 6” letters. A light semi-rigid handle should be provided. This combination sign may be fabricated from sheet metal or other light semi-rigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW shall be orange with black letters and border. When used at night, the stop/slow paddle shall be retroreflective.

For nighttime operations, jackets and vests shall be retroreflectorized and meet the most current version of the Performance Class 3 requirements of the ANSI/SEA 107. In addition to the retroreflectorized clothing and STOP-SLOW paddle, the nighttime flagger should also be equipped with a flashlight or other lighted signal device. The flashlight or signal device shall be equipped such that a red color is visible and shall be used to accentuate hand signals, which may otherwise not be visible. Care must be taken that the light is not of such intensity as to produce glare to oncoming traffic or obscure the sign message.

3. General

Sometimes traffic control equipment alone is inadequate and flaggers should be used, such as:

a. Where workers or equipment are intermittently blocking a traffic lane
b. Where equipment is backing
c. Where only one lane is available for two directions of travel. When the one-lane section is visible from one end to the other end, traffic shall be controlled by means of a flagger at each end of the section. One of the two should be designated as the chief flagger for purposes of coordinating movement. They should be able to communicate with each other verbally or by means of signals. These signals should not be such as to be mistaken for flagging signals. When the end of a one-lane section is not visible from the other end, the flagger may maintain contact by means of radio or field phones, or additional flaggers may be stationed at intermediate points. If the one-lane section is short, one flagger only may be used to handle both directions of traffic.
d. Where traffic control equipment is being placed or removed in the roadway.
e. In emergency situations until proper traffic control equipment can be obtained and properly installed.
f. When existing traffic signals are to be countermanded, in which case only a Uniformed Police Officer shall be the flagger.
g. To assist in the control of pedestrian traffic at intersections and crosswalks.

Other general rules pertaining to flaggers include:

a. At no time shall a flagging station be left without a flagger.
b. To keep traffic moving, road users who stop to question delays should be advised as briefly as possible of the reason and its approximate duration.

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c. The flagger should not initiate conversations with roadway users and should avoid arguments.

4. Stations

Flagger stations shall conform to the following criteria whenever possible (see illustration in Chapter VIII):

a. They should be stationed far enough in advance of the work area to properly slow or stop traffic before it enters the work area.
b. Flaggers should stand adjacent to the road users being controlled or in the closed lane prior to stopping road users. A flagger shall only stand in the lane being used by moving road users after road users have stopped.
c. At a "spot" obstruction where a single flagger controls traffic from both directions, the flagger should normally be positioned on the shoulder opposite the work area.
d. Flaggers should stand apart from the other crew members and should not mingle with others while on duty. Flaggers should be aware of their position relative to construction equipment such that they do not blend in with their background.
e. Flagger stations shall be provided with advance warning signs as indicated in the illustrations in Chapter XI especially in the case where one lane is being utilized for two directions of travel.
f. During the hours of darkness, flagger stations shall be lighted.

5. Control Procedures and Signals

Flagger signals to traffic should use devices and methods as described in the MUTCD.

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V. TYPES AND METHODS OF SIGNING

A. General Requirements

Signs shall meet the following standards:

1. They shall conform in size, shape, color, material, and message with those included in this Manual or in the MUTCD.
2. The use of stripes (other than the standard border) or other geometric patterns or contrasting colors on or around the sign in an attempt to make it more conspicuous shall not be permitted; however, standard fluorescent red/orange flags or yellow flashing lights may be used for added emphasis so long as they do not interfere with the sign message.
3. All signs used shall be properly retroreflectorized except for parking and pedestrian prohibition signs. Retroreflectorization of the sign face shall be accomplished using an approved weatherproof, retroreflectorized sheeting, high intensity prismatic or as approved for night conditions. Paint impregnated with glass beads shall not be used. Where retroreflectorization is rendered ineffective due to extraneous light sources, the sign shall be illuminated either externally or internally. Where external illumination is used, the source shall be properly shielded to reduce glare. Street or highway lighting shall not be considered adequate for illuminating signs. All reflectorized or illuminated signs should be checked by the Contractor during the hours of darkness to insure that they are functioning properly.
4. Signs shall be constructed from material which will not deteriorate abnormally under normal weather conditions. Sign blanks should be weatherproof plywood or non-corrosive metal. Roll-up signs fabricated from vinyl-coated nylon or vinyl-coated nylon mesh may also be used. If such signs are not retroreflectorized, they shall not be used at night.

Sign placement and usage shall generally conform to illustrations in Chapter XI of this Manual unless special circumstances indicate that some other placement is more advantageous to convey the proper message to the traveling public. The code number given below each sign in Figures V-1 and V-2 is the City of Seattle's identification number and the one in parentheses is the MUTCD designation. In addition, the following shall be adhered to:

a. Signs shall be placed in a position so that they will convey their message most effectively without restricting lateral clearances or sight distance.
b. Normally, signs shall be mounted on the right-hand side of the roadway; however, dual installations (one sign on the left side and one on the right) should be used where increased emphasis is necessary, and on one one-way streets. Signs may also be placed in a closed lane if such placement is most advantageous and does not present a hazard. Signs shall not be placed where they obstruct bicycle or pedestrian movement.
c. All permanent curb or shoulder mounted construction signs shall be mounted to maintain a standard minimum horizontal clearance of 2’ from the curb or pavement edge and a standard minimum vertical clearance of 7’ above the ground. Where

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equipment, pedestrians, vehicles, or other obstructions obscure the signs or when they are used on high-volume, high-speed facilities, higher mounting heights should be used.

d. Signs may be pedestal- or post-mounted or may be mounted on portable sign supports, high level warning devices, or utility poles (with authorization of the utility in question). All signs and mounting apparatus shall be securely fastened or weighted so that they are not moved or blown over by wind or passing traffic.

e. Spacing of advance warning signs shall be as indicated in the tables included with the illustrations in Chapter XI unless special circumstances indicate that different spacing would be more advantageous. Advance warning signs used for flagging operations must be set up and spaced in accordance with WAC 296-155-305.

B. Regulatory Signs

Since Regulatory Signs impose legal obligations and/or restrictions, all shall comply with specifications contained in the MUTCD and their use must be approved by the Traffic Engineer prior to installation. Several of the more commonly used regulatory signs are included here for reference as to size and designation. No existing regulatory sign shall be changed without permission of the City Traffic Engineer.

C. Warning Signs

Warning Signs as used herein are generally diamond shaped with black symbols or letters on an orange background. Warning signs are used to alert motorists of abnormal conditions on the roadway resulting from construction or maintenance work. The more commonly used construction warning signs and sizes are illustrated in this section. Warning signs not included here and deemed necessary for a specific project shall comply with those included in the MUTCD.

Reference should be made to Table XI-1 and the illustrations in Chapter XI of this Manual for use, spacing, position, etc., of the warning signs.

D. Guide Signs

The function of this class of sign on a construction project is to indicate to the motorist the path they must follow through a detour in order to bypass the construction and continue to their original destination. The most common are Detour and Detour Arrow signs. The street name may be added to define the detour route.

E. Special Signs

As needed for specific projects, signs with special or non-standard messages may be required to properly convey information to the motorist, bicyclist or pedestrian. These signs should follow as closely as possible principles and standard set forth in this Manual and shall be approved by the Traffic Engineer before installation.

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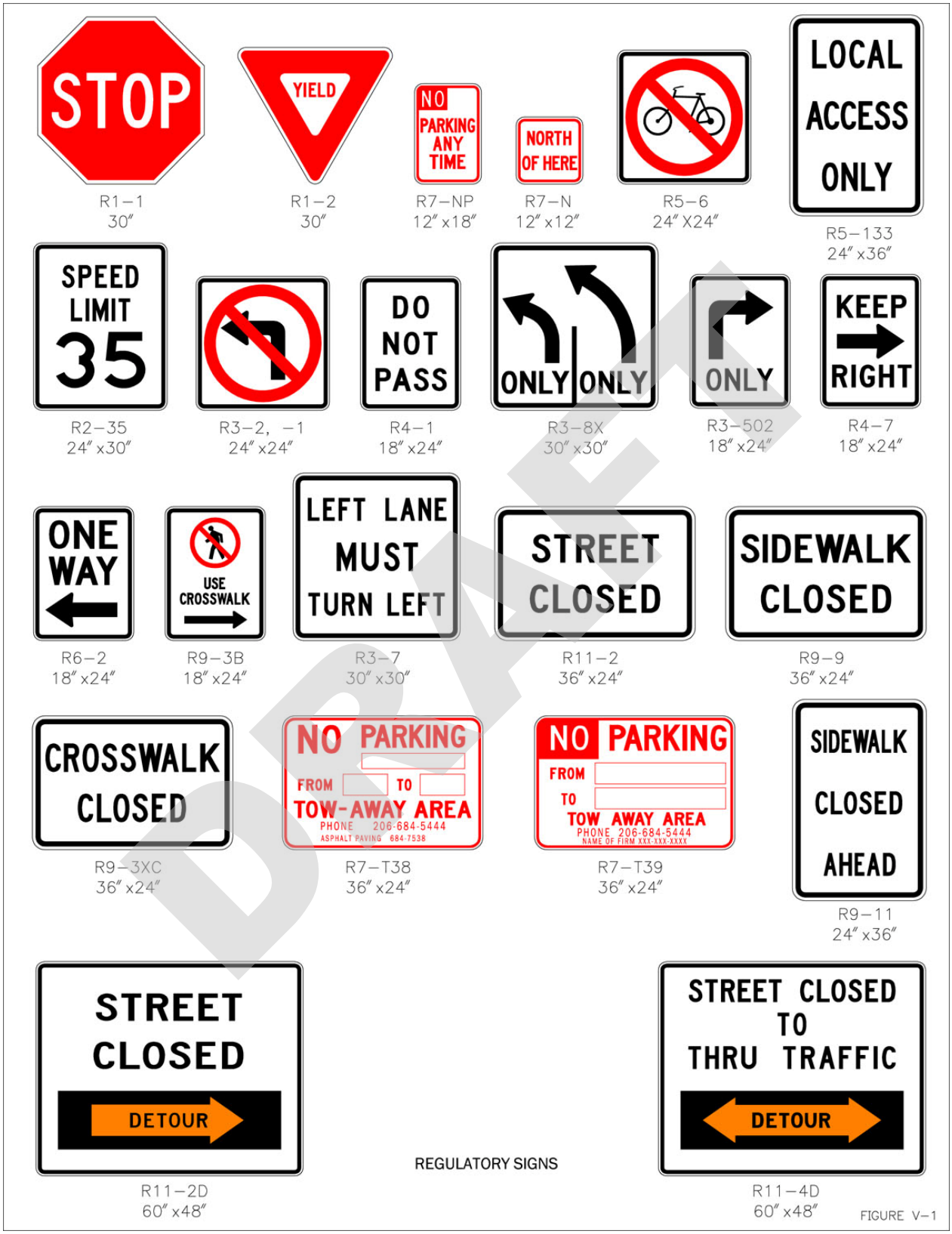
STOP
R1–1
30″
YIELD
R1–2
30″
NO PARKING ANY TIME
R7–NP
12″ x18″
NORTH OF HERE
R7–N
12″ x12″
R5–6
24″ X24″
LOCAL ACCESS ONLY
R5–133
24″ x36″
SPEED LIMIT 35
R2–35
24″ x30″
R3–2, –1
24″ x24″
DO NOT PASS
R4–1
18″ x24″
ONLY ONLY
R3–8X
30″ x30″
ONLY
R3–502
18″ x24″
KEEP RIGHT
R4–7
18″ x24″
ONE WAY
R6–2
18″ x24″
USE CROSSWALK
R9–3B
18″ x24″
LEFT LANE MUST TURN LEFT
R3–7
30″ x30″
STREET CLOSED
R11–2
36″ x24″
SIDEWALK CLOSED
R9–9
36″ x24″
CROSSWALK CLOSED
R9–3XC
36″ x24″
NO PARKING
FROM TO
TOW-AWAY AREA
PHONE 206-684-5444
ASPHALT PAVING 684-7538
R7–T38
36″ x24″
NO PARKING
FROM
TO
TOW AWAY AREA
PHONE 206-684-5444
NAME OF FIRM XXX-XXX-XXXX
R7–T39
36″ x24″
SIDEWALK CLOSED AHEAD
R9–11
24″ x36″
STREET CLOSED
DETOUR
R11–2D
60″ x48″
STREET CLOSED TO THRU TRAFFIC
DETOUR
R11–4D
60″ x48″
REGULATORY SIGNS
FIGURE V–1
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ROAD WORK AHEAD
W20–1
30″ –36″
ONE LANE ROAD AHEAD
W20–4
30″ –36″
BIKE LANE ENDS
W9–1B
30″ –36″
DETOUR AHEAD
W20–2
30″ –36″
NEW TRAFFIC PATTERN AHEAD
W23–2
30″
RIGHT LANE ENDS
W9–1
30″ –36″
STREET CLOSED AHEAD
W20–3
30″ –36″
BIKES MERGE WITH TRAFFIC
W4–1B
30″ –36″
W20–7
30″
BE PREPARED TO STOP
W3–4
30″ –36″
LOOSE GRAVEL
W8–7
30″
GROOVED PAVEMENT
W8–15
30″
TRAFFIC MERGE WITH BIKES
W4–1A
30″ –36″
SURVEY CREW
W21–6
30″
SHOULDER WORK
W21–5
30″
W4–2
30″
STEEL PLATE AHEAD
W8–24
30″
W1–4B
30″
W6–3
30″
W1–4
30″
WARNING SIGNS
DETOUR ROUTE
M4–9A
24″ x36″
DETOUR
M4–9
30″ X24″
DETOUR
M4–9a
30″ X24″
DETOUR
M4–9b
30″ X24″
DETOUR
M4–9c
30″ X24″
MOTORCYCLISTS USE EXTREME CAUTION
W21–1701
30″
GUIDE SIGNS
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FIGURE V–2

VI. PEDESTRIAN ACCESS. CONTROL AND PROTECTION

When the work area encroaches upon a sidewalk, pedestrian walkway or crosswalk area, special considerations must be given to the pedestrian's access and safety. A maximum effort must be made to provide and maintain an accessible, safe, clearly defined and convenient pedestrian way separate from the work area. (Figure VI- 1)

Protective barricades, fencing, and bridges, together with warning and guidance devices and signs, shall be utilized so that the passageway for pedestrians is wheelchair accessible, safe and well defined. Pedestrian walkways across excavations shall be provided with suitable handrails. Foot bridges shall be safe, strong, free of bounce and sway, and free of cracks, holes, and irregularities that could cause tripping. Wheelchair accessible ramps shall be provided at the entrances and exits of all raised footbridges.

Adequate illumination and reflectorization shall be provided during hours of darkness. All walkways shall be maintained at least 4’ wide with 7’ wide pullouts every 85’ except in areas of unusually heavy pedestrian traffic such as business districts, where the minimum width should be 8’. A pullout is defined as an area where one wheelchair can pass another wheelchair in the opposite direction. Pedestrian access to recommended school walking route crossings shall be maintained at all times.

Where walkways are closed by construction, a wheelchair accessible alternate walkway shall be provided, preferably within the planting strip area. Where it is necessary to divert pedestrians into the roadway, barricading or channelizing devices shall be provided to separate the pedestrian walkway from the adjacent traffic lane. Temporary curb ramps shall be provided to maintain wheelchair accessibility. At no time shall pedestrians be diverted into a portion of the street used concurrently by moving vehicular traffic.

At locations where adjacent alternate walkways cannot be provided, appropriate signs shall be posted at the limits of construction and in advance of the closure at the nearest crosswalk or intersection to divert pedestrians across the street. A flagger shall be required on arterials to assist pedestrians across the street at non-signalized intersections.

To prevent visually impaired people from inadvertently entering a closed area, physical barricades shall be installed to prevent passage. Devices which channelize pedestrians to a defined path shall have a rail within 2’’ of the path surface for cane detection and shall be spaced closely enough to maintain cane detection. All pedestrian walkways shall be wheelchair accessible at all times. Pedestrian access shall be maintained to all properties adjacent to the construction site.

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Where required by special provisions, fixed pedestrians ways (of fence and canopy type as illustrated in Figure VI-3) shall be considered and shall include the following:

1. The traffic approach end of the barricade shall have a fixed handrail extending from curb to outermost side of the pedestrian walkway. The area from the handrail to approximately the bumper rail shall be covered and marked with standard 45 degree angle orange and white reflectorized markings sloping downward on the side on which traffic must pass. The area of this panel shall have a minimum of 4' x 2' reflectorization.
2. A high level warning board with minimum height of 2’ and width equal to that of the walkway shall be mounted above pedestrian walks on all traffic approaches. The warning board shall be striped with the standard 45 degree angle orange and white markings sloping downward on the side on which traffic must pass.
3. Yellow warning lights shall be mounted on 20’ centers along the traffic side of the barricade. They shall be installed approximately 8’ above the roadway surface.
4. A continuous 2" x 12" bumper guardrail should be mounted on the street side of the structure at a height of 10" from the pavement to the bottom of the rail.
5. The street side of a walkway shall be 3’ 6” high from the bottom of the walkway, plus or minus 6”, excepting structural members, for security concerns.
6. Relocating a pedestrian crosswalk further than 10’ from pedestrian signal indications requires use of a UPO or installation of a temporary pedestrian signal head.
7. School routes require special attention. For more information, see: http://www.seattleschools.org/area/transportation/walk/index.dxml

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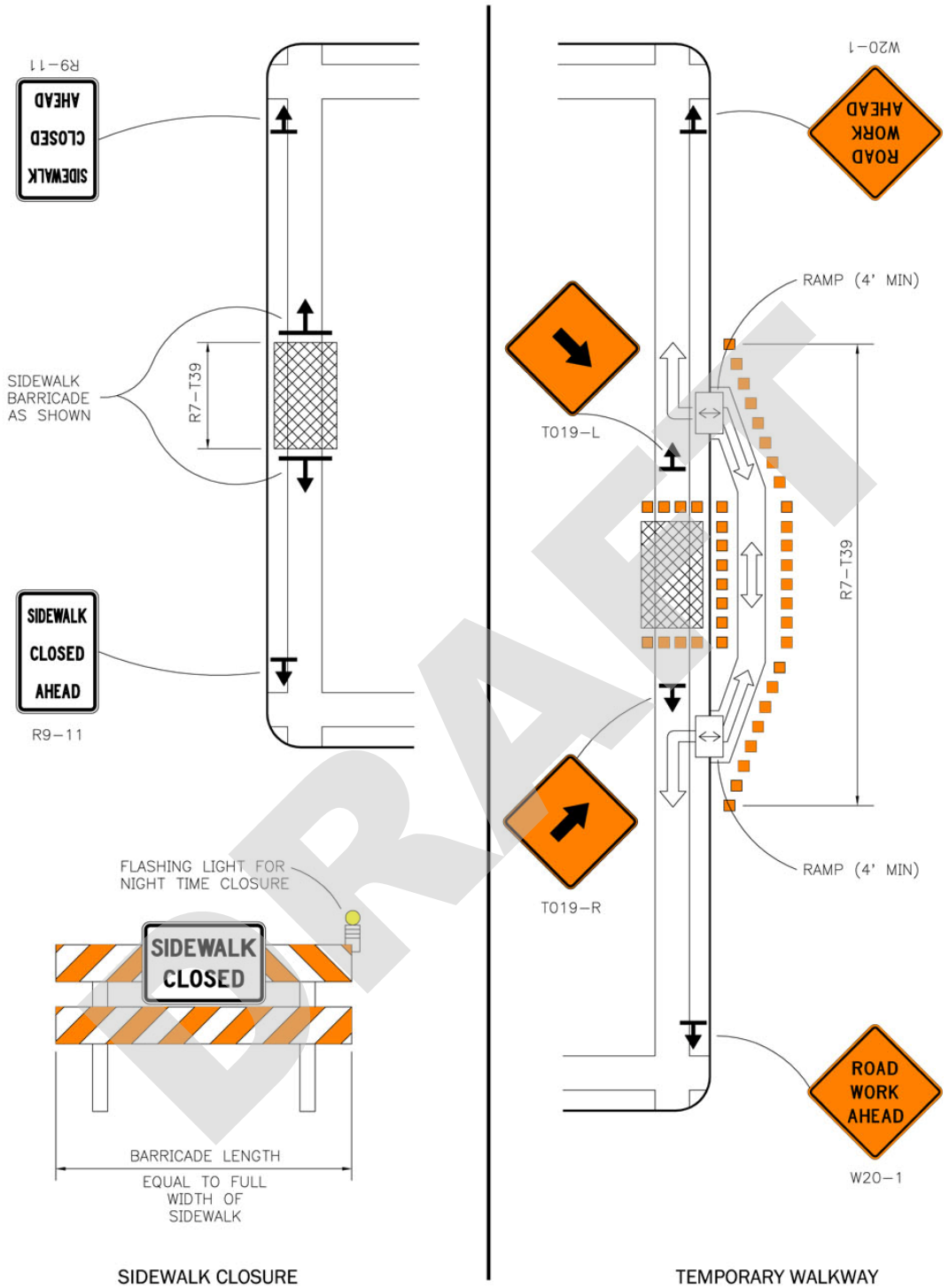

PEDESTRIAN CONTROL

FIGURE VI-1

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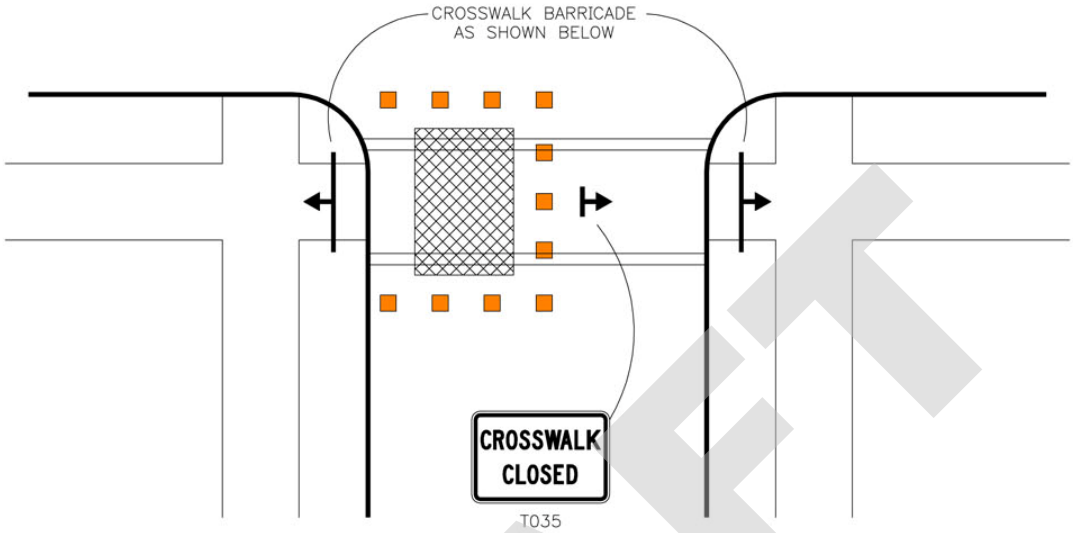

CROSSWALK CLOSURE

PEDESTRIAN CONTROL

FIGURE VI–2

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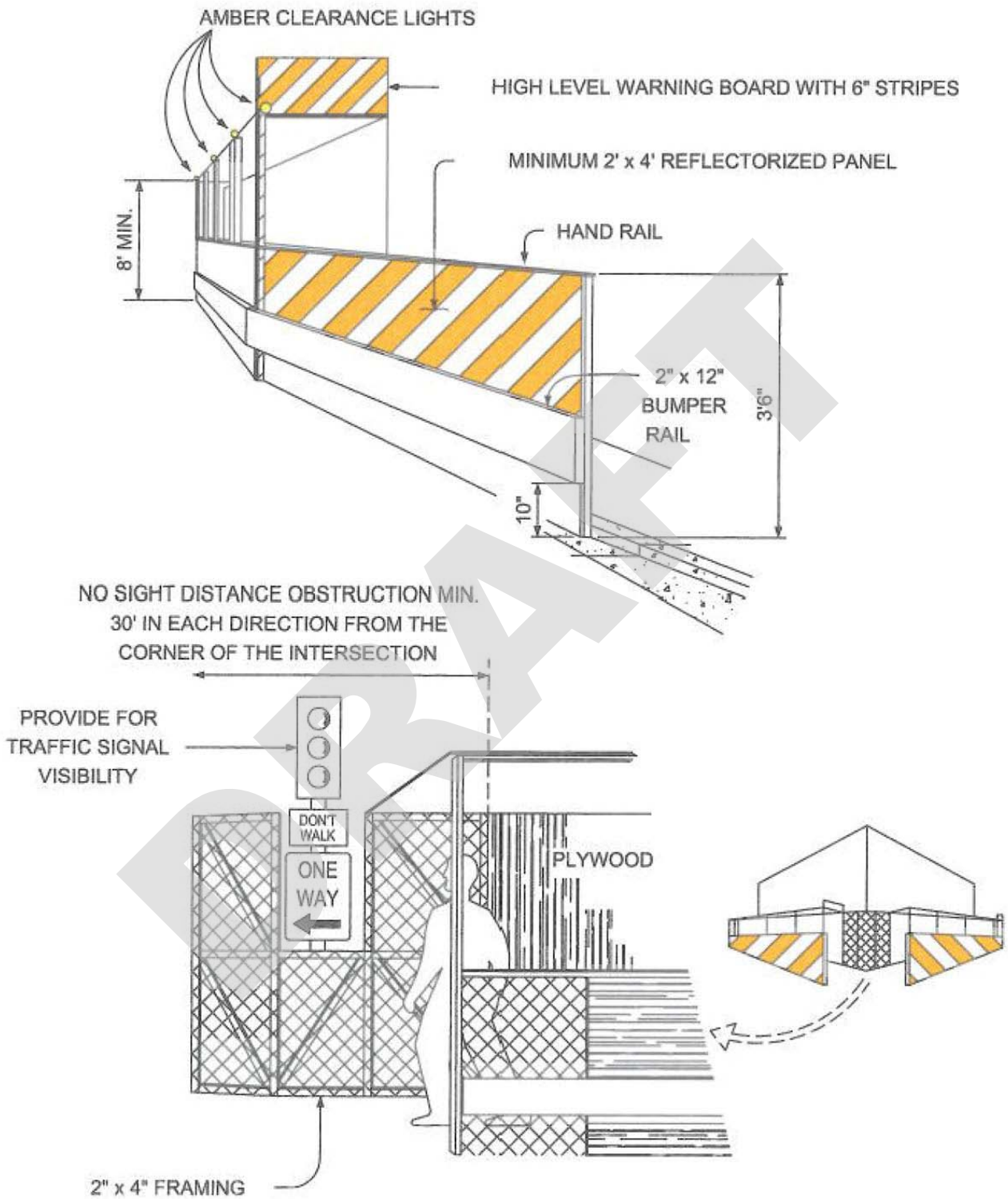
AMBER CLEARANCE LIGHTS
HIGH LEVEL WARNING BOARD WITH 6" STRIPES
MINIMUM 2' x 4' REFLECTORIZED PANEL
HAND RAIL
8' MIN.
2" x 12"
BUMPER
RAIL
3'6"
10"
NO SIGHT DISTANCE OBSTRUCTION MIN.
30' IN EACH DIRECTION FROM THE
CORNER OF THE INTERSECTION
PROVIDE FOR
TRAFFIC SIGNAL
VISIBILITY
DON'T
WALK
ONE
WAY
PLYWOOD
2" x 4" FRAMING

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VII. BICYCLE ACCESS

A. General Requirements

Bicycles may legally use both street and sidewalk, and need to be considered under both conditions. When work encroaches upon a bike lane, bike trail, shared lane, signed bike route or a road or sidewalk commonly used by bicyclists as identified on SDOT's "Seattle Bicycling Guide Map," an accessible, safe and clearly defined route shall be provided and maximum effort made to provide a convenient bicycle way separate from active work areas. The Contractor shall not force a cyclist into an unsafe condition, such as grating, debris, or an abrupt stop within moving traffic as part of traffic control. Bicycle lanes and other identified bicycle routes shall be kept free of obstructions. If bicyclists cannot be accommodated through the work area with facilities comparable to pre-construction conditions, bicycle detours shall be considered.

Closing a bike lane requires the same signage and traffic control as a motor vehicle use lane. Proposals to close a bike lane shall demonstrate that impacts cannot be reasonably avoided through alternative construction methods, that the facility cannot be reasonably relocated through reassignment of vehicle lanes or other existing facilities, that the duration and extent of impacts has been minimized, and that an adequate detour has been provided. The Contractor shall seek to safely accommodate bicycles through the work area and avoid installing "Bicyclists dismount" signs at the closure of a bicycle lane to the extent possible, but shall use advance signage that the bicycle lane is closed at a place where the cyclist can modify their route when necessary..

Bicycle trails, such as the Burke Gilman Trail, need to have proper signing and traffic control equipment. A bicycle trail should be maintained at a minimum of 8'. If this width cannot be provided, flagging and/or an approved detour route shall be required.

B. Work Area Accommodation

The Contractor shall accommodate bicyclists in work areas as follows:

1. The Contractor shall provide safe and protected bicycle access into, through and out of the work area, including proper channelization and signage.

2. The Contractor shall ensure construction equipment, including signs and barricades, do not obstruct the bicycle way.

3. When steel plates are necessary on the bicycle way, the Contractor shall follow the requirements of Section II E. 6.

4. When exposed utility manholes or lids are necessary, the Contractor shall follow the requirements of Section II E. 7.

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5. When roadway grindings occur as part of a pavement rehabilitation project, the Contractor shall ensure the roadway surfaces are frequently cleaned or swept to minimize exposure to bicyclists.

6. For pavement or utility replacement projects, the Contractor shall avoid or minimize asphalt or concrete seam exposures (especially longitudinal seam formation) to bicyclists.

7. For vehicle lanes which continue through the work area the Contractor shall provide advance warning to bicyclists and motorists of any transition into and out of the travel lanes, and allow sufficient lane width to accommodate both.

8. For vehicles lanes which continue through the work area the Contractor shall consider auto travel speed, grade, pavement condition, length of work area, lighting, and sight distance to determine if lane widths are sufficient to accommodate both motorists and bicyclists.

9. The Contractor will avoid requiring bicyclists to dismount their bicycles while traversing a work area, whenever feasible, and will provide advance notice to bicyclists regarding alternate routes when bicycling through the work area cannot be safely accommodated.

C. Bicycle Facility Closures, Detours and Alternate Routes

If the Engineer determines that temporarily closing a bicycle facility traversing the work area is required for the safety of bicyclists, such closure requires the same level of signage and traffic control design considerations as when a motor vehicle lane is closed. The Contractor shall include a bicycle facility closure and detour plan in the proposed traffic control plan for review and approval by the Engineer before closing any bicycle facility.Approved signs, markings, and traffic control shall be used when a detour is required.

Determination to close a bicycle facility and to provide a well-signed detour route will include consideration of the needs of all bicyclists who use the bicycle facility under normal conditions, including daily commuters as well as recreational and novice bicyclists. The conditions to be considered to close a bicycle facility and provide an alternate route include:

1. Removal or reduction of existing auto and/or bicycle lanes through the work area and the ability to effectively transition bicyclists into and out of auto traffic;

2. Auto and bicycle travel speeds;

3. Grades;

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4. Significant amount or frequency of pavement grindings, potholes, or utility lids;

5. Length and duration of work area; and

6. Lighting and sight distance.

The Engineer may determine that bicycle safety is adequate to maintain bicycle access through the work area but may require additional bicycle alternate routes.

The following shall be considered in the development of a bicycle detour or alternate route:

1. The bicycle detour or alternate route should parallel the existing bicycle facility impacted by the work area and minimize detour distance to the extent possible.

2. The bicycle detour or alternate route shall be maintained and regularly monitored (clear of debris and signs maintained) during the course of construction.

3. Adequate signage shall be used in advance of each approach to the bicycle detour or alternate route, and shall be posted at least 5 days in advance of the closure.

4. Where bicycle detours or alternate routes are expected to create a significant change in bicycle volumes on a detour or alternate route, appropriate directional and warning signage for bicyclists and motor vehicles shall be considered.

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VIII. DETOURS AND STREET CLOSURES (Figure VIII-1)

Several elements, in addition to those indicated in Chapter I, are involved whenever it is deemed necessary before or during the course of a project to close an existing street and create a detour.

A. Permission and Notification

Notification to close a street shall be given to and permission obtained from the Seattle Department of Transportation (SDOT) Traffic Management Division, as outlined in Chapter II of this Manual. The Contractor or Utility shall submit detour schedules and diagrams showing the steps required to maintain the detour during each phase of construction and showing the type, number and placement of all traffic control equipment. The submittal shall include a tentative schedule indicating when specific signs, barricades and pavement markings will be activated and deactivated.

B. Detour Requirements

All detours shall meet the following requirements in addition to any specified by the Traffic Engineer as being necessary for a particular project:

1) The detour shall be as simple and direct as possible.
2) No turns shall be used on the detour other than those required to leave or enter the closed street or the parallel detour route.
3) Streets less than 36' in width shall be used to detour only one direction of traffic unless parking on one or more sides is restricted.
4) All detour routes shall be protected by the proper temporary traffic control signs.
5) When detouring a multi-lane street on a detour route less than four lanes in width, parking shall be prohibited on the detour route.
6) The detour route shall be clearly marked where it intersects other streets so that motorists will not turn prematurely into the construction area or closed portion of the street.
7) Arterial streets shall be detoured to arterial streets unless otherwise approved by the Traffic Engineer.
8) Advance warning signs to detours shall be used on arterial streets.
9) All temporary traffic control equipment used shall conform in design and placement to requirements set forth in this Manual.
10) All temporary traffic control equipment used shall be supplied and maintained by the Contractor and adjusted as work progresses.

In addition, the Contractor shall be responsible for:

1. Posting signs and barricades advising of the street closure at the nearest intersections away from the closed portion of the street and on all cross-streets in order to minimize unnecessary backing, turning around and maneuvering. Normally, such street closings should not exceed two blocks in length at any one time.

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2. Providing and maintaining access for local residents as much as conditions permit.
3. Maintaining access for all emergency vehicles, fire hydrants and alarm boxes along the closed route at all times.

C. Requirements Within Streets Closed to Through Traffic

When construction work is being conducted on a street that is closed to all but local traffic, the requirements for signing, particularly advance signing, channelizing devices, lighting, and work area protection may differ from those indicated in this Manual.

Generally, the following guidelines should be adhered to; however, each situation should be evaluated on the basis of traffic volume and speed, familiarity of motorists with the roadway, and sight distance.

1. All open excavations, ditches, spoil banks, etc., within or adjacent to the right of way shall be properly marked with barricades. Also, obstructions such as poles, curbing, etc., which due to the construction are in a position where they could be struck by a vehicle or bicyclist should be properly identified by barricades, drums, etc.
2. The path of the vehicle through the construction area should be properly identified by channelizing devices especially where the route has been altered or existing paint striping or channelization has been obscured or removed due to the construction activities. This is especially important at night.
3. Where equipment is working in the traveled way during the daytime, advance signing is generally not necessary nor is delineation of the extent indicated in the illustrations. Generally, traffic cones or barricades outlining the immediate work area are sufficient to guide the motorists around the obstructions.
4. Where one lane must be used for two directions of travel a flagger shall be used. Where flaggers are deemed necessary, conformance with requirements discussed previously shall be adhered to. Situations as stated above which require flagger control shall be allowed during daytime only. At night, such areas shall be clearly marked to allow two lanes of traffic.
5. All signs, channelizing devices, and other equipment used for traffic control at night shall be properly reflectorized or provided with warning lights as indicated previously in this Manual.
6. Where equipment is intermittently backing into the traveled way, flaggers are not generally needed provided that traffic volumes are light, speeds are low and adequate sight distance is available to allow a vehicle to stop safely if necessary.

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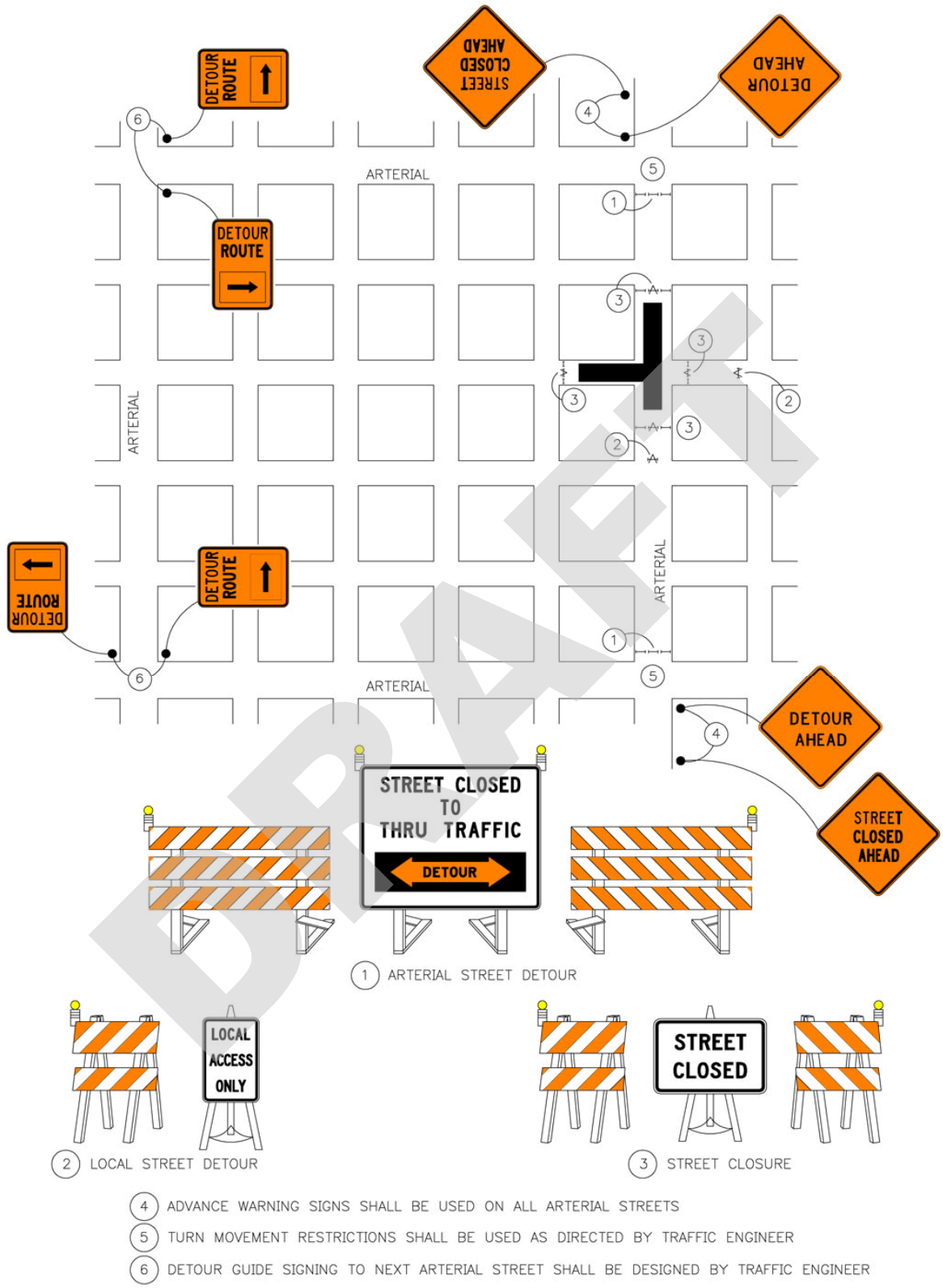

FULL ROADWAY CLOSURE
TYPICAL DETOUR PLAN

FIGURE VII–1

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IX. EMERGENCY WORK

Emergency work is defined as that work which must be done immediately. By its nature it cannot be pre-planned; however, standard procedures and requirements shall apply whenever practical.

The person responsible for the emergency work shall at the earliest possible opportunity notify the Seattle Department of Transportation 24-hour Dispatch at 206-386-1218.

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X. ENFORCEMENT

It shall be the responsibility of the Contractor to comply with the requirements of this Manual. Should said person fail to comply, the Traffic Engineer or his agent or a Street Use Inspector shall have the authority to stop all work until compliance has been achieved. Such work will not be resumed until the necessary corrections have been implemented. Any work required by the City to achieve compliance with the Manual shall be paid for by the Contractor. In addition, citations may be written to those directly responsible for the construction activities.

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XI. BARRICADING AND SIGNING ILLUSTRATIONS

The illustrations contained herein are meant to indicate typical situations and utilization of the traffic control devices described in the text. The use of certain traffic control devices for specific situations is not intended to exclude the use of those traffic control devices for other situations. At all times, however, practices prescribed in the text shall be adhered to. The following is a list of procedures for placement of traffic control devices:

1. Advance warning signs may be placed on:

    a. Portable sign supports
    b. Posts

2. For night operations:

    a. All channelizing devices shall be reflectorized. Cones shall not be utilized alone.
    b. Through the taper section install arrow signs (W4-119) spaced at 3S. (See Table XI-1)
    c. All signs shall be reflectorized, except those controlling parking and pedestrians.
    d. Install a flashing yellow warning light on each high level warning device.
    e. Horizontal barricade or vertical panels shall have a flashing or steady burning light attached.

3. General Notes:

    a. Where possible, place a vehicle between the work area and the traffic flow.
    b. Signs shall not be installed on Type I or Type II barricades.
    c. The predominant color for channelizing devices shall be orange.

4. Set-up (in order of occurrence):

    a. Temporarily place a high level warning device at the side of the road.
    b. Place advance warning signs.
    c. Place channelizing devices for traffic diversions (moving in direction of traffic.)
    d. Adjust placement of high level warning device.
    e. Protect the work area.
    f. Place soil or equipment between traffic flow and work area when practical.

5. Pick-up

    a) Reverse set-up procedure indicated in #4 above.

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Table XI-1

CLASS OF ROAD	WARNING SIGN SPACING IN FEET			TAPER LENGTH (L) IN FEET		CHANNELIZING DEVICE SPACING IN FEET (maximum)				WARNING SIGN MIN. SIZE IN INCHES
						VEHICLE BARRICADES & DRUMS		OTHER**		
	A	B	**C**	Lane Width		Taper (S)	Tangent	Taper (S)	Tangent	
				10'	12'					
I	*			75	90	Speed limit	Speed limit X 2	15	30	30X30
II	150	150	75	150	200	Speed limit	Speed limit X 2	20	50	30X30
III	350	350	350	450	540	Speed limit	Speed limit X 2	30	80	48X48

ROAD CLASS DEFINITIONS

CLASS I – Central Business District, University District

CLASS II – Arterial Streets

CLASS III – All partially or full controlled access arterial streets

* Advance warning sign spacing depends on availability of curb space

** Vertical barricades, cones, tubular guideposts

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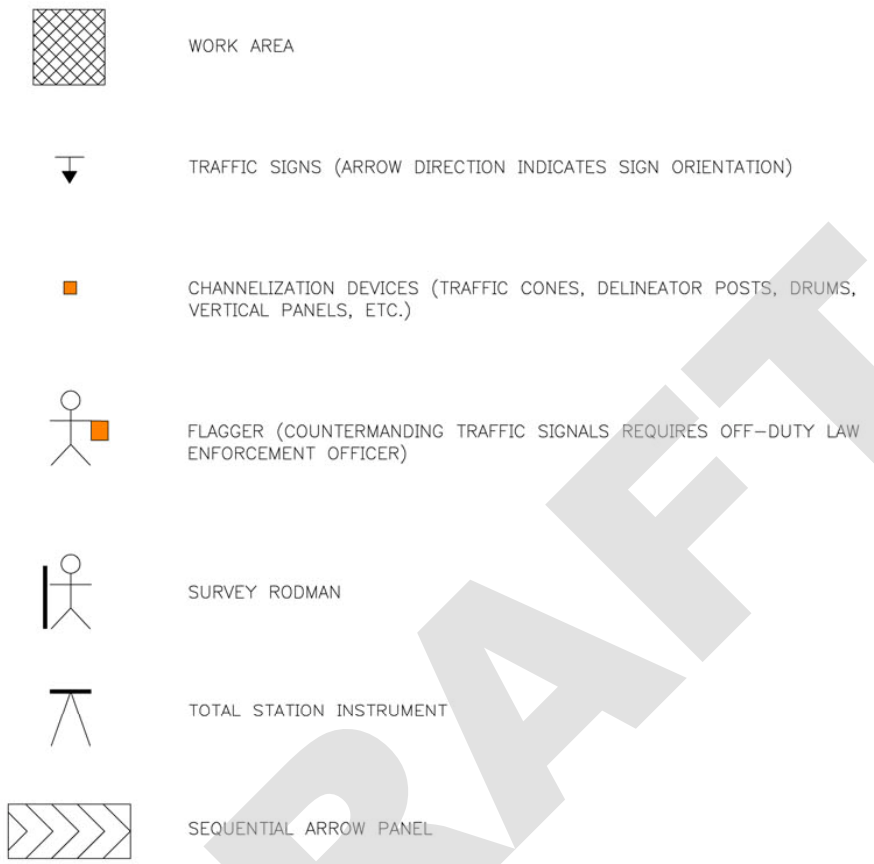

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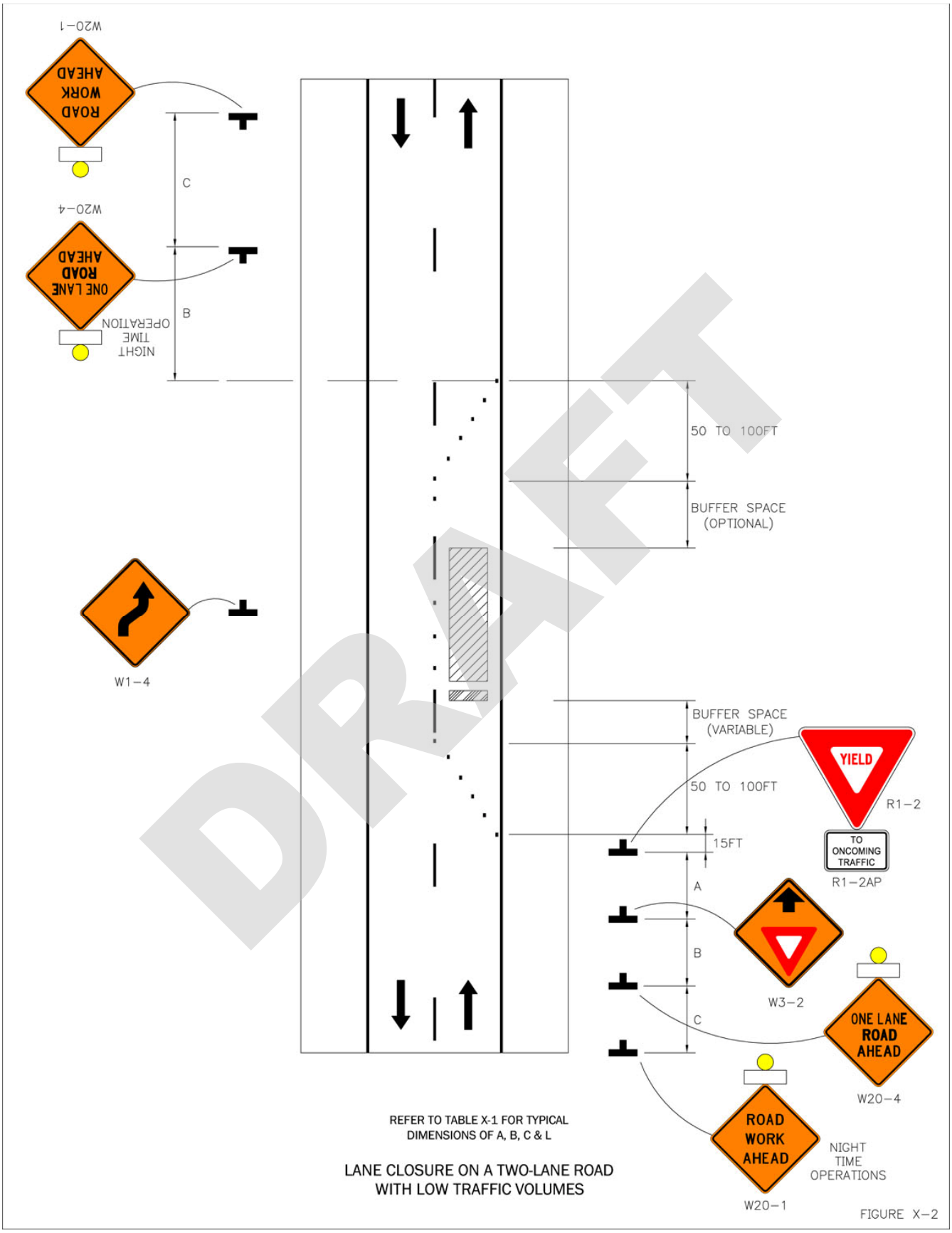
NOTES:

1. FOR NIGHT TIME USAGE, REFER TO "WARNING LIGHT APPLICATIONS DURING NIGHT TIME OPERATIONS", FIGURE X-17.
2. ADDITIONAL TEMPORARY TRAFFIC CONTROL DEVICES (SEQUENTIAL ARROWS, BARRICADES, STEEL PLATES) MAY BE REQUIRED.
3. CONTACT TRAFFIC SIGNAL OPERTIONS (684-5118) BEFORE CLOSURE OF ANY TRAFFIC LANES CONTROLLED BY SIGNAL LOOP DETECTORS.

SYMBOLS AND LEGENDS

FIGURE X-1


W20-1
ROAD WORK AHEAD
C
W20-4
ONE LANE ROAD AHEAD
B
NIGHT TIME OPERATION
50 TO 100FT
BUFFER SPACE (OPTIONAL)
W1-4
BUFFER SPACE (VARIABLE)
YIELD
R1-2
50 TO 100FT
15FT
TO ONCOMING TRAFFIC
R1-2AP
A
B
C
W3-2
ONE LANE ROAD AHEAD
W20-4
ROAD WORK AHEAD
W20-1
NIGHT TIME OPERATIONS
REFER TO TABLE X-1 FOR TYPICAL DIMENSIONS OF A, B, C & L
LANE CLOSURE ON A TWO-LANE ROAD WITH LOW TRAFFIC VOLUMES
FIGURE X-2
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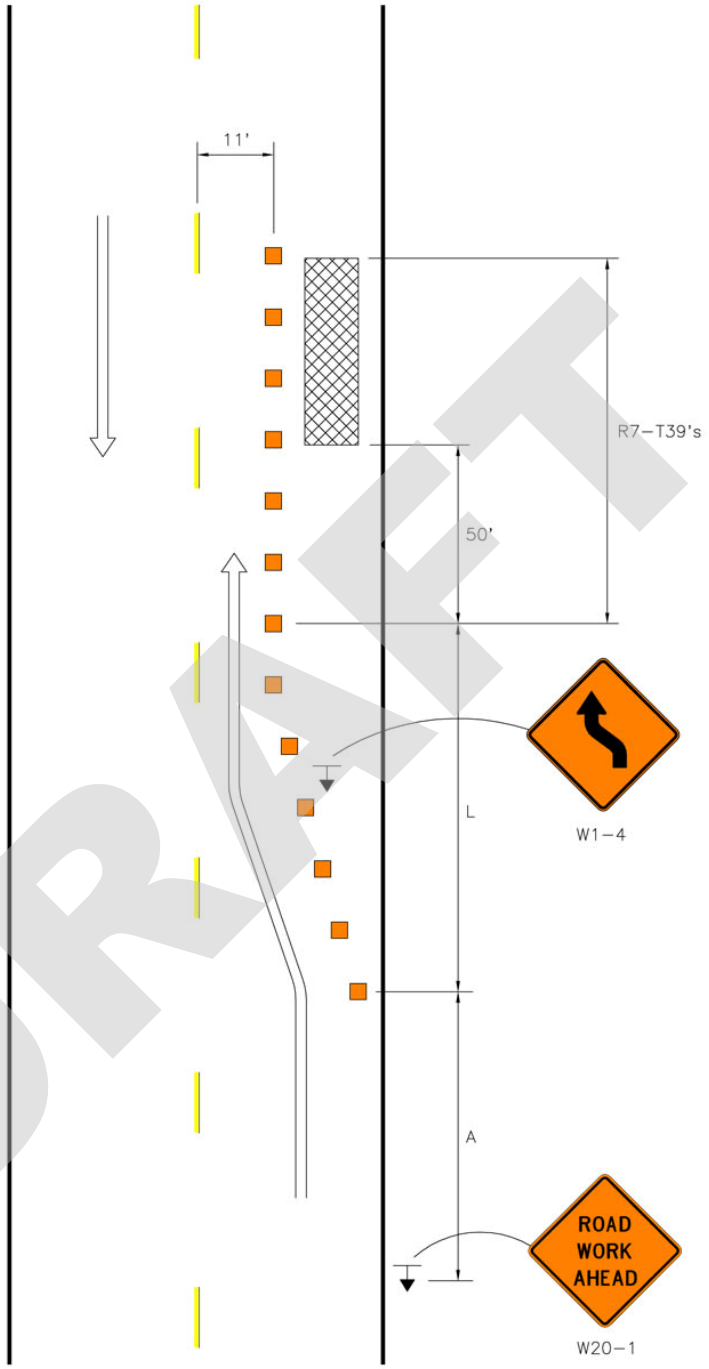

REFER TO FIGURE X-2 FOR TYPICAL
DIMENSIONS OF A & L

WORK AREA ON RIGHT SIDE OF STREET

MINOR ARTERIAL

FIGURE X–3

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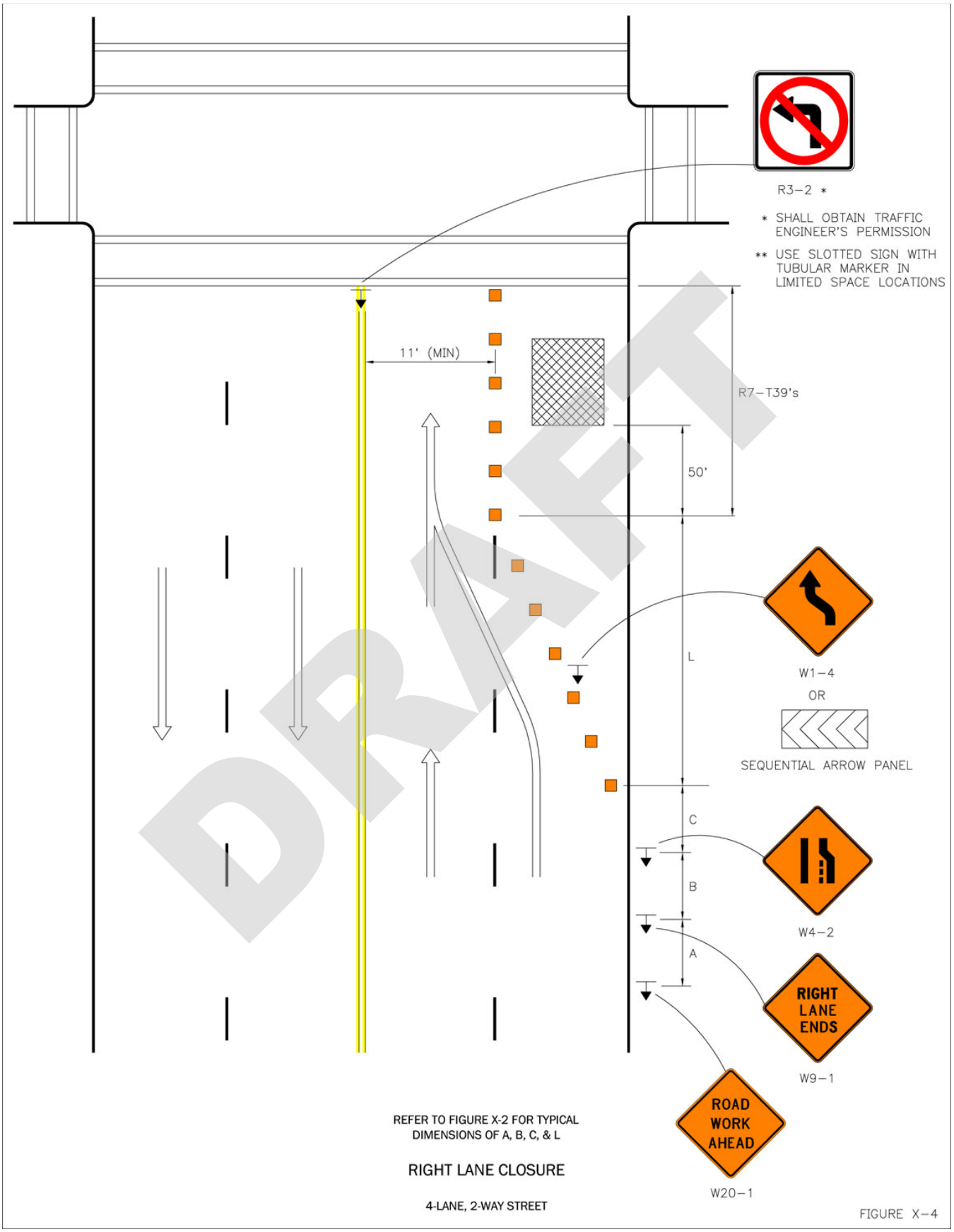
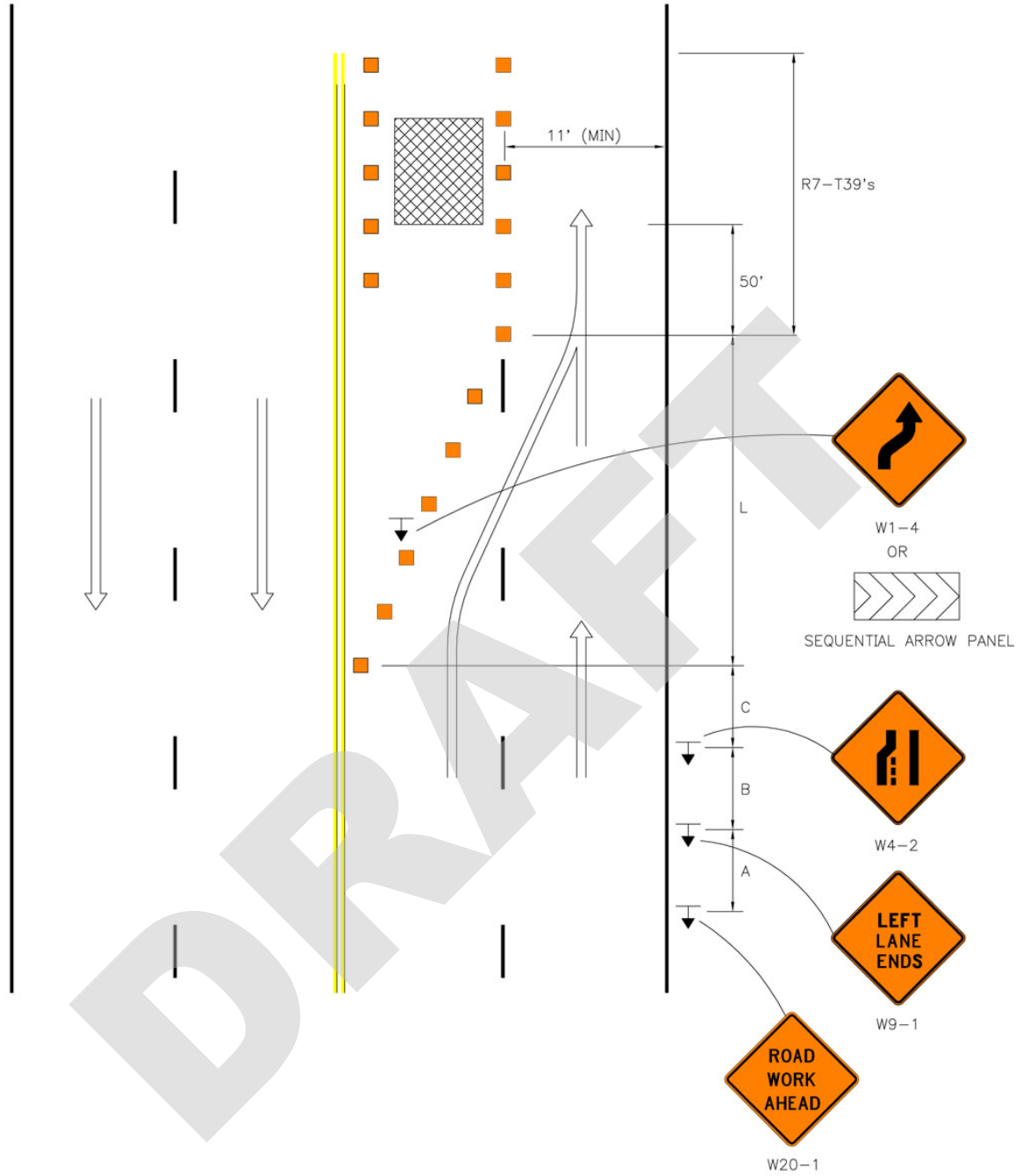

R3–2 *
* SHALL OBTAIN TRAFFIC ENGINEER'S PERMISSION
** USE SLOTTED SIGN WITH TUBULAR MARKER IN LIMITED SPACE LOCATIONS
11' (MIN)
R7–T39's
50'
L
W1–4
OR
SEQUENTIAL ARROW PANEL
C
B
A
W4–2
RIGHT LANE ENDS
W9–1
ROAD WORK AHEAD
W20–1
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L
RIGHT LANE CLOSURE
4-LANE, 2-WAY STREET
FIGURE X–4
DRAFT



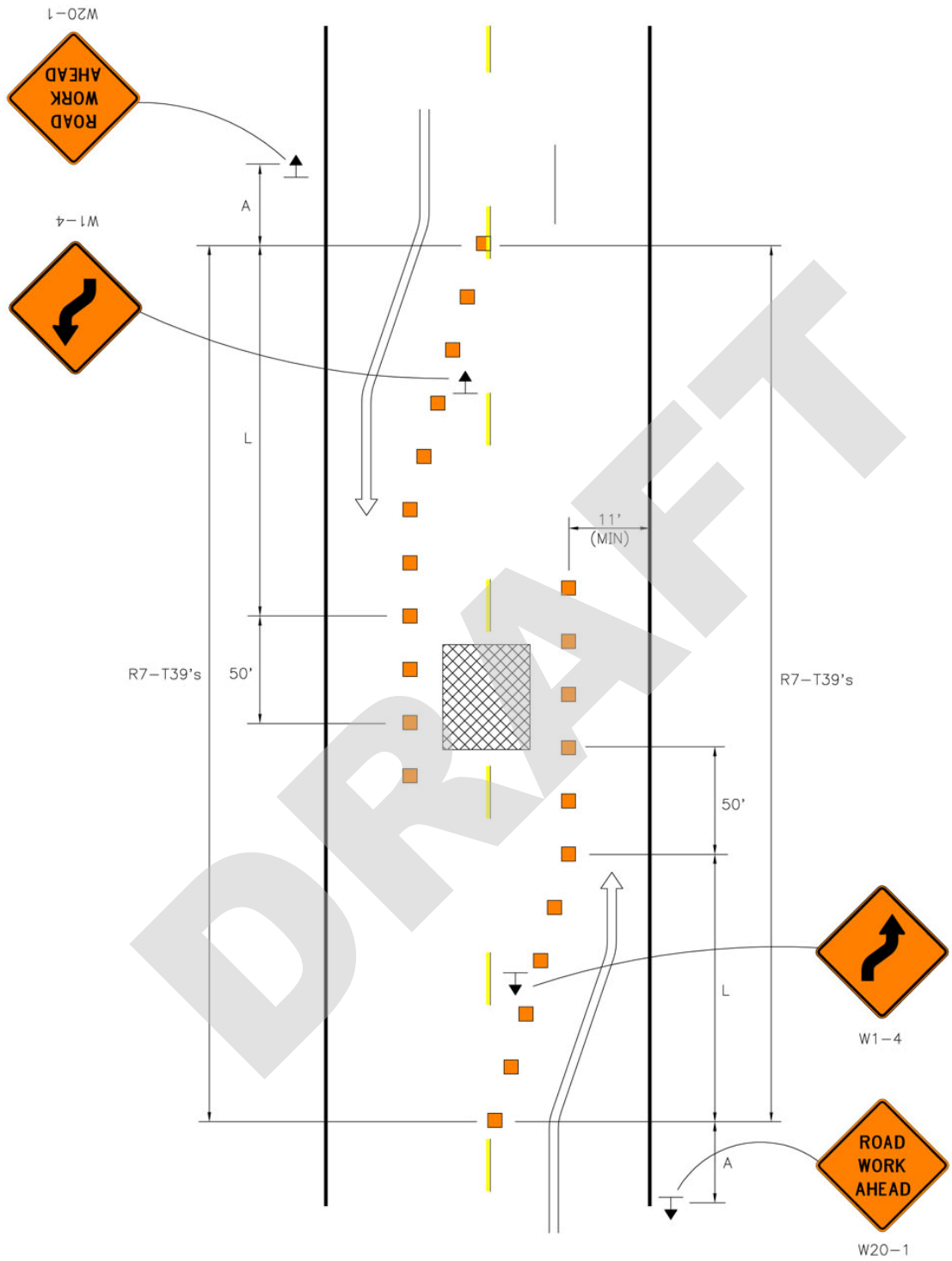
REFER TO FIGURE X-2 FOR TYPICAL
DIMENSIONS OF A, B, C, & L

LEFT LANE CLOSURE

4-LANE, 2-WAY STREET

FIGURE X-5

DRAFT



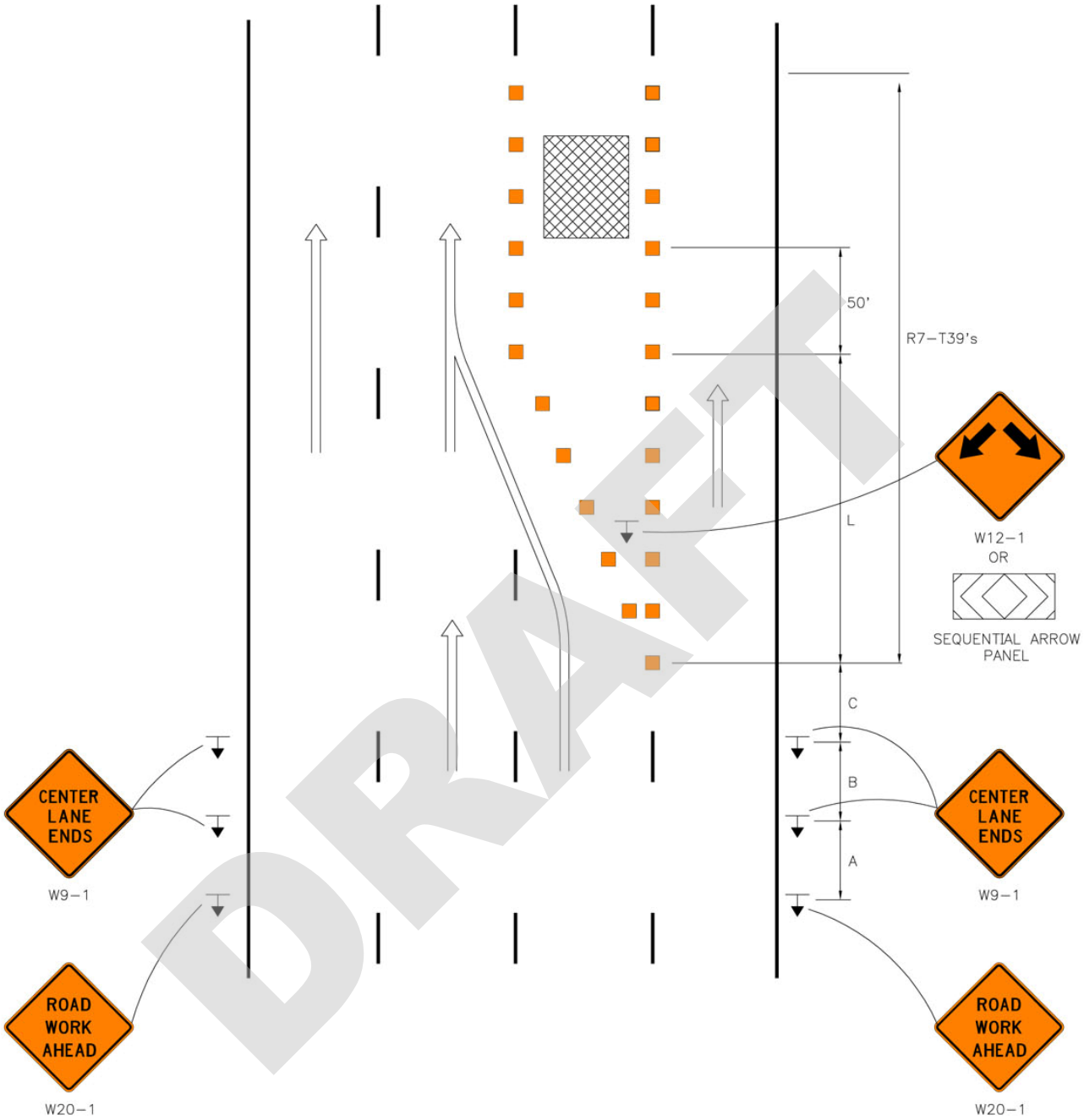
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A & L

WORK AREA IN CENTER OF STREET

MINOR ARTERIAL

FIGURE X-6

DRAFT



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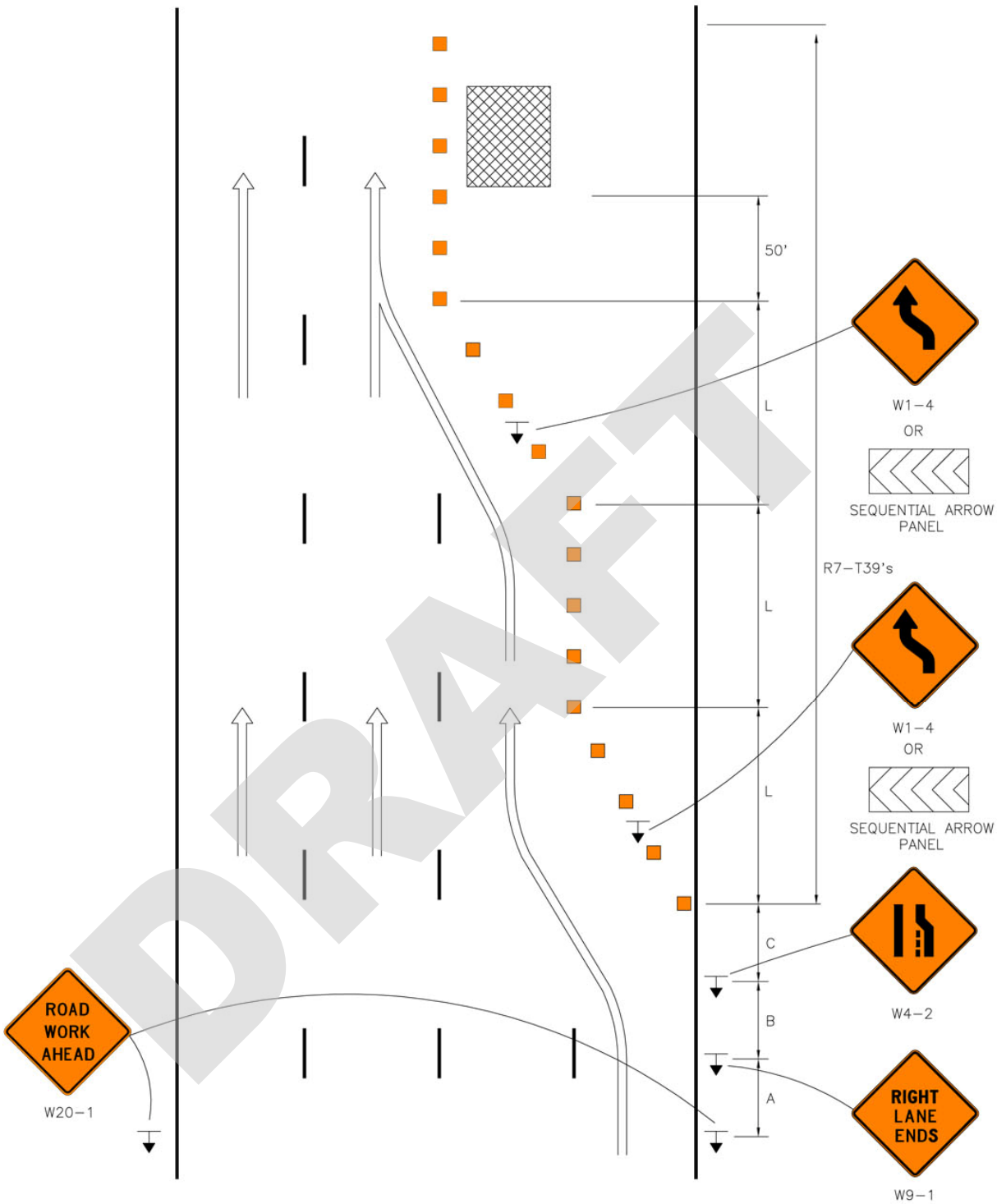
REFER TO FIGURE X-2 FOR TYPICAL
DIMENSIONS OF A, B, C, & L

CENTER LANE CLOSURE

ONE-WAY STREET

FIGURE X–7



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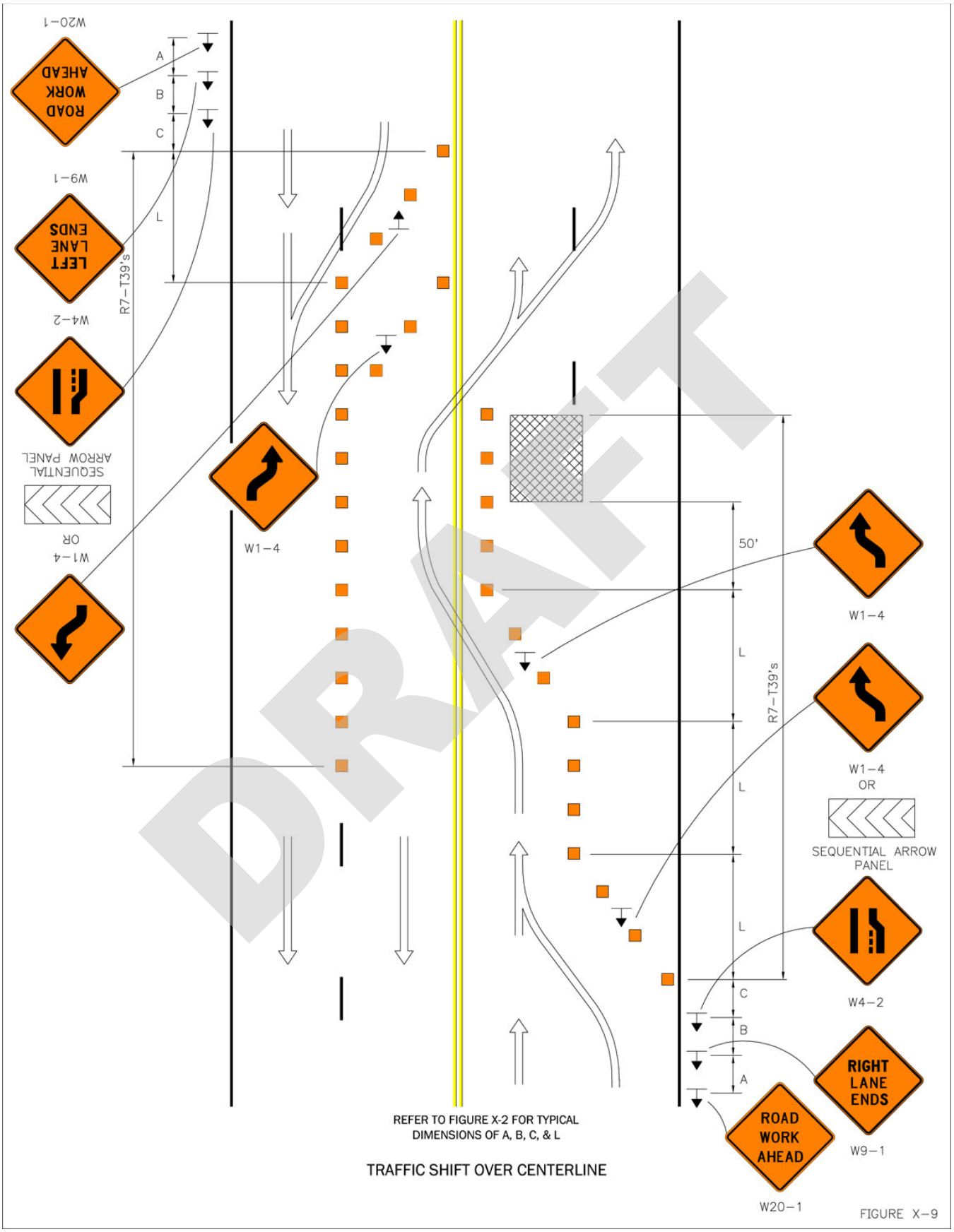
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L

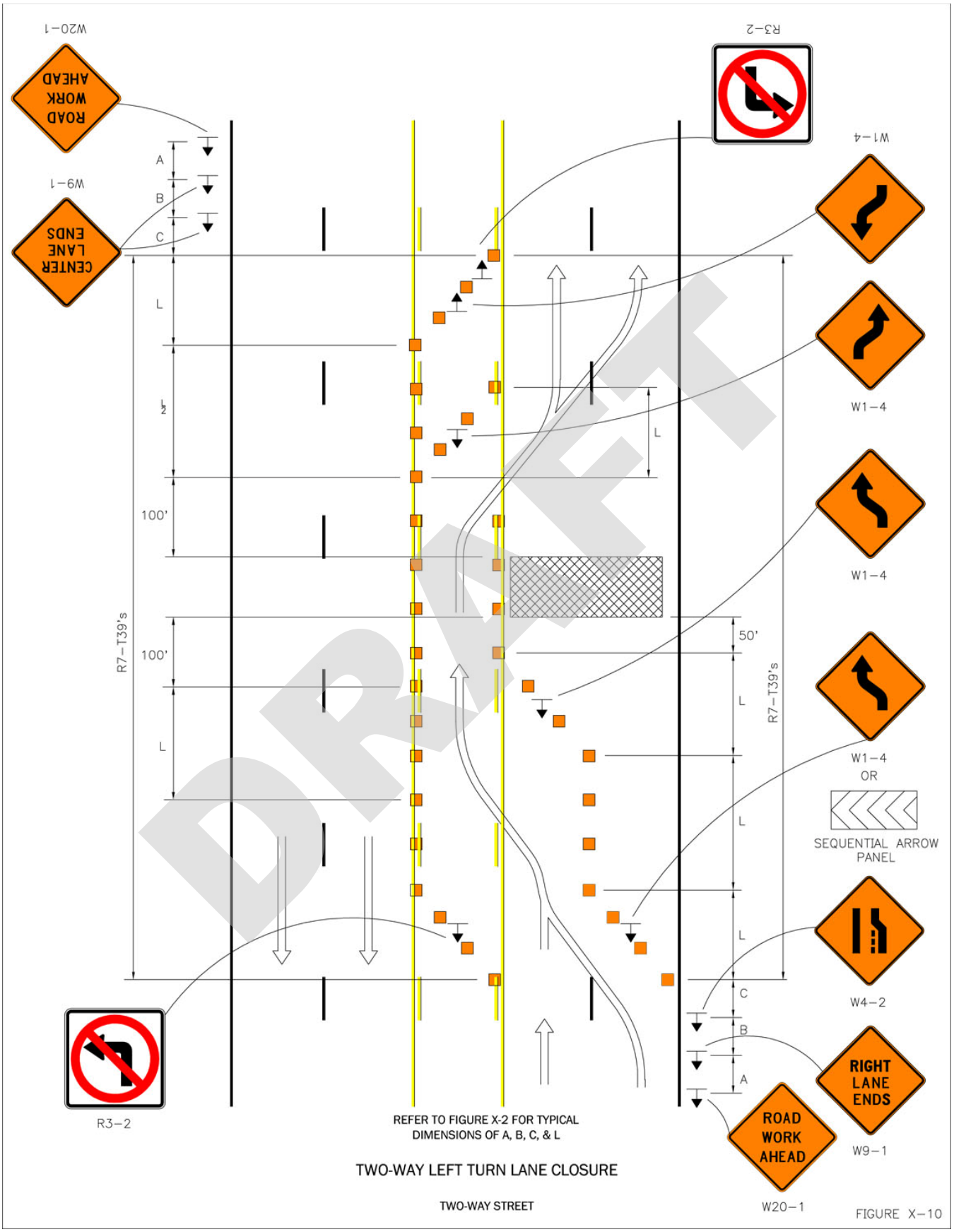
MULTIPLE LANE CLOSURE

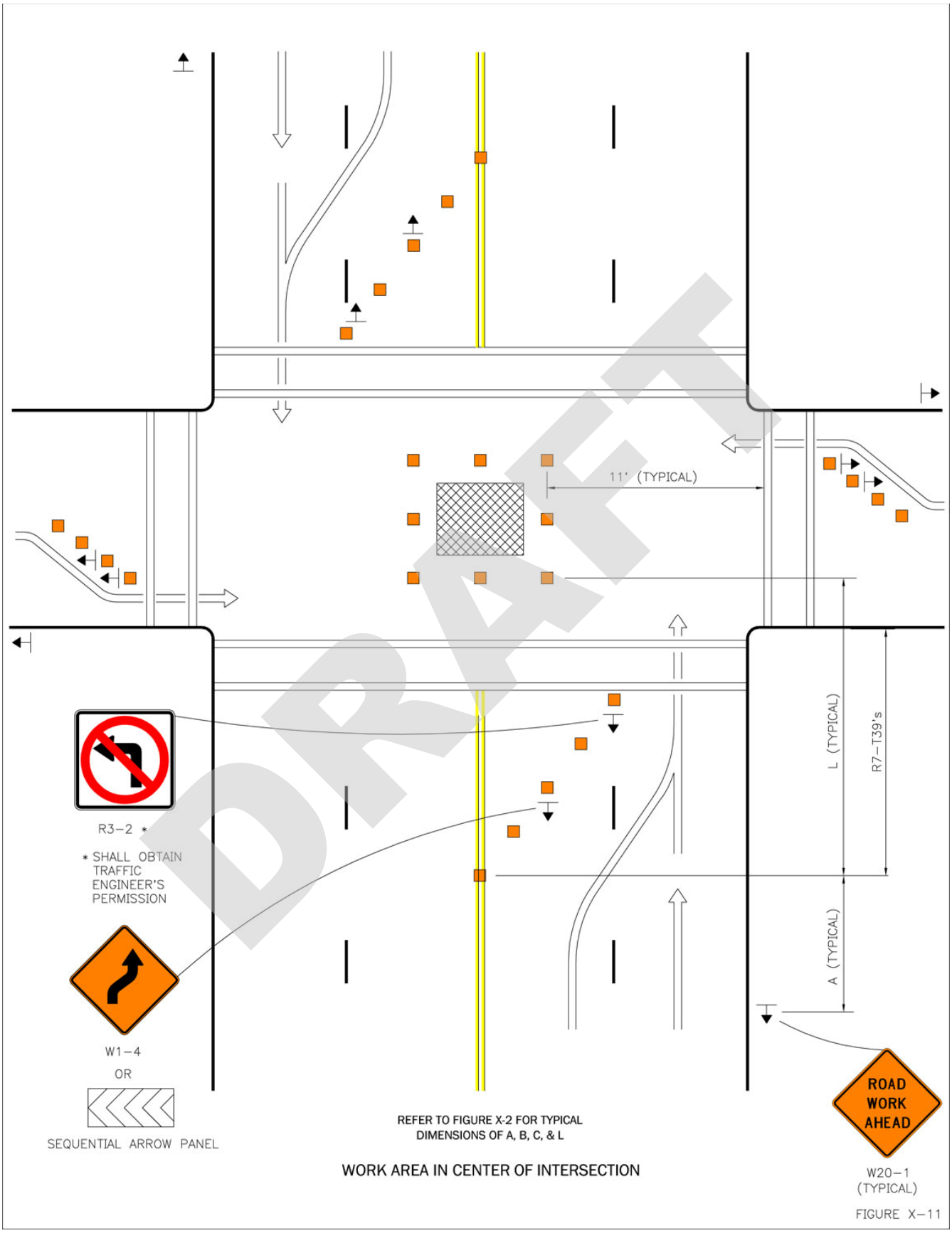
ONE-WAY STREET

FIGURE X–8


W20-1
ROAD WORK AHEAD
A
B
C
W9-1
LEFT LANE ENDS
L
R7-T39's
W4-2
SEQUENTIAL ARROW PANEL
W1-4
OR
W1-4
50'
L
L
L
R7-T39's
W1-4
W1-4
OR
SEQUENTIAL ARROW PANEL
W4-2
C
B
A
RIGHT LANE ENDS
W9-1
ROAD WORK AHEAD
W20-1
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L
TRAFFIC SHIFT OVER CENTERLINE
FIGURE X-9

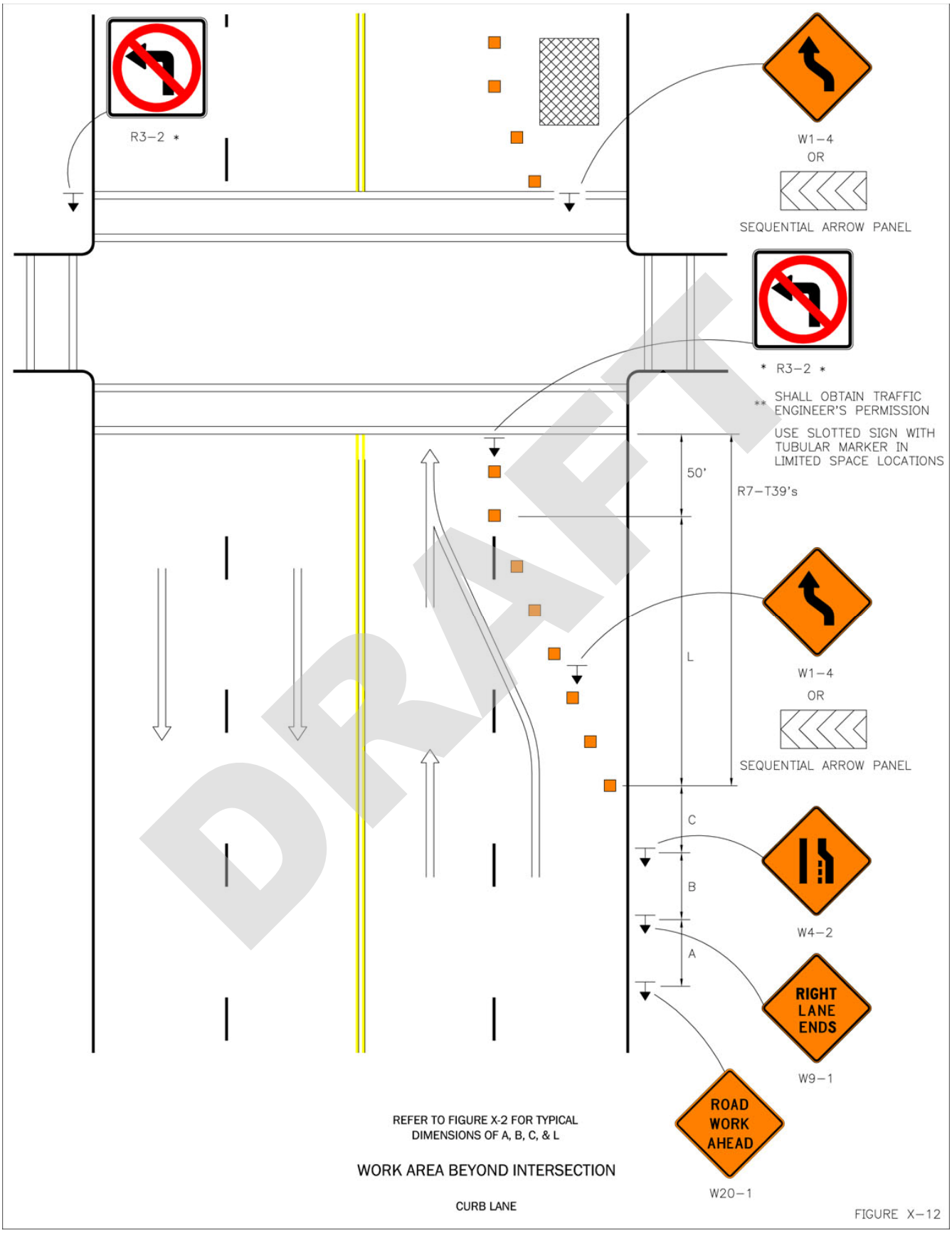
DRAFT

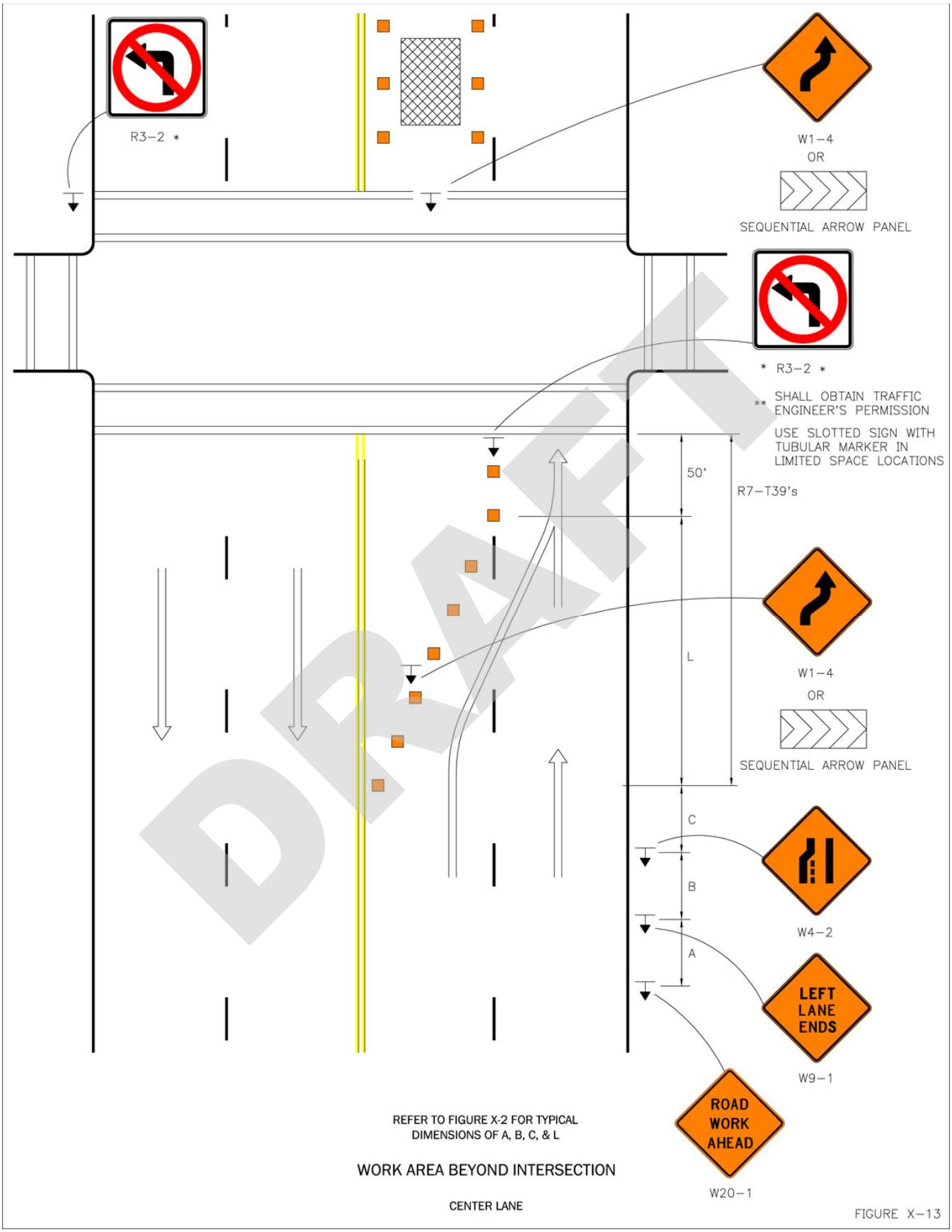

W20-1
ROAD WORK AHEAD
W9-1
CENTER LANE ENDS
R3-2
W1-4
W1-4
W1-4
W1-4
OR
SEQUENTIAL ARROW PANEL
W4-2
RIGHT LANE ENDS
W9-1
ROAD WORK AHEAD
W20-1
R3-2
A
B
C
L
L/2
100'
100'
L
R7-T39's
50'
L
L
L
L
R7-T39's
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L
TWO-WAY LEFT TURN LANE CLOSURE
TWO-WAY STREET
FIGURE X-10
DRAFT

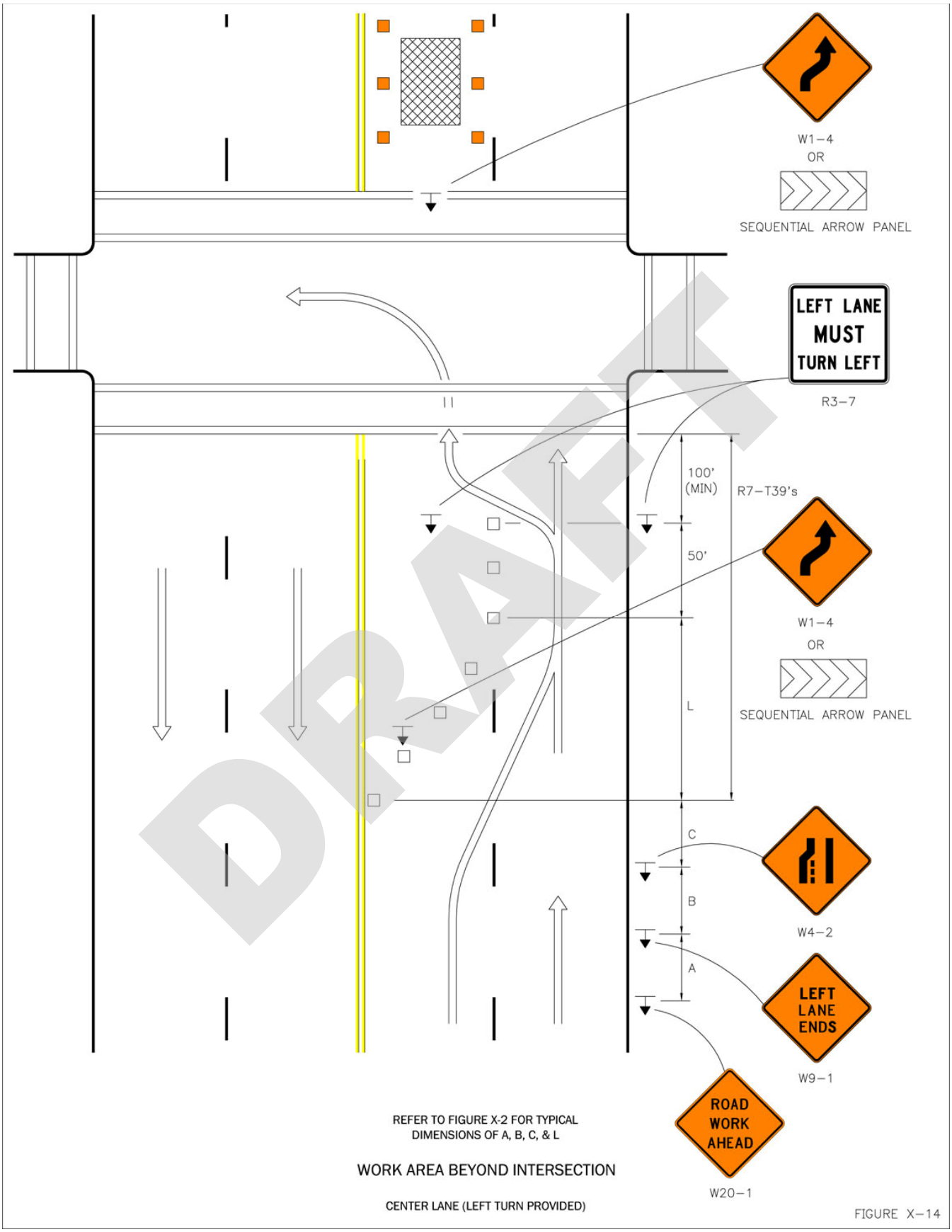


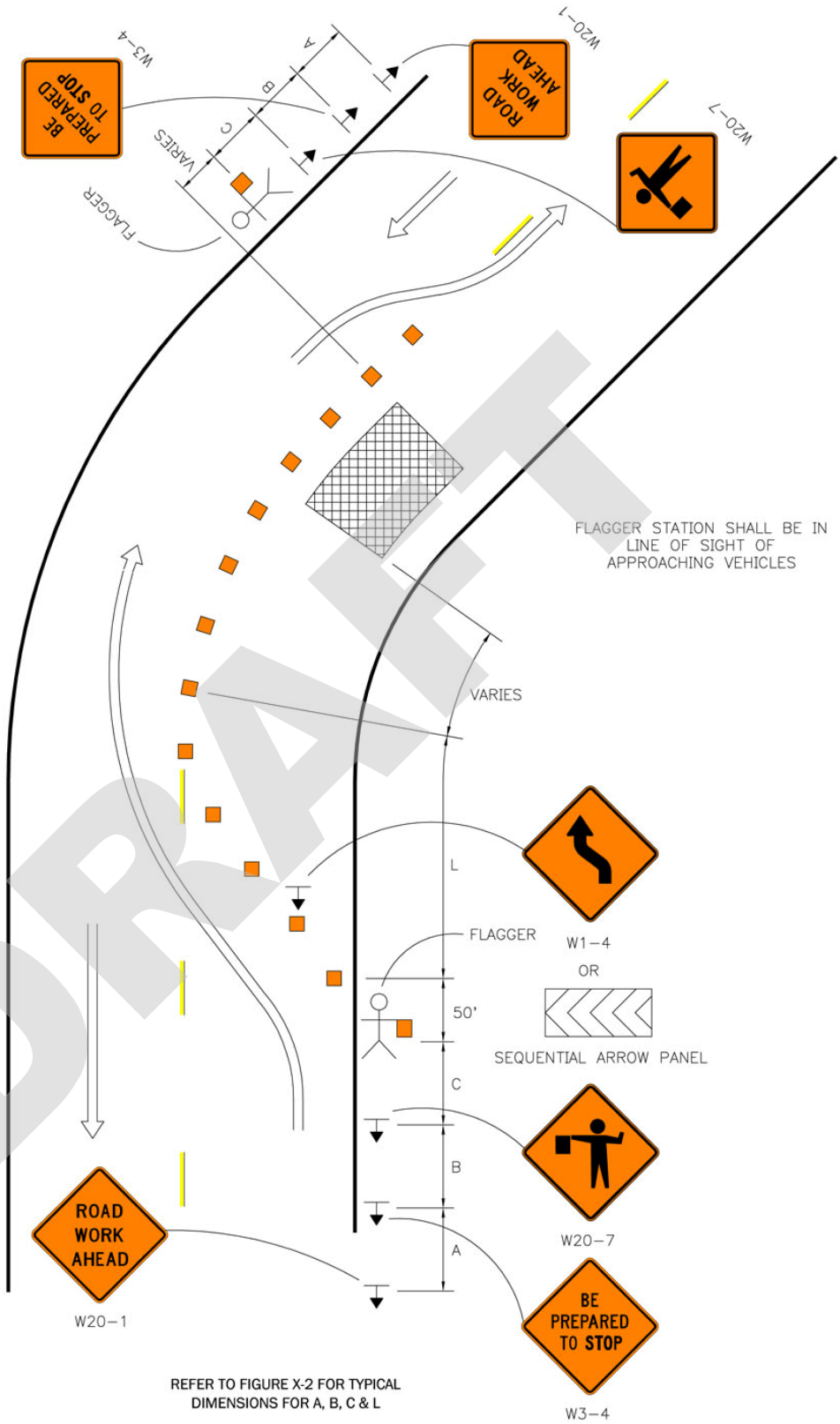
WORK AREA IN CENTER OF INTERSECTION

FIGURE X-11


R3-2 *
W1-4
OR
SEQUENTIAL ARROW PANEL
* R3-2 *
** SHALL OBTAIN TRAFFIC ENGINEER'S PERMISSION
USE SLOTTED SIGN WITH TUBULAR MARKER IN LIMITED SPACE LOCATIONS
50'
R7-T39's
L
W1-4
OR
SEQUENTIAL ARROW PANEL
C
B
A
W4-2
RIGHT LANE ENDS
W9-1
ROAD WORK AHEAD
W20-1
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L
WORK AREA BEYOND INTERSECTION
CURB LANE
FIGURE X-12
DRAFT


R3-2 *
W1-4
OR
SEQUENTIAL ARROW PANEL
* R3-2 *
** SHALL OBTAIN TRAFFIC ENGINEER'S PERMISSION
USE SLOTTED SIGN WITH TUBULAR MARKER IN LIMITED SPACE LOCATIONS
50'
R7-T39's
L
W1-4
OR
SEQUENTIAL ARROW PANEL
C
B
A
W4-2
LEFT LANE ENDS
W9-1
ROAD WORK AHEAD
W20-1
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A, B, C, & L
WORK AREA BEYOND INTERSECTION
CENTER LANE
FIGURE X-13
DRAFT


W1–4
OR
SEQUENTIAL ARROW PANEL
LEFT LANE
MUST
TURN LEFT
R3–7
100'
(MIN)
R7–T39's
50'
W1–4
OR
SEQUENTIAL ARROW PANEL
L
C
B
A
W4–2
LEFT
LANE
ENDS
W9–1
ROAD
WORK
AHEAD
W20–1
REFER TO FIGURE X-2 FOR TYPICAL
DIMENSIONS OF A, B, C, & L
WORK AREA BEYOND INTERSECTION
CENTER LANE (LEFT TURN PROVIDED)
FIGURE X–14
DRAFT



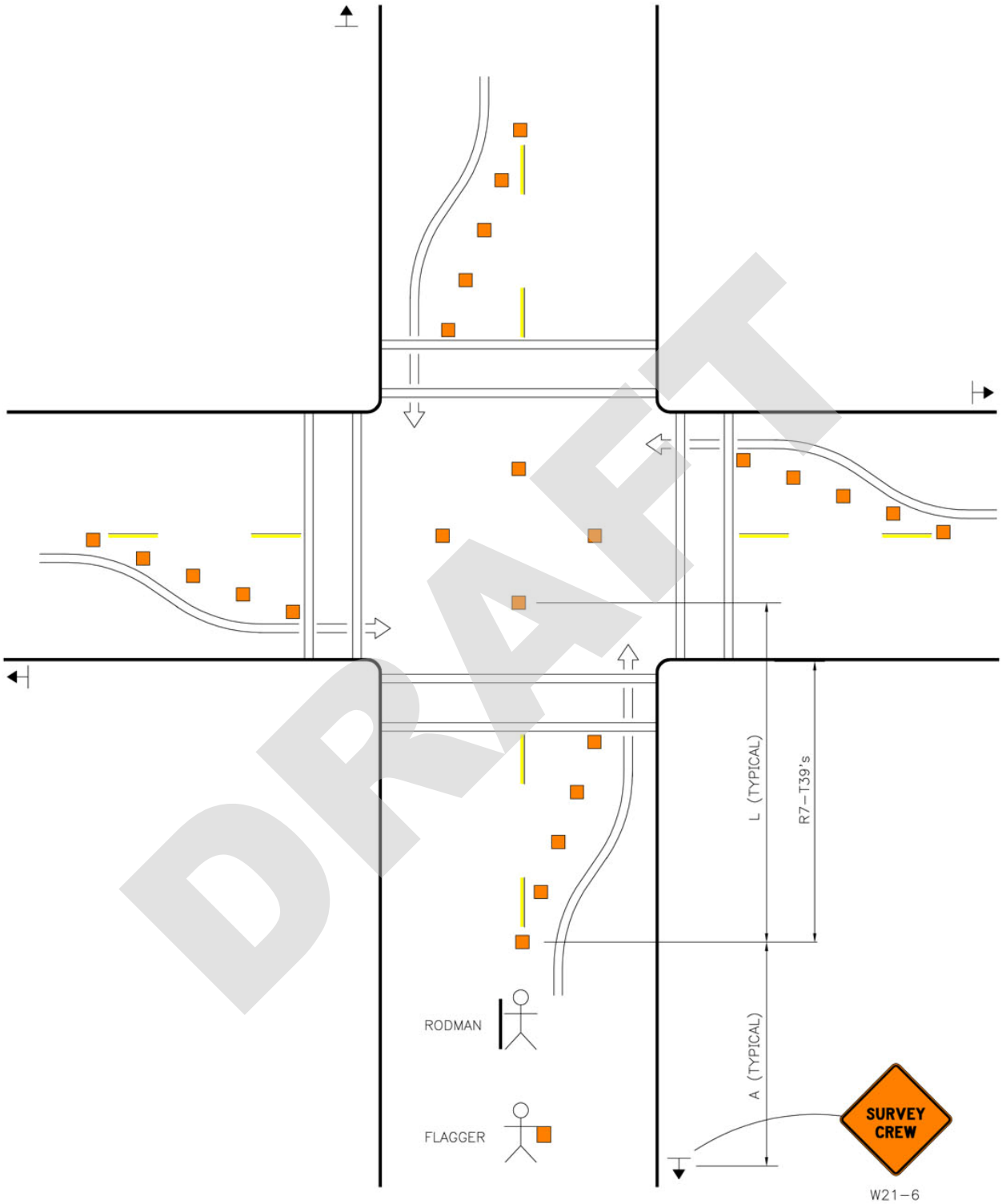
REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS FOR A, B, C & L

ONE LANE ROAD, TWO-WAY OPERATION

HORIZONTAL CURVE (ILLUSTRATED)
VERTICAL CURVE (SIMILAR)

FIGURE X-15

DRAFT



REFER TO FIGURE X-2 FOR TYPICAL DIMENSIONS OF A & L

SEQUENTIAL ARROW PANEL

SURVEY CREW

ARTERIAL STREET

FIGURE X-16

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