

PART B – TRAFFIC CONTROL

Section 6: Traffic Control Layouts – General Instructions

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PART B – TRAFFIC CONTROL

Section 6: Traffic Control Layouts – General Instructions

This section outlines the appropriate development and use of the traffic control layouts described in Sections 7 to 19. The user of this manual should have a thorough understanding of the information in this section before applying the layouts.

Important Notes for Layouts in Sections 7 to 19

1. The traffic control layouts are considered the minimum standard. The associated text description highlights the key standards as well as guidance and options that can be considered by the user.
2. Although this Manual often identifies traffic control requirements by using the word “shall,” there may be circumstances where strict compliance with the requirements is not reasonable and it will be necessary to deviate from the requirements. In these cases, written justification for the modification must be recorded and depending on the complexity of the modification, written permission may need to be granted by the Road Authority.
3. A variety of conditions may be encountered, and no single standard sequences of signs or other traffic control devices can be set up as an inflexible arrangement for all conditions and locations. Furthermore, it may be impossible to comply with the minimum standards in emergency situations.
4. If the layouts in the Manual are not working in a particular situation, alternatives should be considered and implemented.
5. If it is necessary to deviate from the requirements in the Manual, the Prime Contractor should contact the Road Authority.

TCP Acronym

TCP is generally used for Traffic Control Persons throughout Sections 6 to 19.

Side-by-Side Formatting

The layouts in Sections 7 to 19 are shown with the **description on the left** and the corresponding **diagram on the right** so that readers can see them side-by-side

6.1 Introduction to Work Zone Components

Temporary traffic control measures are required within work zones to safely guide and protect road users and workers.

For the purposes of this Manual, a **work zone** is:

A roadway area in which road user conditions have been temporarily changed for the purpose of construction, maintenance, utility work, or for emergency incident management.

A work zone is typically marked by temporary traffic control devices such as signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It usually extends from the first to the last of the traffic control devices, and is generally the area between the first advance warning sign and a point beyond the work operations where traffic is no longer affected by temporary controls.

As shown in [Figure 6.1: Overview of the Six Work Zone Components](#), work zones can be divided into six components:

1. Advance Information Zone (optional)
2. Advance Warning Area
3. Transition Area (if a lane or shoulder is closed)
4. Buffer Space
5. Work Activity Area
6. Termination Area

[Figure 6.1: Overview of the Six Work Zone Components](#) shows a general concept of the work zone components and how they relate to where devices may be located. For traffic control device selection, refer to the appropriate reference layout found in Sections 7 to 19.

Each component is discussed individually in [Section 6.2: Work Zone Components](#) for one direction of travel. If the work activity affects both directions of travel, the same principles apply.

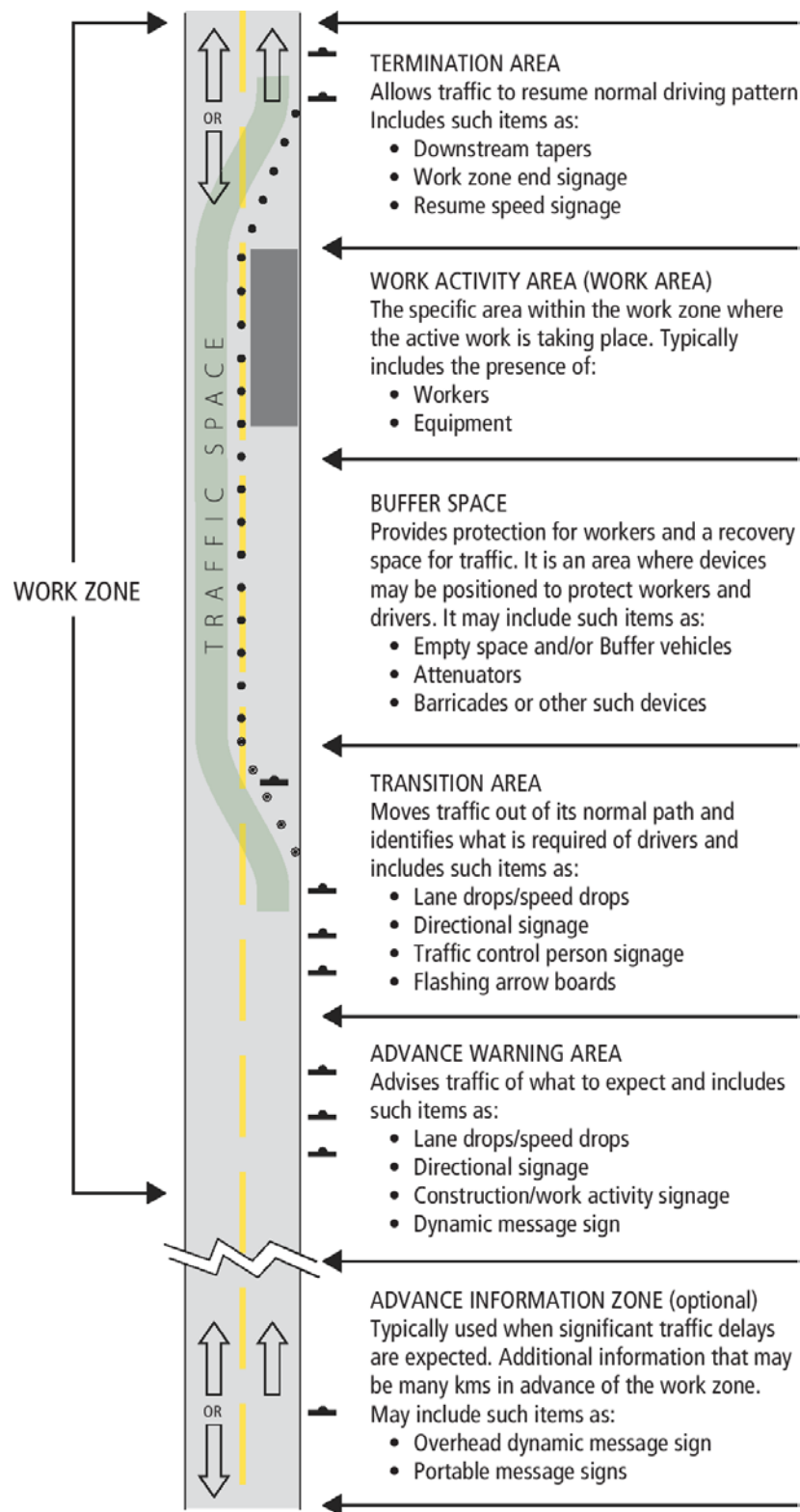


Figure 6.1: Overview of the Six Work Zone Components

6.2 Work Zone Components

6.2.1 Advance Information Zone (optional)

The Ministry has strategically placed overhead Dynamic Messaging Signs (DMS) throughout the province. These can be utilized to provide greater information to travellers, particularly when there are significant impacts or delays. Portable message signs may also be used to provide this advanced information.

The Project Manager would work with the Transportation Management Centre of British Columbia (TMCBC) to post messages on the overhead DMS.

6.2.2 Advance Warning Area

The advance warning area is the area where road users are informed of what to expect ahead. The length of the advance warning area from the first sign to the beginning of the transition area should provide drivers with enough time to adjust their driving patterns safely and appropriately.

The number of traffic control devices in an advance warning area may vary from a single sign or a rotating/flashing light on a vehicle to a series of signs and the use of a portable dynamic message sign (DMS).

The required length of the advance warning area increases with the roadway speed so that road users may more readily perceive and respond to the work condition ahead. Sight distances should be sufficient for drivers to see the situation, interpret what they are seeing, decide what to do, and do what needs to be done (see [Section 2.3.3: Manage Driver Sight Distances](#)).

Advance warning signs are generally not required when the work activity area and access to it are entirely off the roadway and shoulder, and the work does not interfere with traffic, but they should be used when any traffic flow problems or conflicts could possibly occur.

6.2.3 Transition Area and Tapers

Transition Area: The transition area is the area in which vehicles are channelized/redirected from their normal path of travel into a new path in order to move around the work activity area. This movement of traffic is achieved by using channelizing devices and directional signs in the tapers that are used to close lanes.

The transition area should be obvious to road users, with the correct path clearly identified with pavement markings and/or channelizing devices so that drivers will not attempt to follow the normally travelled path.

For moving work operations, the transition area moves with the work activity area. A shadow vehicle may be used to warn traffic and/or guide traffic into the proper lane (see [Section 4.11.5: Shadow Vehicles](#)).

Tapers: Tapers are used in both the transition and termination areas, and are created with a series of channelizing devices or pavement markings placed to move traffic out of—or back into—its normal path. Adjustments to standard taper lengths may be necessitated by the presence of access/egress points and other site constraints. Five different tapers are used within work zones.

1. Merging Taper

A merging taper (lane closure taper or channelizing taper) is most commonly used on a multilane roadway to close a lane and combine its traffic with that of the adjacent lane.

The length of the taper should be appropriate for the speed of traffic and the complexity of actions that drivers will be undertaking—for example, merging versus making a lane shift (see [Table A – Taper Lengths](#) in [Appendix F](#)).

After a merging taper is installed, traffic should be observed to determine whether or not the taper is working well. The frequent use of brakes and evidence of skid marks indicate that the taper is too short or the advance warning is inadequate.

If restricted sight distance is a problem, the taper should begin well in advance of the sight restriction—for example, a sharp curve. The beginning of a taper should not be hidden downstream of curves.

2. Lane Shift Taper

A lane shift taper is used when there is a change in alignment of the travelled lane that does not necessitate a merge. A lane shift taper generally requires half the length of a merging taper.

3. Shoulder Taper

A shoulder taper closes a shoulder to traffic so that shoulder work can be undertaken or equipment can be placed on the shoulder.

When a wide, paved shoulder is closed adjacent to a high-speed roadway, it should be treated as a closed portion of the travelled roadway so that drivers do not pull off onto the shoulder or stop in the work zone.

Shoulder tapers are often used in combination with merging tapers. A shoulder taper used to close a non-travel lane does not require the length of a full merging taper, but if the shoulder is used as a travel lane, a normal merging taper length should be used so that drivers do not mistake the closed shoulder for a lane.

4. TCP, AFAD, or Signal Taper

A Traffic Control Person (TCP), Automated Flagger Assistance Device (AFAD), or signal taper is placed in advance of a work activity area to implement a single lane alternating traffic (SLAT) pattern.

This taper is not used to merge traffic but rather to close a work area to traffic and indicate that a speed and path adjustment will be required. It is typically 15 metres long and contains five equally-spaced channelizing devices in the closed lane, with the right-of-way usually assigned by one or more TCPs or AFADs, a temporary traffic signal, or temporary self-regulating lane control.

5. Downstream Taper

A downstream taper is installed in the termination area at the far end of the work activity area to direct traffic back into its normal path. A downstream taper is not advisable when work vehicles are moving into or leaving the work activity area from the downstream end.

6.2.4 Buffer Space

The buffer space is the unoccupied space between the transition area and the work activity area. It improves safety for drivers and workers by providing recovery space for errant vehicles. They should be included wherever possible.

Circumstances that may necessitate the implementation of a buffer space include:

- poor sight distance in advance of the work activity area
- high speeds and/or high traffic volumes on the roadway

The buffer space should be kept free of equipment, workers, and materials, and should be free of vehicles except when a buffer vehicle is used.

For moving operations in which a shadow vehicle is used, the buffer space is the space between the shadow vehicle and the work vehicle.

6.2.5 Work Activity Area

The work activity area is the area where the work is taking place.

It may be a fixed location or multiple locations as moving work progresses down the roadway. The work activity area is closed to traffic, set aside for exclusive occupation by workers, equipment, and construction activities, and is delineated by channelizing devices.

Potential **hazards increase** in and around a work activity area when:

- the work activity area is close to the travel lanes
- traffic speeds and volumes increase
- work activities affect normal traffic operations (e.g., uneven pavements, vehicles loading or unloading)
- the change in travel path becomes more complex (e.g., traffic is shifted across the median and into lanes normally used by opposing traffic)

Minimize hazards between traffic and the work activity area by considering the following:

1. Use traffic control devices to make the travel path clearly visible to traffic. Avoid gaps that may falsely suggest to drivers that they have passed through the work zone.
2. Place channelizing devices between the work activity area and the travel path. Devices placed on a tangent along the work activity area to keep traffic out of a closed lane should be spaced appropriately—for the extent and type of activity, the speed limit of the roadway, and the vertical and horizontal alignment—so that it is obvious that the lane is closed. For urban streets and low-speed roadways, closer spacing may be required.
3. Provide an unobstructed entrance and exit for work vehicles.
4. Protect moving operations with adequate advance warning of the work and/or shadow vehicles.

6.2.6 Termination Area

The termination area is a short distance through which traffic clears the work activity area and returns to the normal traffic path. It extends from the downstream end of the work activity area to the last temporary traffic control device and may include a downstream taper.

There are occasions where the termination area may include a transition area. For example, if a taper is used to shift traffic into an opposing lane of a multilane roadway, the termination area needs a taper to shift traffic back to its normal path.

A buffer space may be used between the end of the work activity area and the beginning of the downstream taper.

6.3 Overlapping Work Zones

Overlapping work zones occur when signs and devices overlap from two separate work zones.

Work zones that are in close proximity to one another, but signed independently, may create driver confusion and lead to undesirable driver behaviour. When traffic control layouts have the potential to overlap, contractors and Traffic Control Supervisors should work cooperatively to develop a joint Traffic Control Plan to ensure that the traffic control setups do not conflict.

Coordinate overlapping work zones to:

- reduce message conflicts.
- prevent driver confusion and frustration.
- increase maintenance efficiencies for signs and devices.
- contribute to safer traffic control and better overall driver compliance.

Rural areas, where work is one kilometre apart or less, should be managed as one continuous work zone. This prevents driver confusion and frustration, and makes it easier for Traffic Control Persons to maintain appropriate signage.

See [*Figure 6.2: Overlapping Work Zones – Uncoordinated and Coordinated Setups*](#) for examples of improper and proper traffic control setups for two work zones in close proximity.

Even when the sign layouts do not overlap, it may be beneficial to develop a cooperative Traffic Control Plan when the work areas are within one kilometre of each other.

[*Figure 6.2: Overlapping Work Zones – Uncoordinated and Coordinated Setups*](#) shows a general concept of overlapping work zones and how they relate to where devices may be located. For traffic control device selection, refer to the appropriate reference layout found in Sections 7 to 19.

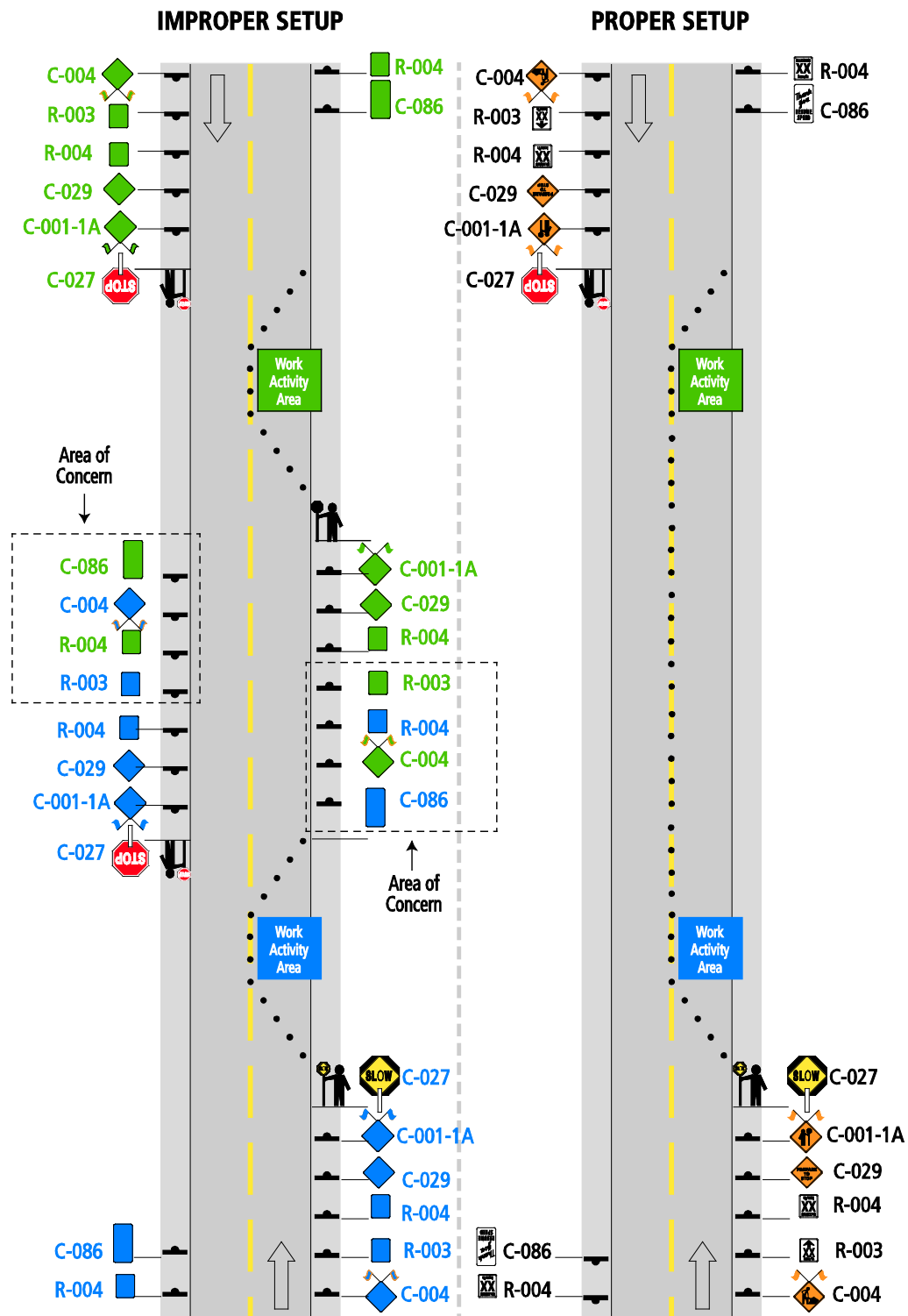


Figure 6.2: Overlapping Work Zones – Uncoordinated and Coordinated Setups

6.4 Queue Management

6.4.1 Advance Warning and Queue Length

The typical traffic control layouts and associated spacing may not be sufficient for queue management when:

- Traffic is stopped for too long, and the queue extends back past the advance warning signage.
- Hills and/or curves prevent drivers from seeing the back of the queue.

These conditions make it difficult for drivers to see that they are approaching a work zone or the end of a traffic queue. The techniques and options for improving overall queue management may include:

- reducing queue length by reducing stoppage times within work zones or where Traffic Control Persons are positioned
- reducing the length of a single lane alternating traffic section—the distance between stop bars or TCPs
- scheduling the work activity at a time when traffic volumes are lower
- using additional signage in advance of the main construction zone signage¹ (see [Figure 6.3: Managing Queue Length and Additional Advance Warning](#))
- undertaking frequent sign checks to ensure that all signs are erect and visible to approaching drivers
- adjusting the placement of signage so that it is in the most visible location, and repeating the signage at the approach to the work zone

Also consider any other conditions that may make a standard advance warning setup insufficient for the situation, including:

- weather conditions, such as fog, that make it difficult to see signs in the approach to a work area
- high winds or routes with limited or no shoulder space, making it difficult to erect signs with appropriate spacing and ensure that they stay erect

When such conditions exist, additional advance warning signage and sign checks may be required.

1 Use the Traffic Control Person Ahead C-001-1 sign only in the vicinity of a TCP, not in any other advance warning series.

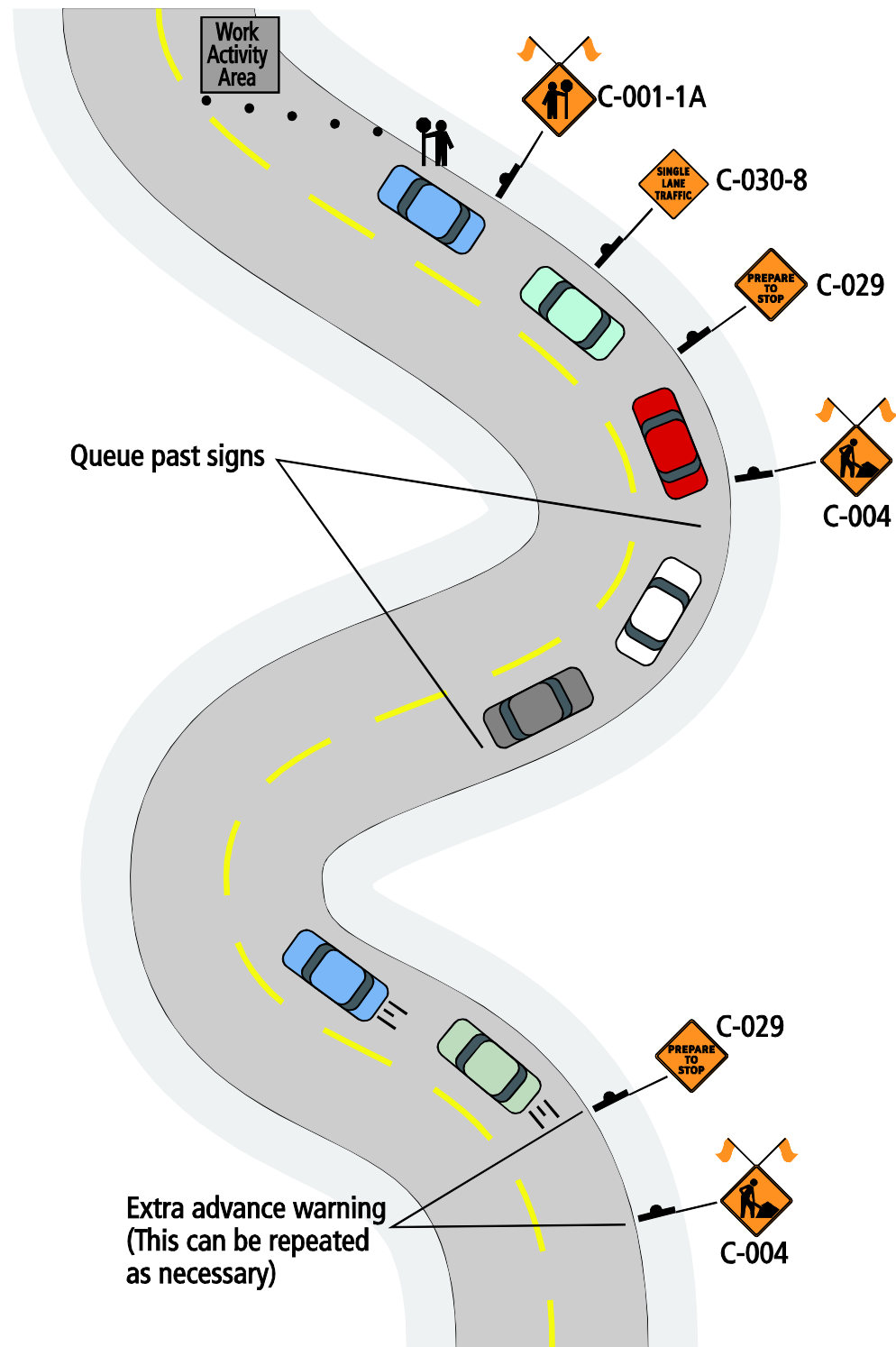


Figure 6.3: Managing Queue Length and Additional Advance Warning

6.4.2 Preventing Premature Queue Shifting

Premature queue shifting occurs when drivers move into the directed lane well upstream of the traffic control person. This creates problems for the following reasons:

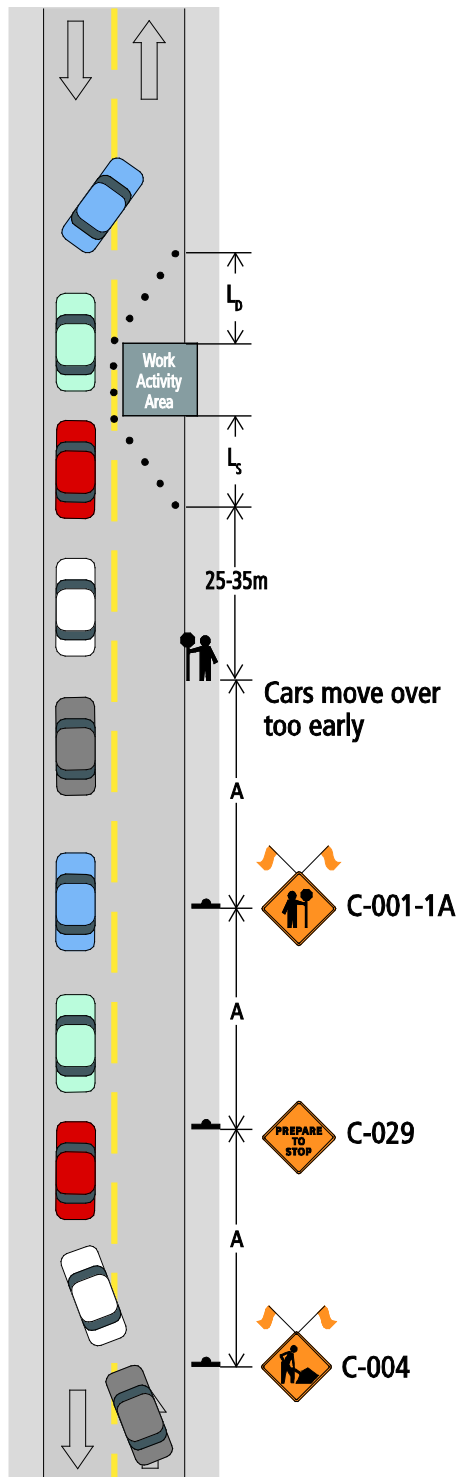
- All vehicles in the queue must be released in order to clear the lane for opposing or work traffic.
- It is difficult to stop the queue for emergency or work functions.
- It is difficult to accommodate the passage of emergency vehicles.
- If the traffic is being controlled by traffic signals, the vehicles may no longer be passing over the detectors.

Using centreline delineation on the approach to a stop condition defines the path for traffic to follow and keeps vehicles in the appropriate lane until drivers are directed to shift. This delineation method is useful because:

- It keeps drivers in the required travel lane as they approach and depart from the Traffic Control Person.
- It provides visual cues to drivers that may assist in slowing the speed at which they join the queue.

See also [*Figure 6.4: Premature Queue Shifting and Prevention of Premature Shifting.*](#)

PREMATURE SHIFTING



PREVENTING PREMATURE SHIFTING

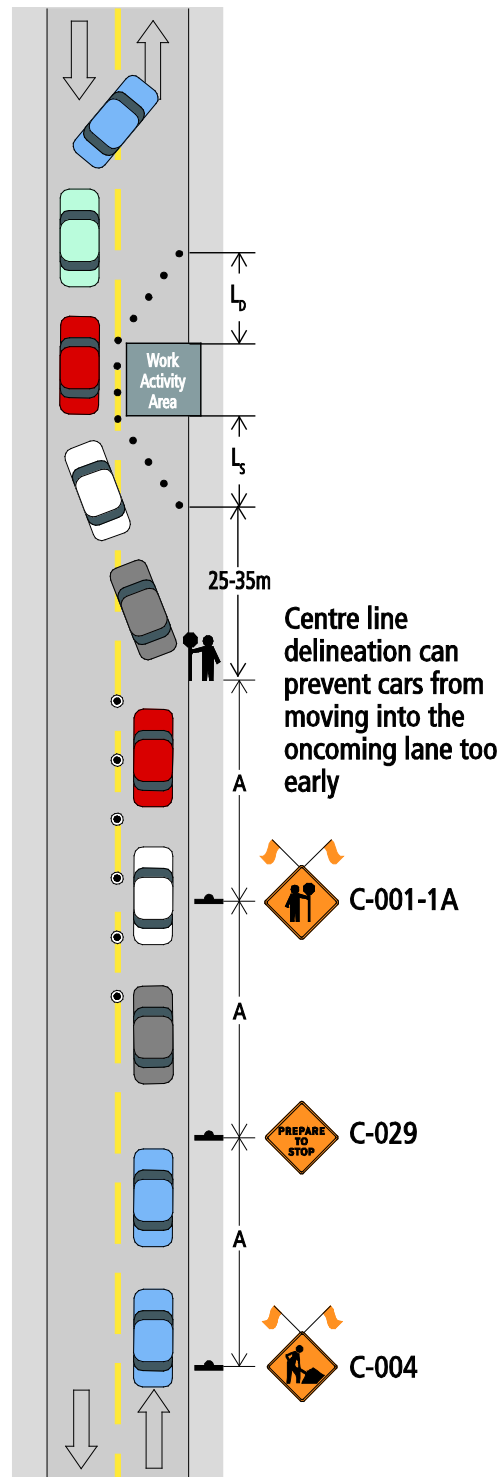


Figure 6.4: Premature Queue Shifting and Prevention of Premature Shifting

6.5 Treatment of Drop-Offs and Travel Lane Excavations

6.5.1 Drop-Offs

Drop-Off An abrupt change in elevation created by construction activity (such as milling, paving, or excavation) that is steeper than 3:1 (non-traversable slope). It is typically adjacent to a travel lane, and runs parallel to the direction of travel.

Drop-offs in work zones should be marked with appropriate signing and devices.

Roadways with drop-offs should have regular, scheduled inspections—including over weekends and holidays—to ensure that the appropriate devices are in place.

Drop-offs that are left exposed to traffic shall be treated as follows:

1. If the drop-off is caused by the removal of barrier, Barrier Removed C-069 signs shall be installed in advance of the drop-off and every 500 metres as long as the condition persists.
2. Drop-offs ≤ 60 mm (2.5") should be signed with a Low Shoulder C-013 sign to alert motorists to the condition. The sign should be repeated at least every 500 metres as long as the condition persists.

On two-lane, two-way roadways, the sign may have to be applied for both directions of travel, and "no passing" restrictions may have to be considered. This type of drop-off is common in shoulder rehabilitation and gravel shoulder maintenance projects.

3. Drop-offs > 60 mm (2.5") but ≤ 130 mm (5") should be delineated with tubular markers or drums, and signed with Low Shoulder C-013 signage. The tubes or drums should be spaced according to [Table B – Device Spacing Lengths](#) (see [Appendix F](#)).
4. For drop-offs > 130 mm (5") but < 300 mm (12"), a speed reduction to 80 km/h or less is required, as well as appropriate signage and delineation using tubes or drums.
5. The following treatment options exist for drop-offs ≥ 300 mm (12"):
 - Where the drop-off will be present for 48 hours or less, the drop-off treatment may be as indicated in #3 above; or
 - Closure of an adjacent travel lane in the same direction (for multi-lane highways); or
 - Creation of a lane shift to move traffic away from the drop-off by at least the distance shown in [Table 6.1: Minimum Distance from Edge of Travel Lane to Drop-Off](#), in addition to the treatment indicated in #3 above; or
 - Installation of a temporary barrier with at least 300 mm (12") between the back of the barrier and the drop-off, and at least 600 mm (24") between the front of the barrier and the edge of the travel lane. An approved barrier terminal, flare, or crash attenuator is required at the beginning of the barrier section, and the barrier should have retroreflective markers and/or warning lights for night-time use.

When considering the options above, reducing the lane width to 3.2 metres is generally acceptable.

For situations in which no temporary barrier is installed, [Table 6.1: Minimum Distance from Edge of Travel Lane to Drop-Off](#) shows the minimum distance required between the edge of a travel lane (as marked by a fog/edge line or a line of channelizing devices) and a drop-off ≥ 300 mm (12").

Table 6.1: Minimum Distance from Edge of Travel Lane to Drop-Off

Regular (Non-Construction) Speed Limit (km/h)	Distance from Edge of Travel Lane to Drop-Off (m)
≤ 60	0.5
70 - 100	1.5
≥ 110	3.0

Example:

On a 110 km/h highway, a 60 cm (24") deep excavation is required alongside the travel lane. The project team determines that if they apply a lane shift to move traffic away, traffic will be shifted by only 1.8 metres.

Since a 3-metre offset is the minimum required for a 110 km/h highway, the lane shift is not an acceptable option. Instead, the project team should consider closing a lane or installing a temporary barrier.

If a highway design Engineer prepares a design that deviates from the above guidelines, the design shall include a written, stamped, and documented decision that provides the rationale for the alternative strategy.

Possible reasons for using an alternative strategy may include very low traffic volumes, very short work duration, or mitigation of risk through the use of enhanced signing or enhanced enforcement.

6.5.2 Travel Lane Excavations

Excavation An abrupt change in elevation created by construction activity within the travelled portion of the roadway.

Excavations ≥ 60 mm (3") that are left unattended and exposed to traffic shall be treated as follows:

1. If the regular (non-construction) speed limit is ≥ 70 km/h, excavations may be treated by:
 - Backfilling the excavation, paving to match the existing grade, and installing a Bump or Rough Roadway Ahead C-017 sign ahead of the filled excavation if there is any noticeable difference in elevation; or
 - For situations that are present for no more than 72 hours, backfilling the excavation with gravel and compacting it to match the existing road grade, without paving. A Motorcycle Rough Surface C-019 sign with a Gravel Surface C-019-T tab shall be installed ahead of the filled excavation, and the surface should be monitored and maintained as a smooth surface, free of rutting and wash boarding.
2. If the regular (non-construction) speed limit is ≤ 60 km/h, excavations may be treated by:
 - Installing a steel plate across the excavation and installing a Bump or Rough Roadway Ahead C-017 sign or another appropriate warning sign ahead of the covered excavation; or
 - Backfilling the excavation with gravel and compacting it to match the existing road grade. A Motorcycle Rough Surface C-019 sign with a Gravel Surface C-019-T tab shall be installed ahead of the filled excavation.

If it is not feasible to cover or fill the excavation, the affected area will have to be closed to traffic. This may require a full or partial lane closure, with additional traffic control.

6.6 Positioning of Temporary Traffic Control Devices

Roadway tapers are important components of temporary work zones. They are created by using a series of channelizing devices placed to move traffic out of or into its normal path. Table A shows the taper lengths appropriate for various speed limits.

Device spacing on entry to a work zone should be based on the regular posted speed limit of the highway, regardless if a reduced speed is implemented prior to the work zone. The reasons for this are:

1. The 2015 update to the 1995/1999 Traffic Control Manual for Work on Roadways was in part driven by the need to address the Ministry's increased use of night work and subsequent traffic control for highway maintenance and construction.
2. Nighttime brings a reduction in visibility for drivers, and drivers are often less alert during this time period.
3. To mitigate nighttime driver issues of reduced alertness and slower response times, providing greater distances for warning signs and taper transitions may reduce conflicts at merge and shift points.

Options for lengthy work zones where additional work areas may be utilized, including work zones with multiple construction speed limits:

1. All additional signing, tapers, and device spacing within the work zone may be deployed using the regular posted speed limit of the highway.
Example: Regular posted speed limit of highway =120 km/h, and construction speed limit reduced to 80 km/h. All signing, tapers and devices deployed continue to use the 120 km/h speed.
2. Additional signing, tapers, and device spacing for additional work areas may be based (if a speed reduction is utilized) on the new reduced construction speed limit if signing, tapers, and devices deployed **on entry** have been spaced to the regular posted speed limit, or
*Example: Regular posted speed limit of highway =120 km/h, all signing, tapers and devices deployed **on entry** use this 120 km/h speed. Reduced construction speed limit is now 80 km/h where additional signing, tapers, and devices may use the 80 km/h speed for layout.*
3. If another additional reduced speed limit is deployed beyond the first construction speed reduction (if a speed reduction was utilized) the signing, tapers, and device spacing for this new reduced construction speed zone will be based on the speed prior to entry to the new speed reduced zone.
*Example: Regular posted speed limit of highway =120 km/h, all signing, tapers and devices deployed on entry use this 120 km/h speed. First reduced construction speed limit is to 80 km/h, where additional work areas may utilize options 1 or 2. However, an additional work area now calls for a further reduced construction speed limit from the 80 km/h to 60 km/h. In this case, additional signing, tapers, and devices **on entry** to the 60 km/h speed zone may use either:*
 - a) the regular posted speed limit of 120 km/h, or
 - b) utilize the reduced construction speed limit of 80 km/h for the layout **on entry** to the 60 km/h area.

A minimum of five devices are required for any taper.

TABLE A – TAPER LENGTHS									
Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

Table A Notes	
Regular Posted Speed Limit	Device spacing and taper lengths should be to the regular posted speed limit.
L _M = Merge Taper Length	Merge length required to close lane on approach to work area. For speeds ≥ 70 km/h, merge length should be at least = $\frac{(\text{lane width of 3.7 m}) \times (\text{Posted Speed in km/h})}{1.6}$, rounded to nearest 10 m.
L _L = Lane Shift Taper Length	Used when a lateral shift is needed within the work area. Lane Shift Taper = $\frac{1}{2} \times L_M$, rounded up to nearest 10 m.
L _D = Downstream Taper Length	May be used in work zone termination area to provide a visual cue to drivers that they may return to the original lane or path that was closed.
L _S = TCP, Signal, and Shoulder Taper Length	<u>Shoulder Taper</u> : Used to close shoulders within activity area, or when shoulders might be mistaken for driving lanes. May be increased to $\frac{1}{3} \times L_M$ on higher-speed highways and freeways where shoulder width is ≥ 2.5 m. <u>Signal and TCP Tapers</u> : Used in advance of a work activity area where traffic is controlled so that the road is used alternately by traffic moving in each direction.

L_T = Minimum Tangent Length between Tapers	Used between successive tapers or at other decision or conflict points to provide time for drivers to become accustomed to the first change and observe traffic control devices for the second change. $L_T = L_M$, but for high-speed/high-volume freeways and/or night work, it may be doubled ($2 \times L_T$) to increase time for drivers to become accustomed to the first change.
L_R = Run-In Length on Centreline	May be used on centrelines as minimum tangent length before development of lane departures or lane shifts. Run-in length = $0.8 \times \text{speed (in km/h)}$ (US Manual of Uniform Traffic Control Devices).

Figure 6.5: Taper Diagram shows a general concept of the lengths found in Table A. For traffic control device selection, refer to the appropriate reference layout found in Sections 7 to 19.

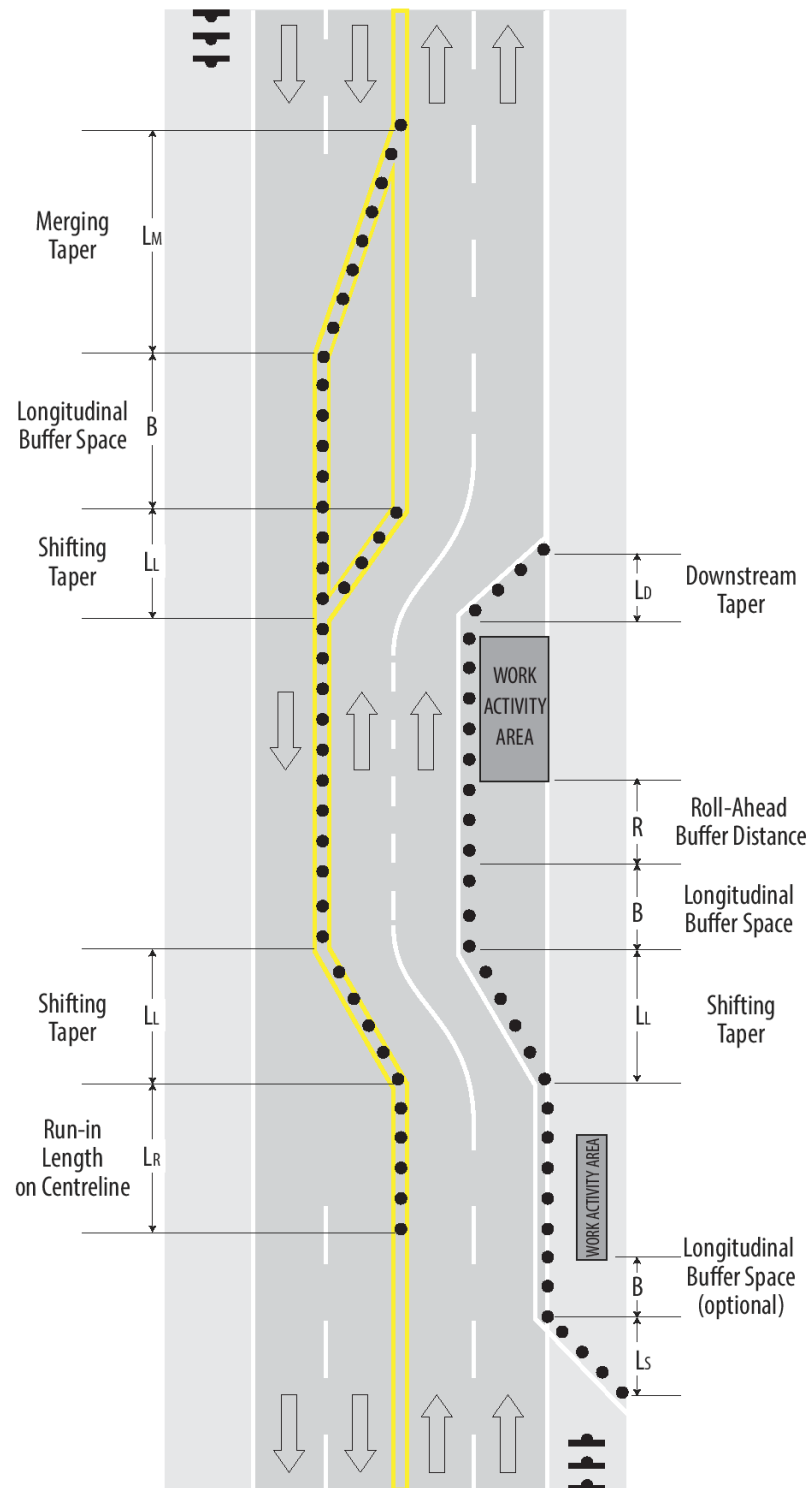


Figure 6.5: Taper Diagram

Tapers require at least five devices—typically drums or tubes.

To set the taper:

1. Place Device 1 as noted in [Figure 6.6: Taper Layout](#).
2. Measure the taper length (parallel to the roadway).
3. Place Device 2 as noted in the figure.
4. Fill in the area between the two devices with devices of the same type, using the spacing shown in [Table B – Device Spacing Lengths](#) as the maximum distance between devices.
5. Adjust the device spacing as necessary.

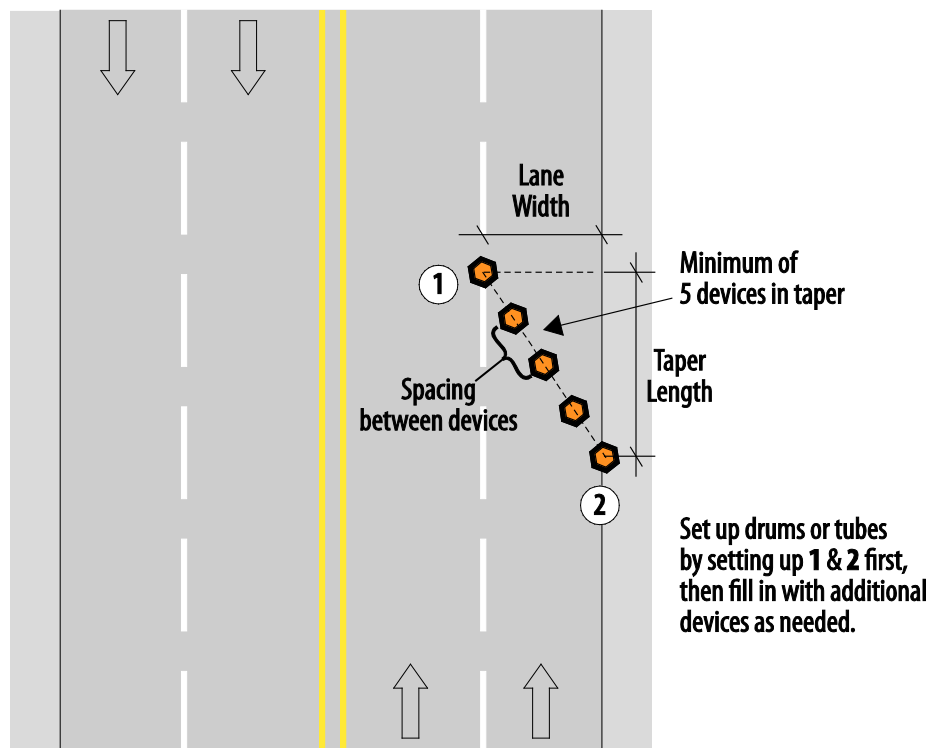


Figure 6.6: Taper Layout

The appropriate positioning of traffic control devices varies with the regulatory speed limit for the roadway and the traffic control devices being used. Some distances shown for 50 km/h and 60 km/h speed limits in Table B are from the BC Traffic Control Manual for Work on Roadways (1999).

TABLE B – DEVICE SPACING LENGTHS									
Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

Table B Notes	
Regular Posted Speed Limit	Device spacing and taper lengths should be to the regular posted speed limit.
A = Construction Sign Spacing	Recommended minimum spacing for signage. Spacing may be adjusted to accommodate site constraints and/or where high numbers of access points exist. Signs within the work zone should be spaced on the basis of the pre-construction, regulatory speed limit. <u>Maximum Construction Sign Spacing:</u> • Spacing for the sign closest to the work activity area should remain as close as possible to Distance A. • For other construction signs in the advance warning area, spacing may be adjusted up to a maximum distance of 2 x Distance A. • Signs that include a distance measurement (e.g., Construction Ahead Next 2 km) should be placed in accordance with the distance cited on the sign or tab.

B = Buffer Space	The longitudinal distance which provides a margin of safety for both the driver and the workers. It is important that the buffer space be free of equipment, workers, material and vehicles. A buffer vehicle with a crash attenuator may be located within the buffer space if there are space constraints. The buffer space is measured is from the end of the taper to the work activity area unless there is a buffer vehicle, in which case it is measured to the back of the buffer vehicle. Typically used on high-speed roadways but should be considered for all works where space allows. Distance is based on the braking distance on level ground for wet pavement as defined in the Transportation Association of Canada's Geometric Design Guide for Canadian Roads (1999).
R = Roll-Ahead Buffer Distance	The longitudinal distance measured from the front of the buffer vehicle to the work activity area. It provides a margin of safety in case of impact. Distance is based on the Minnesota Manual on Uniform Traffic Control Devices (2011).
C = Channelizing Device Spacing for Tapers	Maximum spacing between channelizing devices for tapers.
D = Channelizing Device Spacing on Curves and Tangents	Maximum spacing between channelizing devices on curves and tangents. Tighter spacing is acceptable especially on curves where device loss can impact directional continuity. Maximum device spacing is calculated as $0.4 \times \text{speed}$ (in km/h), rounded to the nearest 10 m.

6.7 Device Installation and Removal

Device installation and removal must be carried out only by individuals who have suitable traffic management work experience or training. If flagging is required during installation and removal, then TCPs will need to be present to direct traffic.

Below is the Ministry's preferred approach for installing and removing temporary traffic control devices. The goal is to ensure that devices are installed efficiently, safely, and in the correct location with the correct spacing. There may be other methods which will also achieve this goal.

6.7.1 General Guidelines

1. It is important to develop the Traffic Control Plan before setting up signs and devices so that the appropriate distance is implemented between the work zone and the traffic control sign or device furthest upstream.
2. Flashing arrow boards, Traffic Control Persons, and/or flashing vehicle lights should be used during device installation and removal as required. Drivers may not expect to encounter workers on the roadway until devices are installed (see [Section 4.6: Flashing Arrow Boards \(FABs\)](#)).
3. More than one work vehicle may be used to install and remove devices.
4. When signs or channelizing devices are to be installed and removed several times during the work operation, the device locations may be marked so that the installation can be repeated quickly and with proper placement assured.
5. When not required, the devices should be stored off the roadway or out of sight.
6. Traffic Control Person Ahead C-001 signs shall remain in place until Traffic Control Persons are not actively controlling traffic.
7. Travelling against the flow of traffic is only permitted within a closed lane.
8. When setting up and removing devices, there is typically no speed reduction so the original posted speed limit of the roadway determines the need for shadow vehicles and crash attenuators.

For further guidance on the use of shadow vehicles when conducting traffic control device placement and/or removal, see [Section 10.3: Intermittently-Moving Work – Two-Lane, Two-Way Roadway](#) and [Section 10.5: Intermittently-Moving Work – Multilane Undivided or Divided Roadway](#).

6.7.2 Installation Considerations

1. If traffic speed is ≥ 70 km/h, a shadow vehicle with a 360-degree flashing light and 4-way flashers is recommended when installing traffic control devices. Position the shadow vehicle between the worker and the approaching traffic.
2. If the signs are not required immediately, turn them so that they are not visible to traffic until they are needed.
3. Cover any existing or conflicting signs on the roadway when the temporary signs are in effect.
4. A Traffic Control Person may be required for stopping traffic while channelizing devices are being placed around the work activity.
5. Ensure that signs and channelizing devices are visible to oncoming traffic. Adjust the signs as required.
6. Work may commence once all temporary traffic control devices are in place.

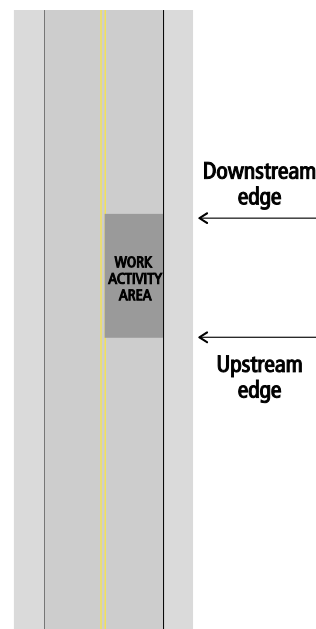
6.7.3 Removal Considerations

1. If the speed is ≥ 70 km/h, a shadow vehicle with a 360-degree flashing light and 4-way flashers is recommended when removing traffic control devices. Position the shadow vehicle between the worker and the approaching traffic.
2. Uncover any previously covered signs that are required for the two-way traffic.
3. In detour situations where vehicles have been directed to use alternative routes, remove upstream signage first to ensure that traffic has not been directed to an alternative route from which the signs have been partially removed.

6.7.4 Two-Lane, Two-Way Roadways

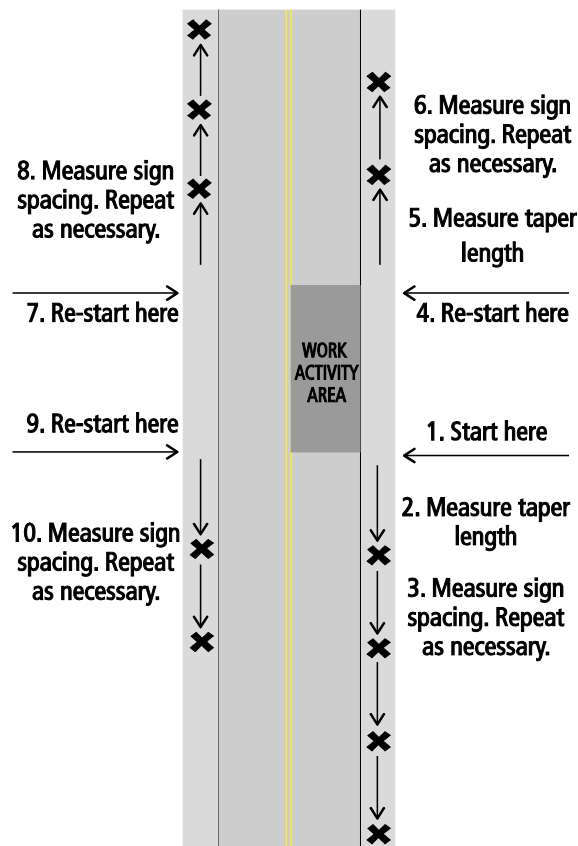
Step 1: Planning the Setup

1. Using the Traffic Control Plan, define the edges of the work activity area.
2. Mark the upstream and downstream edge of the work activity area.



Step 2: Determining the Layout

1. Mark sign and channelizing device placement in accordance with the Traffic Control Plan or Tables A and B (see [Section 6.6](#) or [Appendix F](#)).
 - Measurements may be made using a variety of methods (e.g., Distance Measuring Instrument, GPS, or manual measuring).
 - Marking may be done at the edge of pavement with survey stakes, paint, or other temporary markers.
 - Measure outward starting from the edge of the work activity area.
2. Follow sub-steps 1 through 10 as shown in the diagram on the right.

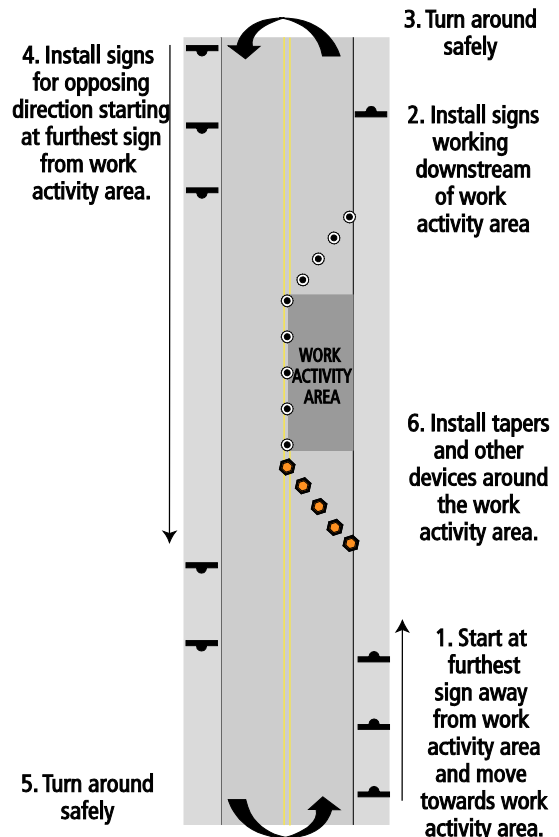


Step 3: Order of Installation

Traffic control devices should be placed in the order that drivers will encounter them, beginning with the sign or device furthest upstream from the work activity area and continuing forward. Typically, channelizing devices forming lane shifts, merges, detours, and other traffic pattern changes are established after the signs identifying the work zone are in place.

Using the diagram on the right:

1. Start at the furthest sign upstream and move towards the work activity area, placing signs in the locations previously marked and keeping as far to the right as possible.
 - Cover any existing conflicting signs.
2. Place signs for the termination area.
3. Pull off the road in an appropriate area to turn around and travel in the opposite direction.
4. Complete sign placement in the opposite direction, keeping as far to the right as possible.
 - Cover any existing conflicting signs.
5. Pull off the road in an appropriate area to turn around and travel in the opposite direction.
6. Place tapers and delineation around the work activity area.



Step 4: Planning the Removal

As soon as the traffic control devices are no longer needed, they should be removed. During the removal process, Traffic Control Persons, flashing arrow boards, shadow vehicles, and/or flashing vehicle lights should be used.

Signs and devices are removed in the opposite order of which they were installed. Traffic Control Person Ahead C-001 signs should remain in place until Traffic Control Persons are no longer needed.

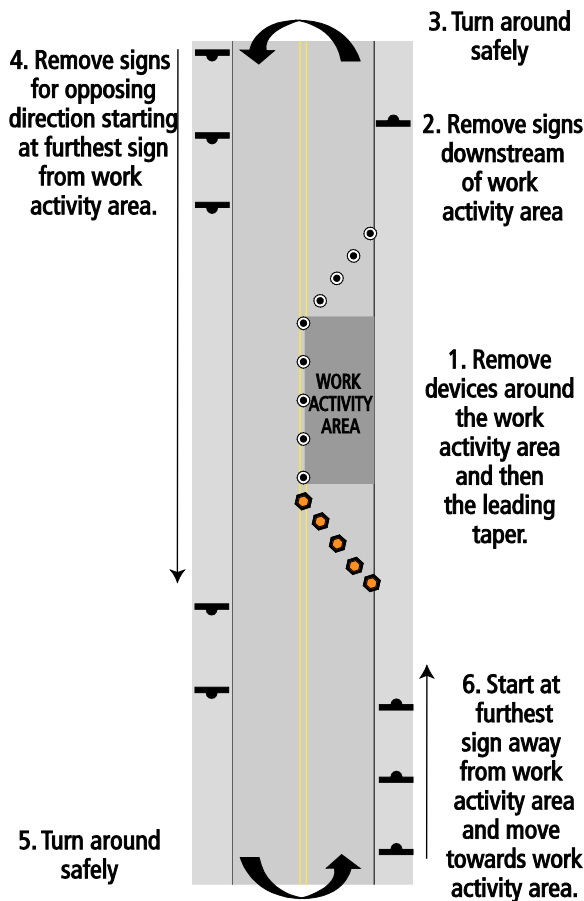
No worker should ride outside on the rear of a reversing vehicle. If special circumstances allow for this practice, it is mandatory to follow Section 16.31 in WorkSafeBC's Occupational Health and Safety Regulation (Rider Restriction).

Step 5: Order of Removal

Ensure that work operations have ceased, and that all equipment and workers are off the roadway.

Using the diagram on the right:

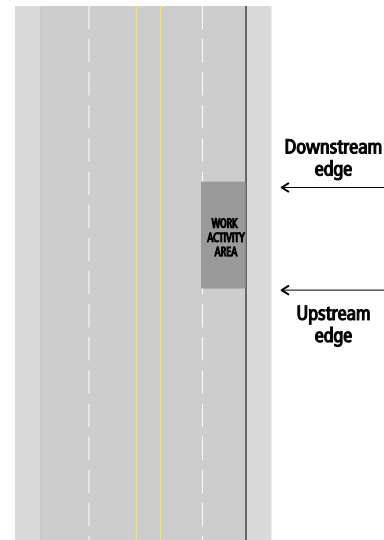
1. First remove channelizing devices on the travelled roadway. Do not remove advance warning signs until all other devices are removed.
 - Use a TCP to stop traffic, if required, and pull channelizing devices off the roadway, starting with those closest to the work on the downstream side and then moving to the upstream side. If necessary, place channelizing devices on the shoulder for storage and later pick-up.
2. Starting at the nearest sign downstream of the work activity area, remove or turn signs not in use, keeping as far to the right as possible.
 - Uncover any previously covered signs that are required for re-establishing normal traffic operations.
3. Pull off the road in an appropriate area to turn around and travel in the opposite direction.
4. Remove devices and remove or turn signs not in use in the opposite direction, keeping as far to the right as possible.
 - Uncover any previously covered signs that are required for re-establishing normal traffic operations.
5. Pull off the road in an appropriate area to turn around and travel in the opposite direction.
6. Remove the advance warning signs upstream of the work activity area.



6.7.5 Multilane Roadways

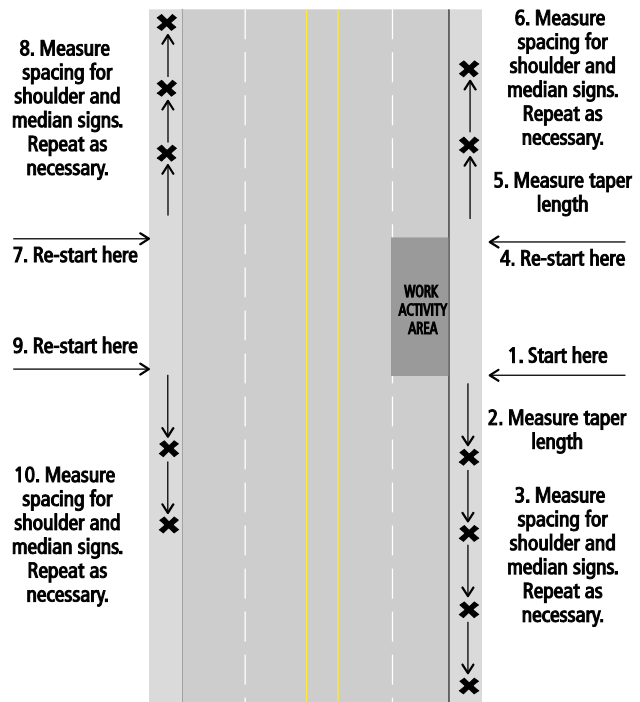
Step 1: Planning the Setup

1. Using the Traffic Control Plan, define the edges of the work activity area.
2. Mark the upstream and downstream edge of the work activity area.



Step 2: Determining the Layout

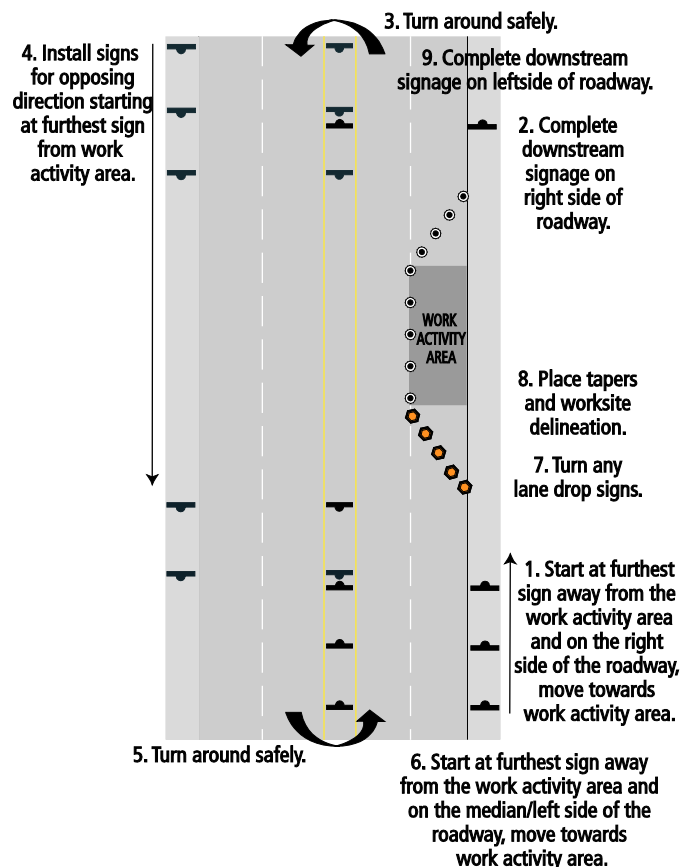
1. Mark sign and channelizing device placement in accordance with the Traffic Control Plan or Tables A and B (see [Section 6.6](#) or [Appendix F](#)).
 - Measurements may be made using a variety of methods (e.g., Distance Measuring Instrument, GPS, or manual measuring).
 - Measurements may be made on one side of the road for signs on both sides of the roadway.
 - Marking may be done at the edge of pavement with survey stakes, paint, or other temporary markers.
2. Follow sub-steps 1 through 10 as shown in the diagram on the right.



Traffic control devices should be placed in the order that drivers will encounter them, beginning with the sign or device farthest upstream from the work activity area and continuing towards the work area. Typically, channelizing devices forming lane shifts, merges, detours, and other traffic pattern changes are established after the signs identifying the work zone are in place.

Start upstream from the work area, on the right shoulder, and in the same direction as the flow of traffic, place signs in the previously marked locations. Keep as far off the travel lane as possible.

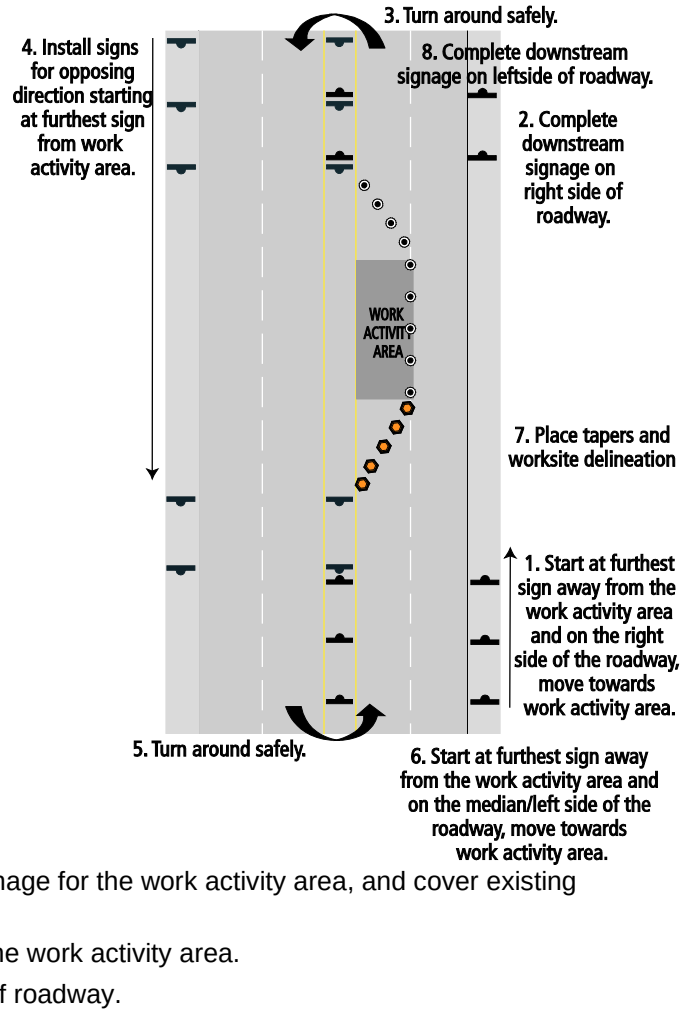
1. Place the advance warning signs on the right shoulder, starting in advance of the work activity area.
 - When placing lane drop signs, keep them turned away from the view of traffic.
 - Cover any existing conflicting signs.
2. Place signs in the termination area.
 - Cover any existing conflicting signs.
3. Turn around using the next appropriate location downstream of the work area to travel in the opposite direction.
4. If signs and devices are required in the opposing direction, repeat items 1 and 2 in the opposite direction, starting in advance of the work activity area.
5. Travel to the next appropriate location upstream of the work area and in advance of the warning signs, and turn around.



6. On the left lane shoulder, set up all required signs for the work activity area, and cover any existing conflicting signs. Repeat sub-steps 3 and 4 as required.
7. Return to the right shoulder and turn the lane drop or directional signage.
8. Place tapers and delineation around the work activity area.
9. Install downstream signs on left side of roadway.

For a left lane closure:

1. Place the advance warning signs on the right shoulder, starting in advance of the work activity area.
 - Cover any existing conflicting signs.
2. Place the signs in the termination area.
 - Cover any existing conflicting signs.
3. Turn around using the next appropriate location downstream of the work area to travel in the opposite direction.
4. If signage and devices are required in the opposing direction, repeat items 1 and 2 in the opposite direction, starting in advance of the work activity area.
5. Travel to the next appropriate location upstream of the work area and in advance of the warning signage, and turn around.



6. On the median, set up all required signage for the work activity area, and cover existing conflicting signs.
7. Place tapers and delineation around the work activity area.
8. Install downstream signs on left side of roadway.

Step 4: Planning the Removal

As soon as the traffic control devices are no longer needed, they should be removed. During the removal process, Traffic Control Persons, flashing arrow boards, shadow vehicles, and/or flashing vehicle lights should be used.

Signs and devices are removed in the opposite order of which they were installed. Traffic Control Person Ahead C-001 signs should remain in place until Traffic Control Persons are no longer needed.

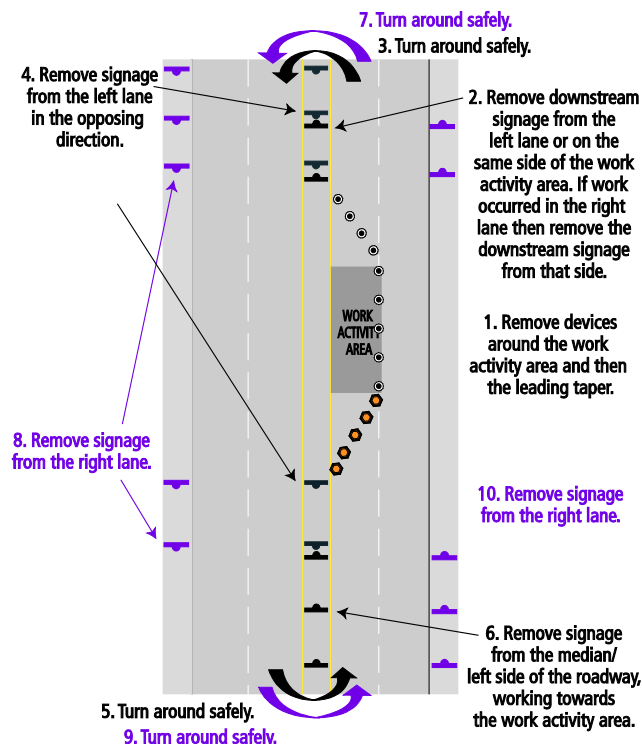
No worker should ride outside on the rear of a reversing vehicle. If special circumstances allow for this practice, it is mandatory to follow WorkSafeBC's Occupational Health and Safety Regulations.

Step 5: Order of Removal

Ensure that work operations have ceased, and that all equipment and workers are off the roadway.

Using the diagram on the right:

1. First remove channelizing devices on the travel lane where the work has occurred. Do not remove advance warning signs until all other devices are removed.
 - Use a TCP to stop traffic, if required, or a buffer vehicle to maintain the closure and direct traffic into the other lane.
 - Pull channelizing devices off the roadway, starting with those closest to the work area on the downstream side and then moving to the upstream side. If necessary, place channelizing devices on the shoulder for storage and later pick-up.
2. Starting downstream of the work activity area, move with the flow of traffic on the same side of the roadway, keeping as far off the travel lane as possible. Pick up or turn signs that are not in use. Uncover any previously covered signs



3. Turn around using an appropriate location downstream of the work area.
4. Moving with the flow of traffic, remove signs and devices in the opposing direction. Remove or turn signs not in use on the median/left shoulder first (if they are set up there), and then remove those not in use on the right shoulder.
5. Turn around using an appropriate location.
6. Working towards the work activity area and moving with the flow of traffic, remove or turn signs not in use on the median/left shoulder. Uncover any previously covered signs.
7. Turn around using an appropriate location downstream of the work area.
8. Moving with the flow of traffic, remove or turn signage not in use on the right shoulder in the opposing direction. Uncover any previously covered signs.
9. Turn around using an appropriate location.
10. Moving with the flow of traffic, remove or turn any remaining signage on the right shoulder. Uncover any previously covered signs.

6.8 Inspection and Maintenance of Traffic Control

Traffic control devices shall be routinely inspected and maintained during both active and inactive work to ensure that they are not missing, and that they are clean, properly positioned, and effective in all weather and light conditions. Inspection and maintenance shall occur on all projects, regardless of size or complexity.

6.8.1 Responsibility for Inspection and Maintenance

Maintenance of traffic control is the responsibility of the Prime Contractor. Once the work zone is installed, it is important to ensure that it functions as intended, and that any subsequent modifications resulting from an inspection process are documented, implemented and maintained.

For each project, an individual shall be assigned supervisory responsibility for establishing and maintaining traffic control. On construction projects, the Prime Contractor shall designate a specific person (or persons) to assume these responsibilities. Possible candidates for this role include:

- Site Supervisor/Foreman/Superintendent
- Traffic Control Manager
- Traffic Control Supervisor
- Traffic Control Person

Lines of communication and responsibility should be clearly established between individuals in charge of routine maintenance of traffic control devices and those with greater authority so that, when necessary, problems can be brought promptly to the attention of personnel or authorities who are in a position to respond immediately.

6.8.2 Elements of Inspection and Maintenance

Inspection and maintenance of traffic control should include:

- devices are installed as per the traffic control plan
- review sign and device placement, condition, cleanliness, height, offset
- review of the functionality of the traffic control layouts during day and night and in all weather conditions
- all hazards within the work zone are addressed and mitigated
- traffic control devices no longer need are covered or removed

Maintenance, servicing, or replacement of temporary traffic control devices and equipment may be required due to:

- traffic incidents
- damage caused by construction activities
- dead/low flashing light batteries or burned out bulbs
- low fuel levels for electrical generators
- weather damage, wear and tear
- dirt on devices
- vandalism or theft

6.8.3 Field Inspection Frequency

The frequency of field inspections should be based on the following:

- project size and duration
- nature of the work activity
- complexity of traffic control
- frequency at which damage occurs
- number of problems observed in previous inspections

Traffic control that is required and left in place overnight should be inspected during hours of darkness.

Inspections should be continued day and night and through holidays, weekends, and other times when work is not active.

6.9 Work Duration

Work duration is the length of time work occupies one or multiple locations. It is a major factor in determining the number and types of temporary traffic control devices to be used in a work activity area.

There are five types of work based on work duration:

1. **Emergent work** is work that occurs when an unanticipated situation or event is discovered during travel or work. It can be carried out in less than 5 minutes. This does not include emergencies, which are situations which require immediate response to save lives or prevent serious injury using whatever resources are available
2. **Brief-duration work** is generally planned work that requires a quick response and can be carried out in less than 15 minutes.
3. **Mobile work** is continuously slow-moving work or intermittently-moving work, with short stops of 30 minutes or less. The traffic control devices for mobile work are typically vehicle-mounted.
4. **Short-duration work** occurs when a work operation occupies one location for more than 15 minutes during a single daylight period.
5. **Long-duration work** is planned construction work that occupies one location for more than one daylight period. Night work lasting more than 15 minutes is also considered long-duration work.

6.10 Risk Evaluation for Emergent and Brief-Duration Work

Emergent and brief-duration work may have limited advance warning because of the type of work being done and the limited duration of that work.

Layouts specific to emergent work and brief-duration work are provided in:

- [*Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways*](#)
- [*Section 8: Traffic Control Layouts – Multilane Undivided Roadways*](#)
- [*Section 9: Traffic Control Layouts – Multilane Divided Roadways*](#)

Other layouts such as those for short-duration and long-duration work may also be used if appropriate.

A **Risk Evaluation** shall be performed using [*Table C – Risk Evaluation for Emergent or Brief-Duration*](#) (see next page or [*Appendix F*](#)) to determine if emergent or brief-duration work is permissible. If emergent or brief-duration work is not permissible, other layouts should be considered to complete the work.

TABLE C – RISK EVALUATION FOR EMERGENT OR BRIEF-DURATION WORK

Risk Evaluation Category	Risk Criteria	Criteria Met?										
1. Work Duration	Can the work be completed in 5 minutes or less?	Yes / No										
2. Sight Distance Distance from parked location to furthest point that can be seen on the road.	For the posted speed limit, is the minimum sight distance met? <table><tr><th>Speed Limit (km/h)</th><th>50 - 70</th><th>80 - 90</th><th>100 - 110</th><th>120</th></tr><tr><th>Minimum Sight Distance (m)</th><td>100</td><td>170</td><td>250</td><td>300</td></tr></table>	Speed Limit (km/h)	50 - 70	80 - 90	100 - 110	120	Minimum Sight Distance (m)	100	170	250	300	Yes / No
Speed Limit (km/h)	50 - 70	80 - 90	100 - 110	120								
Minimum Sight Distance (m)	100	170	250	300								
3. Traffic Volume	Is the traffic volume in lanes that will be entered by workers estimated to be less than 5 vehicles per lane per minute?	Yes / No										
4. Environmental Conditions	Is visibility unrestricted (no fog, blowing snow, etc.) and are road conditions not slippery?	Yes / No										

RISK EVALUATION REVIEW

The Risk Evaluation has three possible outcomes:

- 1. Answers to all risk criteria questions are Yes:** Traffic control devices may be installed in accordance with the appropriate Emergent Work traffic control layout.
- 2. Answers to one or two risk criteria questions are No:** Traffic control devices may be installed in accordance with the appropriate Brief-Duration Work traffic control layout.
- 3. Answers to three or more risk criteria questions are No:** Additional traffic control measures are required beyond those described and illustrated for Emergent and Brief-Duration Work. The standard layout(s) for the appropriate short-duration, long-duration, or mobile work should be applied.

6.11 Using Sections 7 to 19

The traffic control layouts in Sections 7 to 19 are generally the minimum required. These layouts do not represent every work activity that could occur on the roadway. Standards may be modified using expert judgment. The principles outlined in this manual shall always be followed.

6.11.1 Information in Sections 7 to 19

Sections 7 to 19 provide the following information about traffic control layouts:

- basic traffic control principles, situations, and methods
- prescribed traffic control standards for work zones
- guidance and options related to the prescribed standards

Each section begins with a general description which applies to the layouts.

6.11.2 Application of Sections 7 to 19

1. Descriptions on the Left

The descriptions on the left provide the layout information:

Purpose: Intended use of the layout.

Standard: Uses words such as **shall, required, must** - describes a mandatory condition. For provincial highways, if a mandatory condition cannot be met, contact [Traffic and Highway Safety Engineering - Policy and Standards](#) for direction.

Guidance: Uses words such as **should, recommended** - describes a recommended, but not mandatory, practice. Decisions contrary to guidance are required to be documented (example of “should” documentation can be found on the next page).

The primary information to be documented by the Prime Contractor include:

- What is the decision?
- When was it made?
- Why was it made?
- Who made it?
- Other information may be included and may vary based on the scope of the change(s).

Options: Uses words such as **may** - describes a permissive condition. It is optional and carries no requirement or recommendation.

“SHOULD” DOCUMENTATION

The following is an example of written documentation for not following a “should” condition.

Scenario

A Contractor was completing a survey on the shoulder for only a couple hours. The Contractor requested permission to install construction signs on only one side of the road (shoulder) even though median barrier and/or depressed median was available at the location to place signs. On multilane highways where median barrier exists, Ministry guidelines state that signs should be placed.

The Contractor’s justification was they were only going to be out in the field for a single day, working only on the shoulder and right-of-way, during the daytime, for a length of a couple (2-3) hours. The Contractor was of the opinion that installation of the signs themselves (on the median) increases worker exposure and road user exposure to risks. That in itself would not have been enough justification for the Ministry to accept their traffic management plan proposal. However, combined with the type of work, location, and duration, for what amounted to a very short period of time, especially when the work did not impact available lanes for vehicle movements, the Ministry agreed and accepted their proposal.

Documentation

The Contractor provided the following details in their “should” documentation:

- 1) Summary of proposal/request
- 2) Project name, location and date of proposed work
- 3) Overview of work to be completed and explanation of scenario
- 4) Justification of request including the following details:
 - Survey work
 - Shoulder work only
 - One-time occurrence
 - Day time work
 - Only 2-3 hours on shoulder
 - Installing signs on the median has risks in itself to both workers and road users during the period of time signs being installed and removed. Lane travel was not impacted by Contractor’s survey work taking place on shoulder, and Ministry right-of-way.
- 5) Contact person

2. Diagrams on the Right

The diagrams on the right show all standards associated to the traffic control layout. There will be information in the diagram that is not described.

6.11.3 General Instructions for Using the Layouts in Sections 7 to 19

1. The diagrams are not drawn to scale. [Table A – Taper Lengths](#) and [Table B – Device Spacing Lengths](#) shall be used to determine appropriate spacing dimensions.
2. Most of the layouts may be used for both day-time and night-time work.
3. Lighting locations are not shown in the diagrams but Traffic Control Persons shall be illuminated with overhead lighting at night.
4. To determine the appropriate sign size and lateral placement for the roadway, see [Section 4.2: Traffic Signs](#).
5. Speeds on regulatory signs are shown as “XX” to allow for various speeds.
6. The layouts show only one set of advance signage in each direction. See [Section 6.4 Queue Management](#) for more information.
7. Some road features, sight lines, intersections, and other conditions may make it necessary to adjust sign spacing. In these cases, signs should be placed in the most reasonable location that provides good visibility for drivers and enough time for them to make appropriate adjustments.
8. Buffer spaces may not be identified in all the layouts. Where space allows and it is considered desirable, a buffer space should be included, even when it is not indicated on the typical layout or in the Traffic Control Plan.

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PART B – TRAFFIC CONTROL

Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways

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PART B – TRAFFIC CONTROL

Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		Flashing Arrow Board (FAB)
	Shadow Vehicle #2		Flashing Arrow Board (FAB) in caution mode
	Buffer Vehicle		Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS									
Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS									
Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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7.1 General Information – Two-Lane, Two-Way Roadways

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign shall be used.
- For long-duration work, a Construction Ahead C-018-1A sign shall be used.
- Where the speed limit is ≥ 70 km/h, a buffer space shall be used.
- All work, buffer, and shadow vehicles shall be equipped with a 360-degree flashing light and 4-way flashers.

Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.

Options:

- Where cyclists are regularly observed using the shoulder, a Share the Road W-132-1 sign may be used with an appropriate cycling hazard tab (see [Section 18: Traffic Control Layouts – Bicycle Lanes](#) for additional information).
- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.
- In low speed (≤ 60 km/h) urban areas (within municipal boundaries), customization of traffic control layouts, including closer device spacing and shorter taper lengths, may be necessary to maintain access and mobility. In these cases, document why adjustments are being made.

7.2 Typical Construction Speed Zone Signing – Two-Lane, Two-Way Roadway

Purpose:

Construction speed limits are regulatory speeds established in Construction Speed Zones within long-term construction and maintenance project areas where there are continuous hazards for motorists or where workers are in close proximity to active travel lanes.

Construction Speed Zones should be applied prudently because **overuse reduces effectiveness**. Drivers should be able to perceive the need to reduce speed.

Standard:

- Conflicting speed limit signs within the Construction Speed Zone shall be covered or removed.
- The same Construction Speed Zone signing is required in opposing directions.

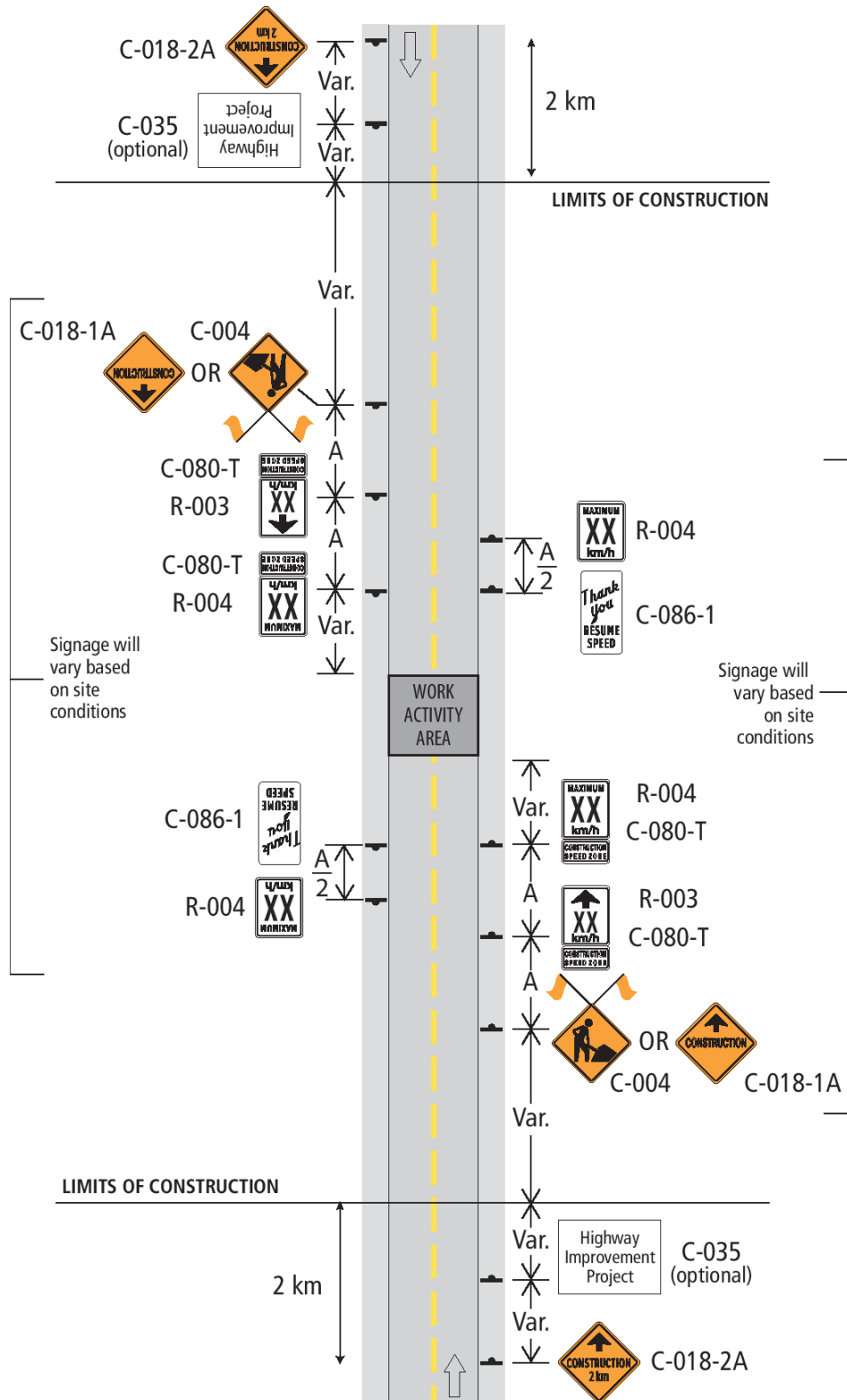
Guidance:

- The Maximum Speed R-004 sign with a Construction Speed Zone C-080-T distance tab should be positioned at the beginning of the active work area.
- Construction speed limit signs should be covered or removed when no work is occurring and other hazards are not present.
- It is important to record when construction speed limits are installed and covered/removed.
- See also [Section 2.4: Management of Speed](#) for information on using Construction Speed Zones.

Options:

- Use of the Construction Project C-035 sign is project-dependent. It is typically used only for large projects. See [Appendix B: Standard Construction Signs](#) for information on using this sign.
- If secondary signs are applied, they should be installed on the left side of the highway.
- The positioning of secondary signs depends on the space available:
 - If the median is more than 2 metres wide, secondary signs may be placed in the median.
 - If the median is less than 2 metres wide, secondary signs may be placed on the opposite shoulder.

Figure 7.2: Typical Construction Speed Zone Signing – Two-Lane, Two-Way Roadway



7.3 Emergent Work (<5 Minutes) – Two-Lane, Two-Way Roadway

Purpose:

Emergent work involves very short-duration activities for which setting up and taking down temporary traffic control devices may take more time than the actual work, and expose workers to greater risk. Each entry onto the travelled portion of the roadway lasts less than 1 minute, and the total time to complete the task is less than 5 minutes.

This does not include emergencies, which are situations which require immediate response to save lives or prevent serious injury using whatever resources are available.

It may occur when an unanticipated situation or event—one that presents a risk to the travelling public—is discovered during travel or work activities. It can be considered unplanned, urgent maintenance work. A Traffic Control Plan is not required for emergent work.

Emergent work may include the removal of debris from the roadway (e.g., tree limbs, lost cargo, dead animals, tire and other vehicle debris, and the manual removal of rock). Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A risk evaluation is required to determine whether or not the work activity is considered emergent (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The entire work activity shall be completed in less than 5 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

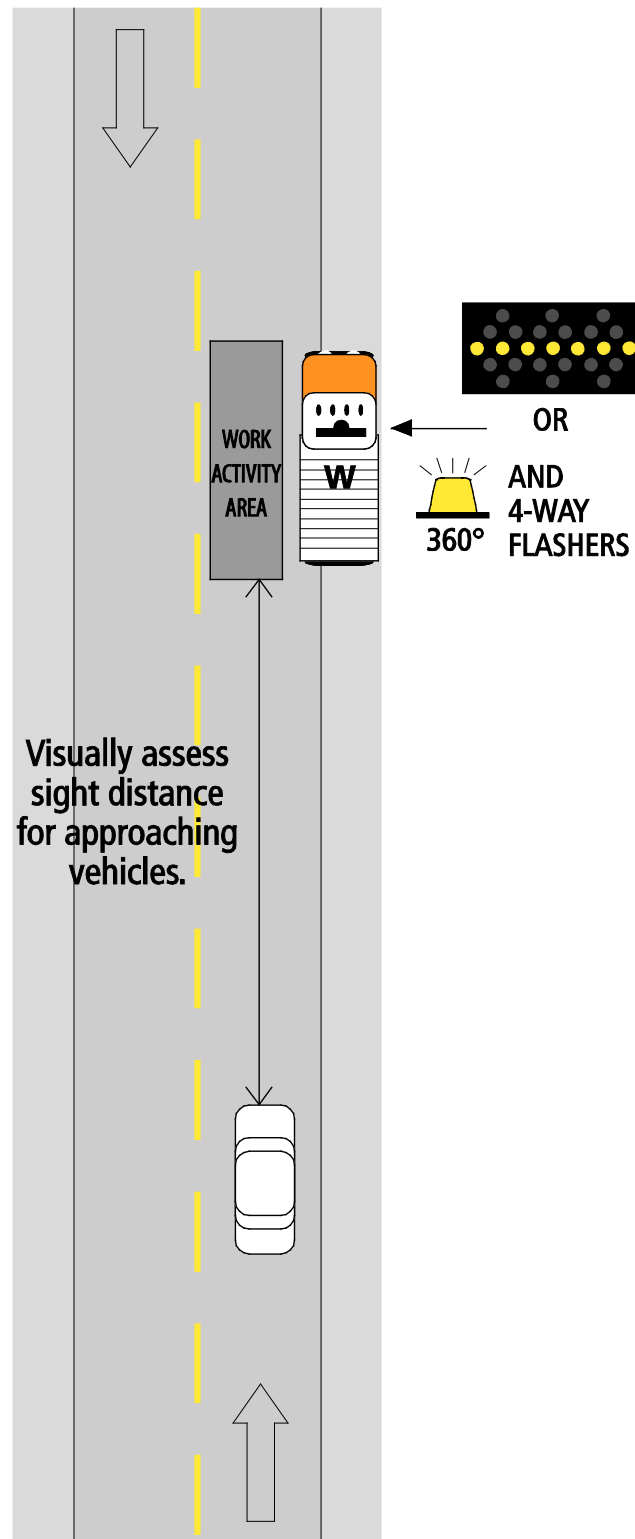
Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and work being performed.

Options:

- None at this time.

Figure 7.3: Emergent Work – Two-Lane, Two-Way Roadway



7.4 Brief-Duration Work (<15 Minutes) – Two-Lane, Two-Way Roadway

Purpose:

Brief-duration work is generally planned, although the exact location or extent of the work required may not be fully known. It requires less than 15 minutes to complete.

Brief-duration work may include:

- locating drainage structures or other roadway features or components
- cleanup of material spills and removing debris from the roadway (e.g., small fallen trees, larger tree limbs, crash debris, etc.)
- quick repairs intended as a partial or temporary response to damage or failure

If the work is expected to last more than 15 minutes, additional resources will be needed to implement a short-duration work zone. The work should be delayed until the appropriate work zone equipment and devices are available.

Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A Crew Working Ahead C-004 is required in advance of the work.
- A risk evaluation is required to determine whether or not the work activity is considered brief (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The work activity shall be completed in less than 15 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and the work being performed.

Options:

- None at this time.

7.5 Work on Shoulder – Short and Long Duration

Purpose:

Stationary work on the shoulder takes place outside the travel lanes but occupies part or all of the shoulder area.

If shoulder work encroaches into a travel lane, a full lane closure may have to be implemented.

Standard:

- When work is in progress and workers are present, a flashing arrow board (FAB) in caution mode is required in the taper or immediately in advance of the work area.
- Barricades are required at each end of the work activity area for long-duration work.

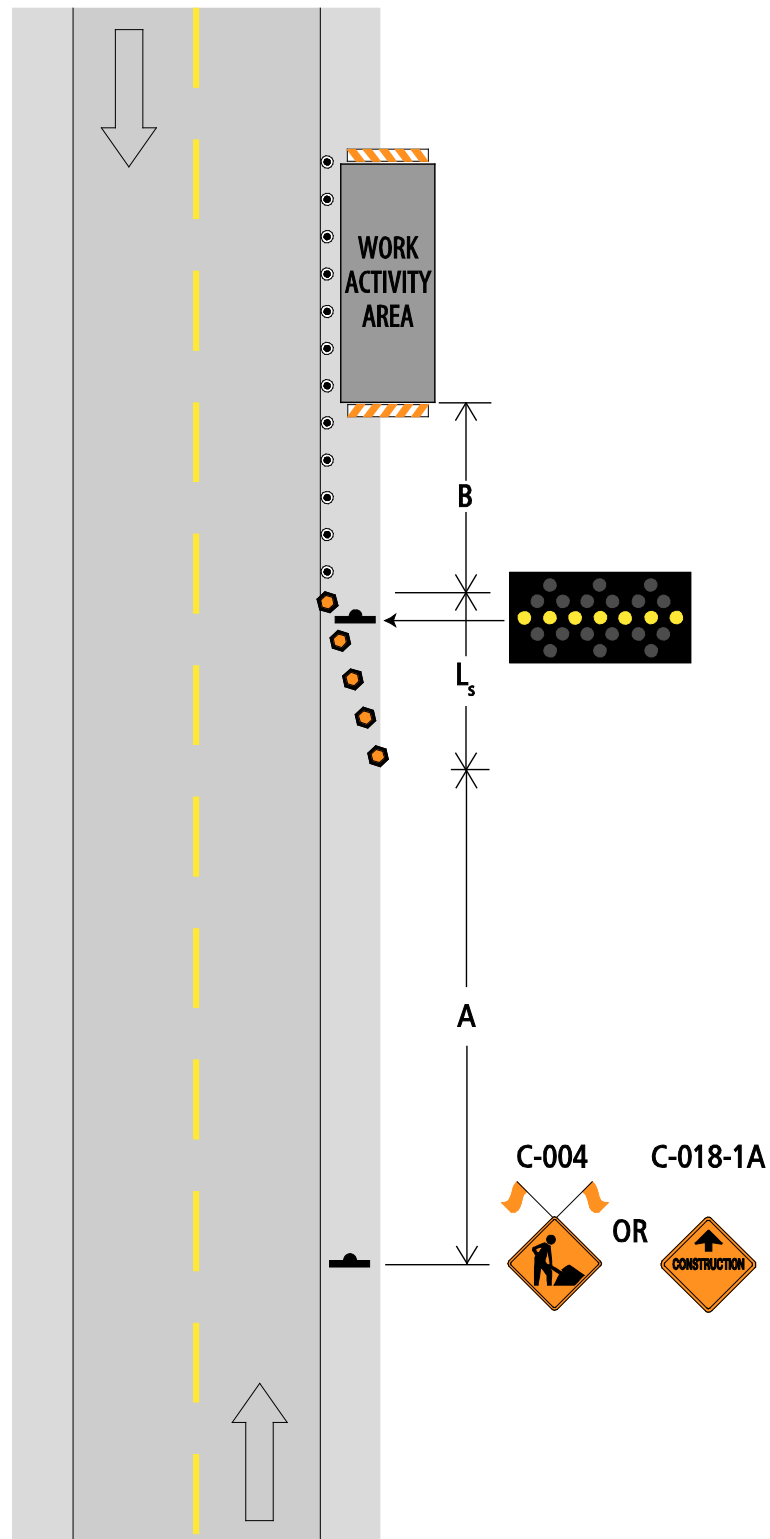
Guidance:

- When work is not in progress but the work area has not been cleared, care should be taken to isolate it from the travelled lane.

Options:

- Advance warning signs may be installed in the opposing direction of travel.
- If the speed limit is ≤ 60 km/h, or there is insufficient room, tubular markers may replace drums for the taper.
- The channelizing devices used alongside the work area may be tubular markers or cones.
- Advance warning signs may be omitted for short-duration work if a shadow vehicle displays a vehicle-mounted dynamic message sign (DMS) or flashing arrow board (FAB) in caution mode.

Figure 7.5: Work on Shoulder – Short and Long Duration



7.6 Work in Parking Lane – Urban Area

Purpose:

This layout is used where a parking lane is closed for construction or maintenance activities.

Standard:

- Advance warning signs shall not be obscured by vehicles or other devices.
- If the parking lane is normally open to vehicle travel at various times of day (such as rush hour) and closed to vehicle travel during other times of the day, the lane shall be considered a travel lane, not a parking lane, and a lane closure shall be implemented.

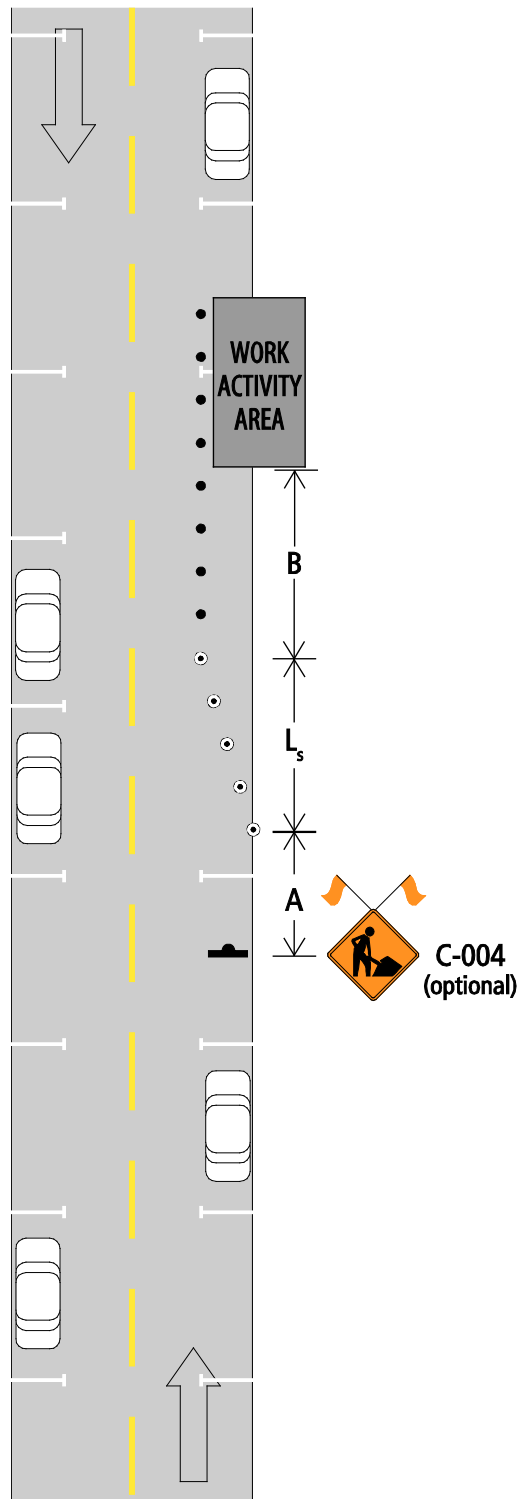
Guidance:

- The closed parking area should be delineated with cones or tubular markers.
- Advance notice of the parking restriction should be installed to ensure an unoccupied work activity area, and may include:
 - covering parking meters;
 - installing no parking signs; and/or
 - using cones to cordon off the area.

Options:

- The Crew Working Ahead C-004 sign may be used within the parking lane if space allows, or placed on the sidewalk as long as it does not impede pedestrians.
- A work vehicle may be parked in advance of the work activity area with a flashing arrow board (FAB).

Figure 7.6: Work in Parking Lane – Urban Area



7.7 Roadside Work – Encroachment into Travel Lane – Short Duration

Purpose:

This layout shows a typical setup on a low-speed (≤ 60 km/h), low-volume roadway where work encroaches into the travelled portion of the roadway but sufficient space remains for vehicles to pass the works within their own lanes.

A low-volume roadway is one on which the total roadway volume is $<1,000$ vehicles per day. Traffic volumes may be obtained from the local Road Authority.

For higher-speed roadways, the options are to create a lowered Construction Speed Zone or to implement a lane closure.

Standard:

- At least 3 metres of width shall be maintained for each travel lane.
- Single lane alternating setup shall be used if at least 3 metres of width cannot be maintained for each travel lane.

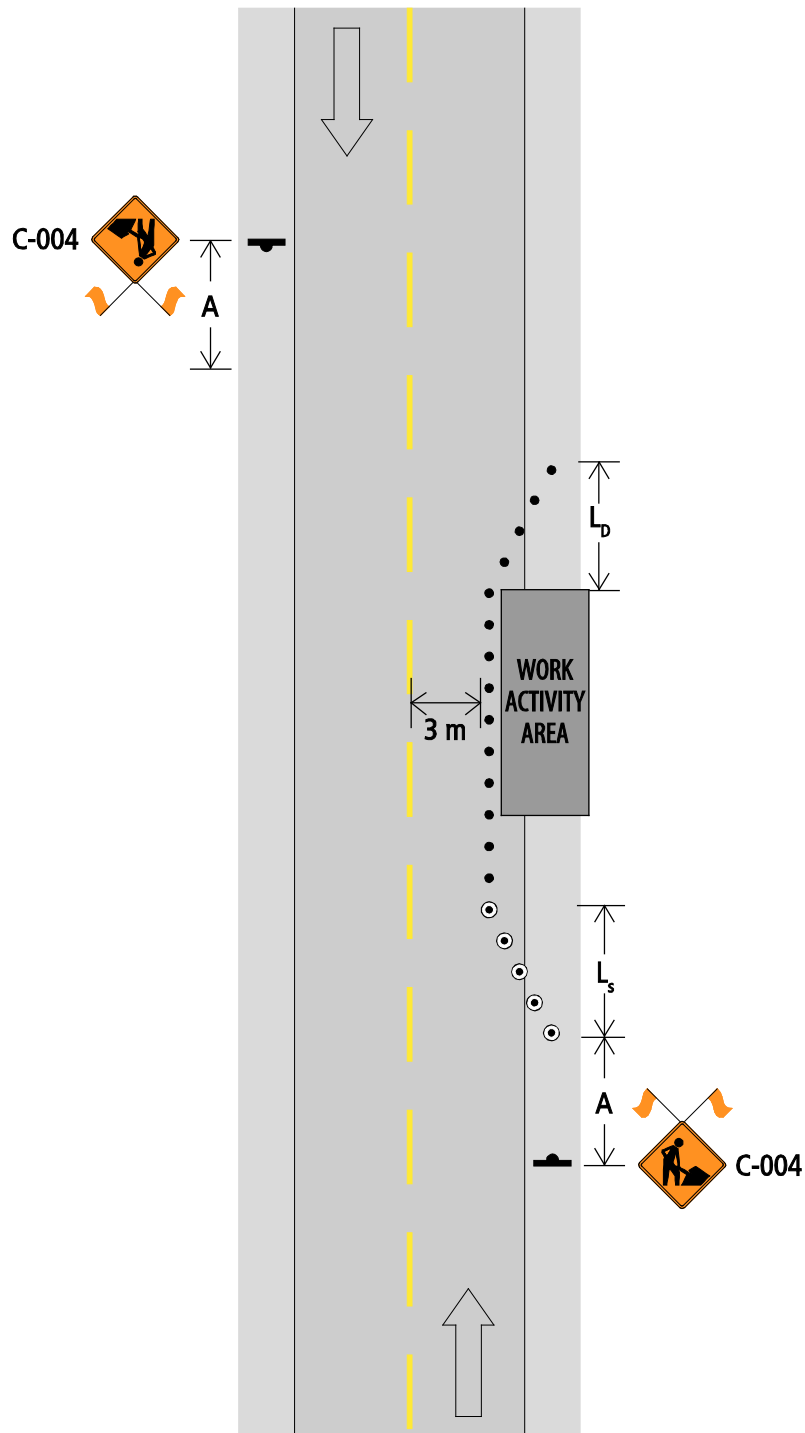
Guidance:

- None at this time.

Options:

- Additional advance warning may be appropriate, such as a Road Narrows C-134 sign between the Crew Working Ahead C-004 sign and the taper.
- The taper and channelizing devices may be omitted if a shadow vehicle with flashing arrow board (FAB) in caution mode is used.
- If the opposite shoulder is suitable for carrying vehicular traffic and at least 3 metres of width can be maintained for each travel lane, the centreline may be shifted by using closely-spaced channelizing devices.

Figure 7.7: Roadside Work – Encroachment into Travel Lane – Short Duration



7.8 Lane Closure with TCPs – Single Lane Alternating – Short and Long Duration

Purpose:

This layout shows the appropriate positions of TCPs when they are directing traffic for a lane closure on a two-lane, two-way roadway.

Standard:

- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.
- When used at night, the TCP station shall be illuminated with overhead lighting.
- Barricades are required at each end of the work activity area for long-duration work.

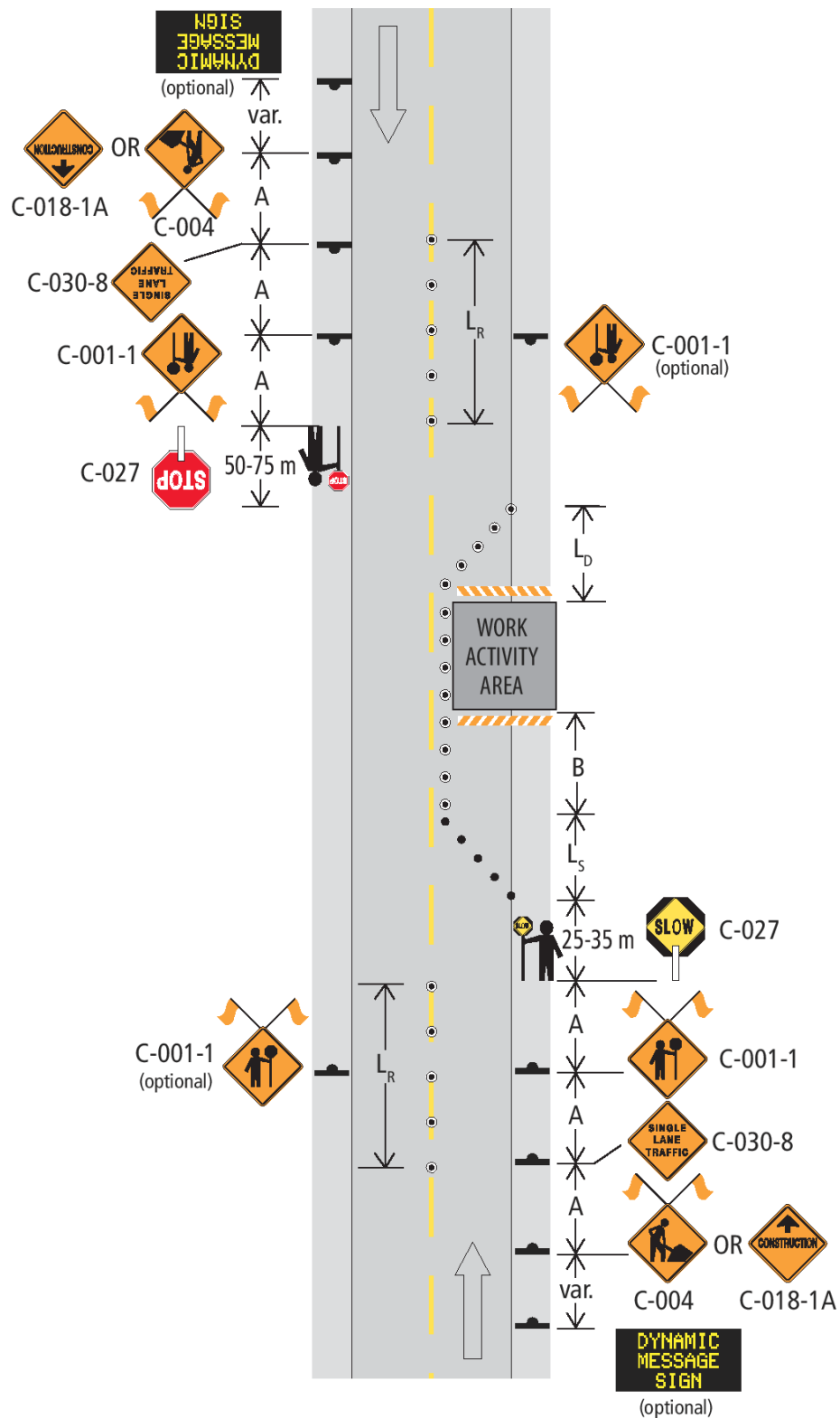
Guidance:

- The distance between the TCP and the Traffic Control Person Ahead C-001-1 sign should not exceed 150 metres.
- Where Crew Working – Maximum Speed C-002-2 signs establish a Temporary Speed Zone, the C-002-2 should be placed upstream of the C-004 or C-018-1A.
 - Thank You Resume Speed C-086-1 signs should be placed across from the Crew Working – Maximum Speed C-002-2 signs in the opposing lanes.

Options:

- An additional Traffic Control Person Ahead C-001-1 sign may be added to the far side of the road to provide queued drivers with increased awareness of the TCP position.
- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- A Prepare to Stop C-029 sign may replace the Single Lane Traffic C-030-8 sign for other applications that require traffic to stop (e.g., equipment crossing road).
- Run-in delineation, L_R may be omitted during period where queues are low, permitting the full release of the queue in each direction.

Figure 7.8: Lane Closure with TCPs – Single Lane Alternating – Short and Long Duration



7.8.1 Lane Closure with TCPs – Single Lane Alternating with Speed Reduction (Construction Speed Limit ≤ 50 km/h)

Purpose:

This layout shows the signs used and the appropriate positions of TCPs when they are directing traffic for a lane closure on a two-lane, two-way roadway. This layout should be used when there is a speed reduction and the construction speed limit is ≤ 50 km/h.

Construction speed limits are regulatory speeds established in Construction Speed Zones within long-term construction and maintenance project areas where there are continuous hazards for motorists or where workers are in close proximity to active travel lanes.

Construction Speed Zones should be applied prudently because **overuse reduces effectiveness**. Drivers should be able to perceive the need to reduce speed.

Standard:

- Conflicting speed limit signs within the Construction Speed Zone shall be covered or removed.
- When used at night, the TCP station shall be illuminated with overhead lighting.
- Barricades are required at each end of the work activity area for long-duration work.

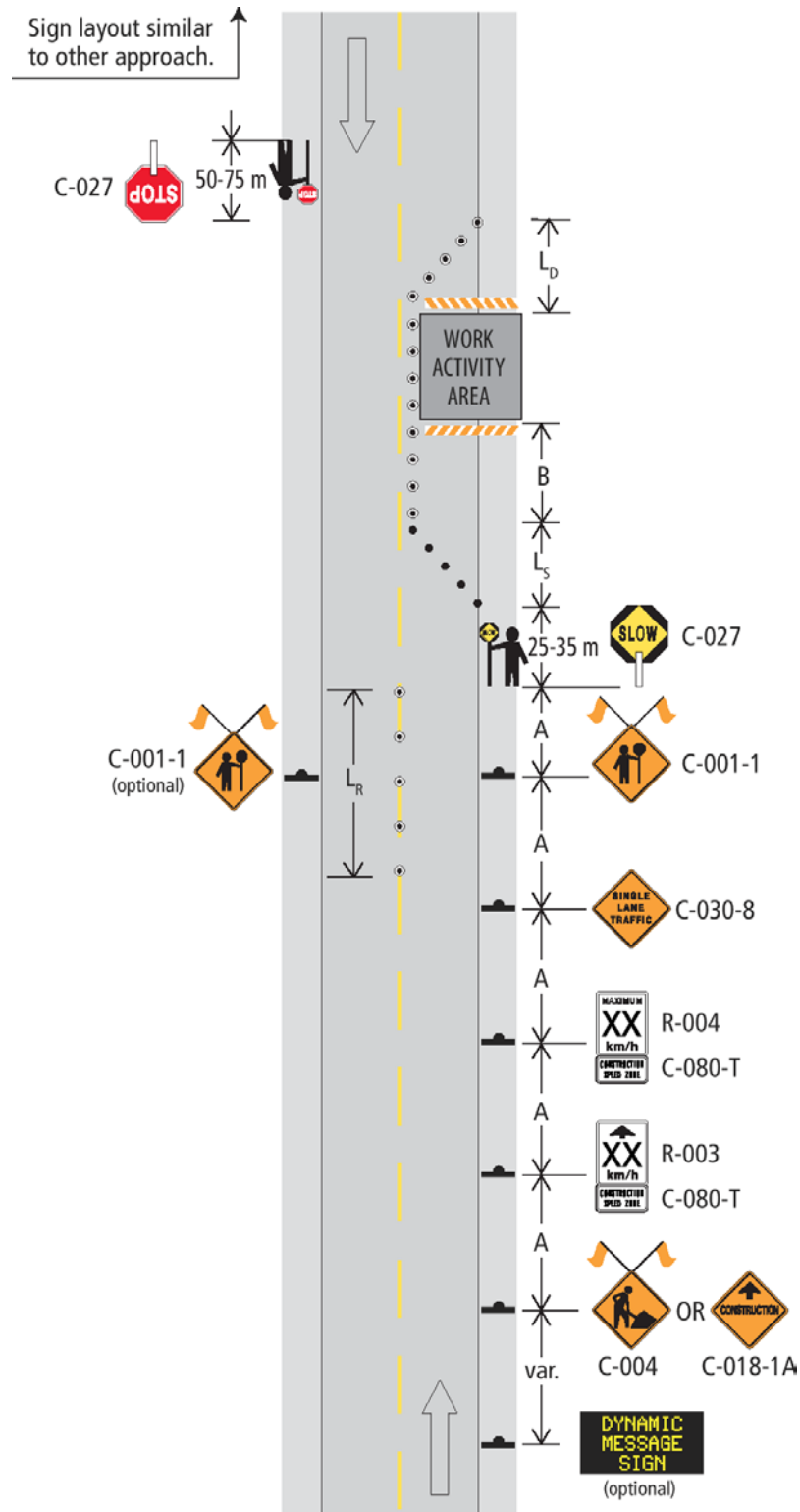
Guidance:

- The distance between the TCP and the Traffic Control Person Ahead C-001-1 sign should not exceed 150 metres.
- Construction speed limit signs should be covered or removed when no work is occurring and other hazards are not present.
- It is important to record when construction speed limits are installed and covered/removed.
- Where Crew Working – Maximum Speed C-002-2 signs establish a Temporary Speed Zone, the C-002-2 should be placed upstream of the C-004 or C-018-1A.
 - Thank You Resume Speed C-086-1 signs should be placed across from the Crew Working – Maximum Speed C-002-2 signs in the opposing lanes.

Options:

- An additional Traffic Control Person Ahead C-001-1 sign may be added to the far side of the road to provide queued drivers with increased awareness of the TCP position.
- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- A Prepare to Stop C-029 sign may replace the Single Lane Traffic C-030-8 sign for other applications that require traffic to stop (e.g., equipment crossing road).
- If secondary signs are applied, they should be installed on the left side of the highway.
- Run-in delineation, LR may be omitted during period where queues are low, permitting the full release of the queue in each direction.

**Figure 7.8.1: Lane Closure with TCPs – Single Lane Alternating with Speed Reduction
(Construction Speed Limit ≤ 50 km/h)**



7.8.2 Lane Closure with TCPs – Single Lane Alternating with Speed Reduction (Construction Speed Limit ≥ 60 km/h)

Purpose:

This layout shows the signs used and the appropriate positions of TCPs when they are directing traffic for a lane closure on a two-lane, two-way roadway. This layout should be used when there is a speed reduction and the construction speed limit is ≥ 60 km/h.

Construction speed limits are regulatory speeds established in Construction Speed Zones within long-term construction and maintenance project areas where there are continuous hazards for motorists or where workers are in close proximity to active travel lanes.

Construction Speed Zones should be applied prudently because **overuse reduces effectiveness**. Drivers should be able to perceive the need to reduce speed.

Standard:

- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.
- Conflicting speed limit signs within the Construction Speed Zone shall be covered or removed.
- When used at night, the TCP station shall be illuminated with overhead lighting.
- Barricades are required at each end of the work activity area for long-duration work.

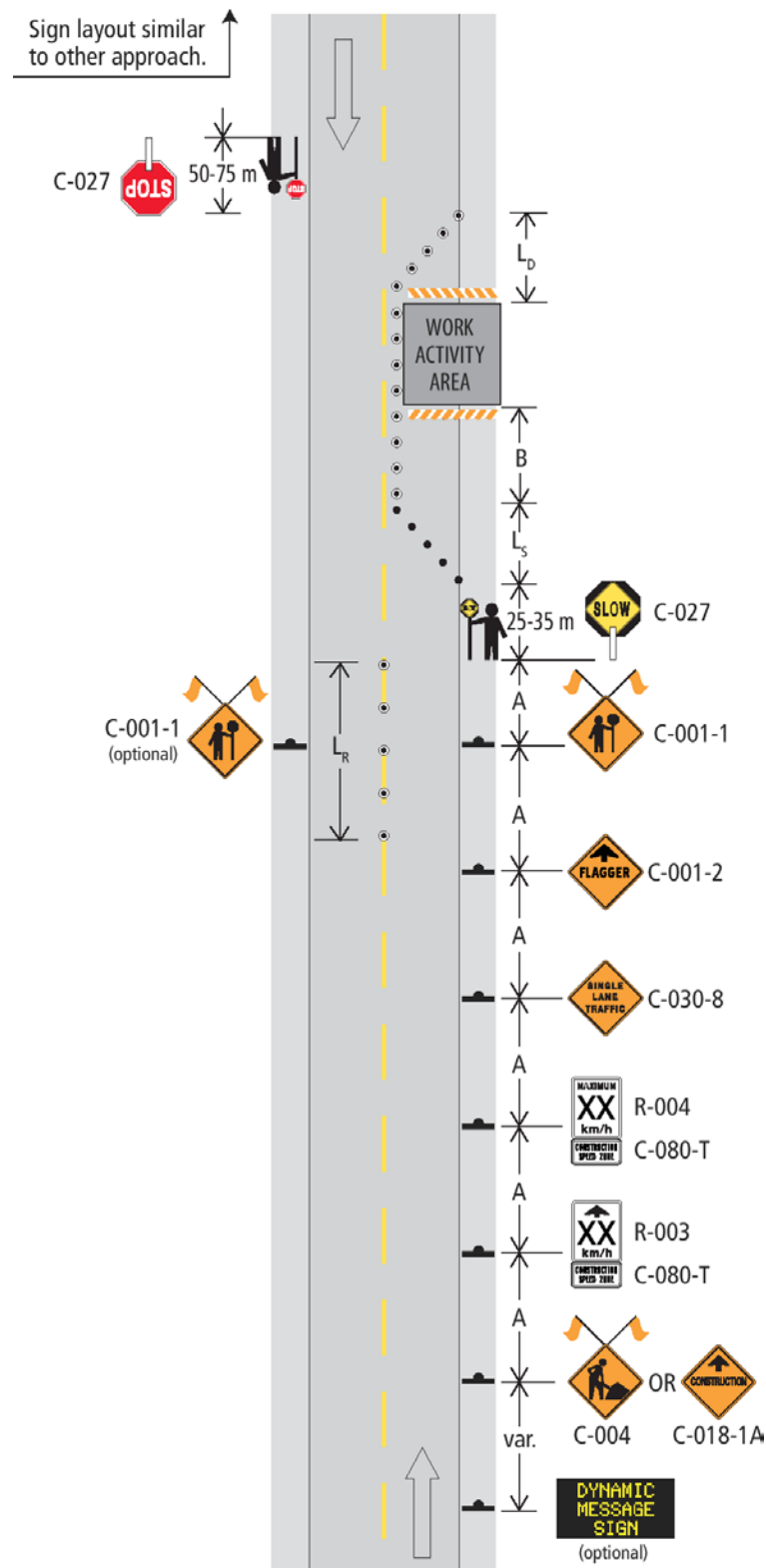
Guidance:

- The distance between the TCP and the Traffic Control Person Ahead C-001-1 sign should not exceed 150 metres.
- Construction speed limit signs should be covered or removed when no work is occurring and other hazards are not present.
- It is important to record when construction speed limits are installed and covered/removed.
- Where Crew Working – Maximum Speed C-002-2 signs establish a Temporary Speed Zone, the C-002-2 should be placed upstream of the C-004 or C-018-1A.
 - Thank You Resume Speed C-086-1 signs should be placed across from the Crew Working – Maximum Speed C-002-2 signs in the opposing lanes.

Options:

- An additional Traffic Control Person Ahead C-001-1 sign may be added to the far side of the road to provide queued drivers with increased awareness of the TCP position.
- The Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- A Prepare to Stop C-029 sign may replace the Single Lane Traffic C-030-8 sign for other applications that require traffic to stop (e.g., equipment crossing road).
- If secondary signs are applied, they should be installed on the left side of the highway.
- Run-in delineation, LR may be omitted during period where queues are low, permitting the full release of the queue in each direction.

**Figure 7.8.2: Lane Closure with TCPs – Single Lane Alternating with Speed Reduction
(Construction Speed Limit ≥ 60 km/h)**



7.9 Lane Closure with AFADs – Short and Long Duration

Purpose:

This layout shows the use of Automated Flagger Assistance Devices (AFADs) when they are used to control traffic for a lane closure on a two-lane, two-way roadway.

Standard:

- When used at night, the AFAD station shall be illuminated with overhead lighting.
- A black-on-white STOP HERE ON RED or STOP HERE ON RED SIGNAL sign shall be installed on the right side of the approach at the point where drivers are expected to stop. It may be installed on the AFAD device itself.
- When AFADs are used, the construction speed limit shall be ≤ 70 km/h.

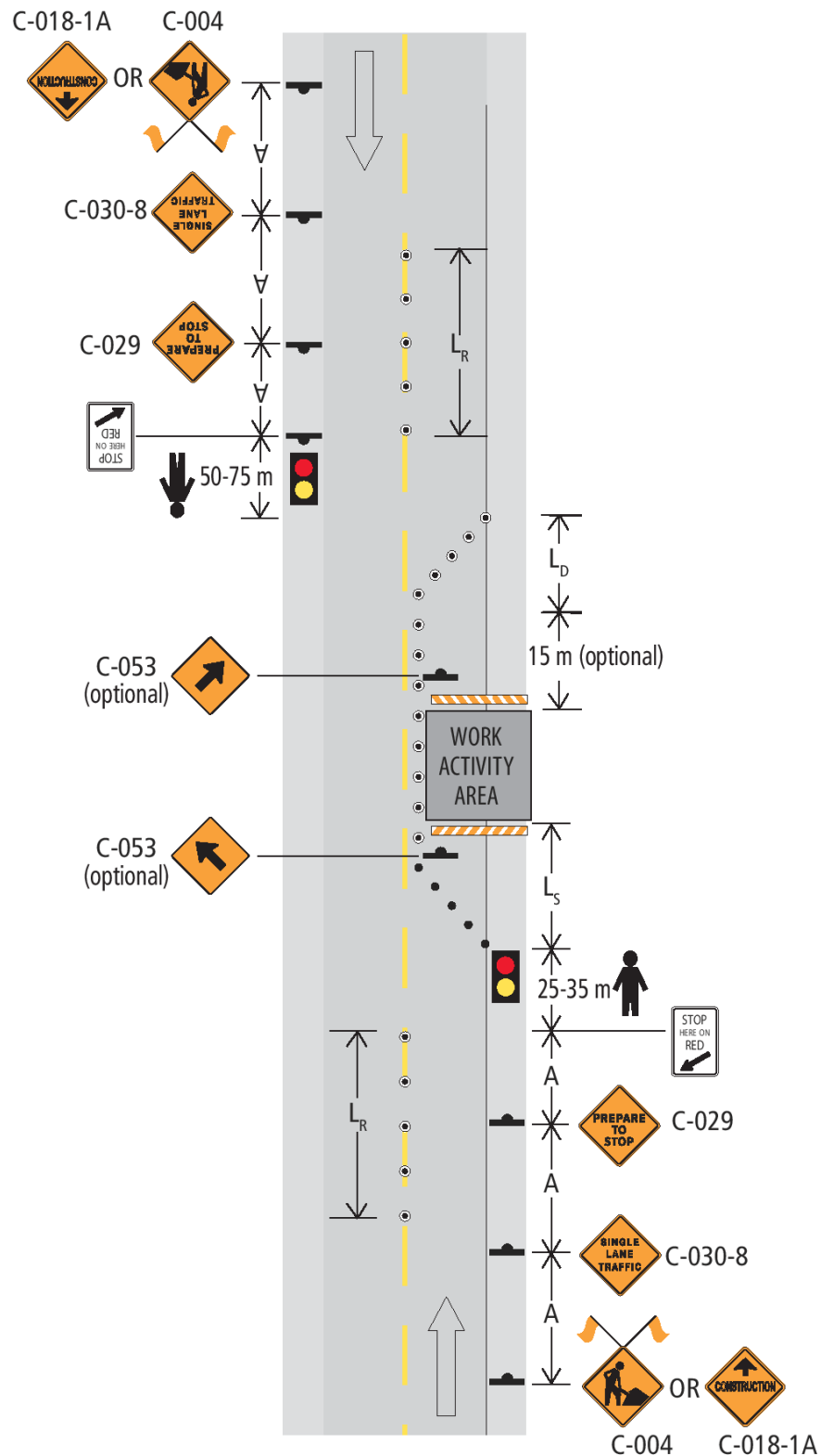
Guidance:

- Where Crew Working – Maximum Speed C-002-2 signs establish a Temporary Speed Zone, the C-002-2 should be placed upstream of the C-004 or C-018-1:
 - Thank You Resume Speed C-086-1 signs should be placed across from the Crew Working – Maximum Speed C-002-2 signs in the opposing lanes.

Options:

- A Prepare to Stop C-029 sign may replace the Single Lane Traffic C-030-8 for applications other than single lane alternating traffic where traffic is required to stop (e.g., equipment crossing road).
- Lane Closure Arrow C-053 signs may be added upstream and downstream of the work activity area to direct traffic into the correct lanes.
- Run-in delineation, L_R may be omitted during period where queues are low, permitting the full release of the queue in each direction.

Figure 7.9: Lane Closure with AFADs – Short and Long Duration



7.10 Lane Closure with Temporary Signals – Single Lane Alternating – Short and Long Duration

Purpose:

This layout shows the appropriate placement of temporary traffic signals when they are required to control traffic for a lane closure on a two-lane, two-way roadway.

Standard:

- Temporary traffic control signals shall be installed and operated in accordance with [Section 4.8: Portable Traffic Signals](#).
- Signal timing and signal head locations shall be established by qualified personnel.
- Advance warning shall include a Signal Ahead C-112 sign and a Single Lane Traffic C-030-8 sign.
- An overhead advance warning W-012 sign, with flashers, shall be used in advance of the stop bar in speed zones ≥ 70 km/h or as required by the Road Authority.
- A Stop Line Here R-025-R sign is required to advise drivers of where to stop.
- Barricades are required at each end of the work activity area for long-duration work.

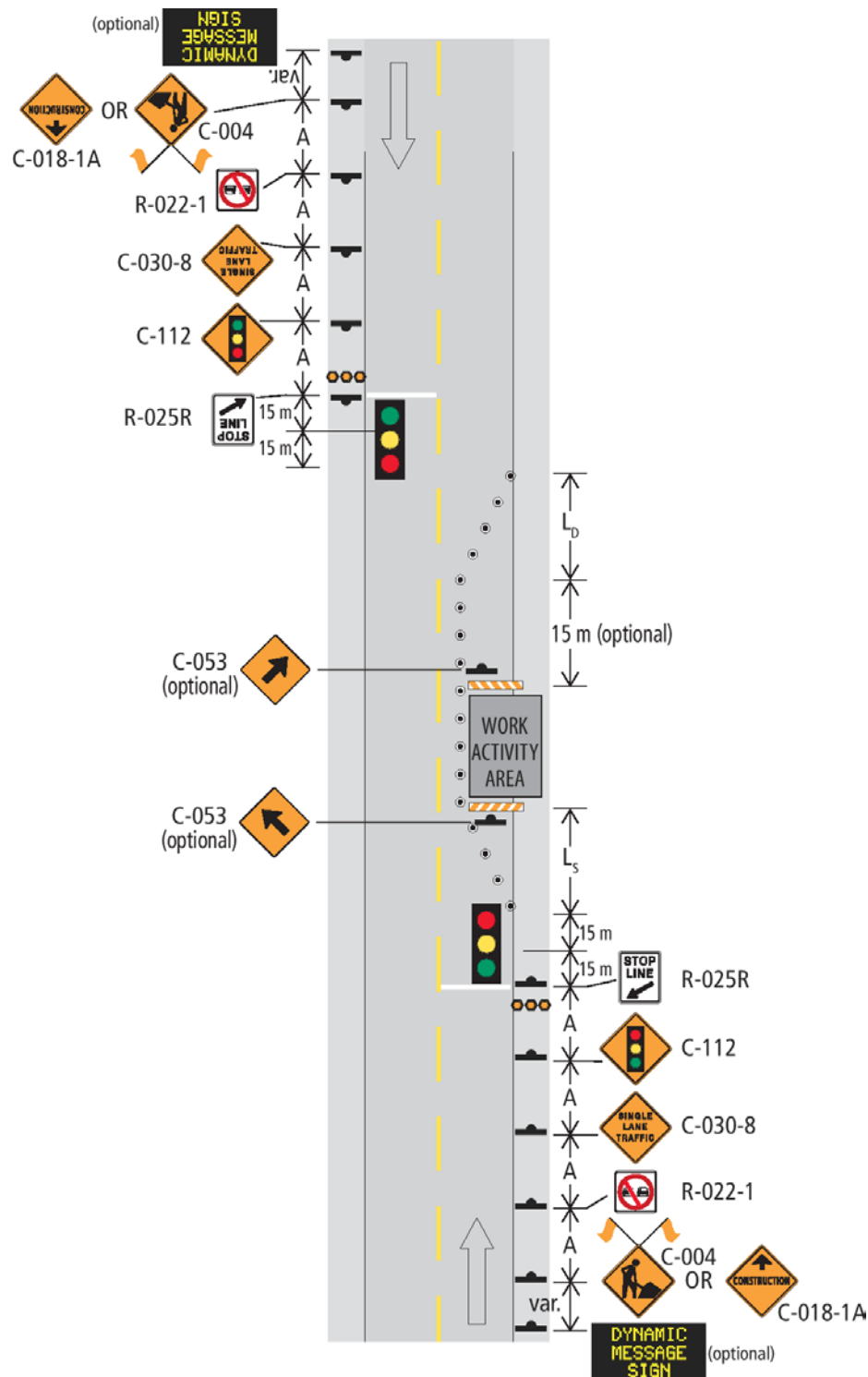
Guidance:

- Inspection of the portable traffic signal (PTS) should occur at least once daily and should include, at minimum, checking the traffic operation (vehicle delay and throughput), signal alignment, power supply, and evidence of vandalism.
- Flexible drum delineators should be placed on the approach side of the portable traffic signal (PTS) to provide notification and protection for road users, including cyclists.

Options:

- Lane Closure Arrow C-053 signs may be added upstream and downstream of the work activity area to direct traffic into the correct lanes.
- A Passing Permitted R-023 sign may be used when traffic exits the work zone.
- A stop bar may be installed to accompany the Stop Line Here R-025-R sign when possible, especially for long duration work taking place over several days. Removable pavement markings may be used to establish the stop bar.

Figure 7.10: Lane Closure with Temporary Signals – Single Lane Alternating – Short and Long Duration



7.11 Work on Low-Volume Roadway – No Centreline – Short Duration

Purpose:

This layout shows a typical setup on a low-volume roadway where work encroaches into the travelled portion of the roadway but sufficient space remains for vehicles to pass the works within their own lanes.

A low-volume roadway is one on which the total roadway volume is <1,000 vehicles per day. Traffic volumes may be obtained from the local Road Authority.

Standard:

- A 5.5 m minimum roadway width shall be maintained.

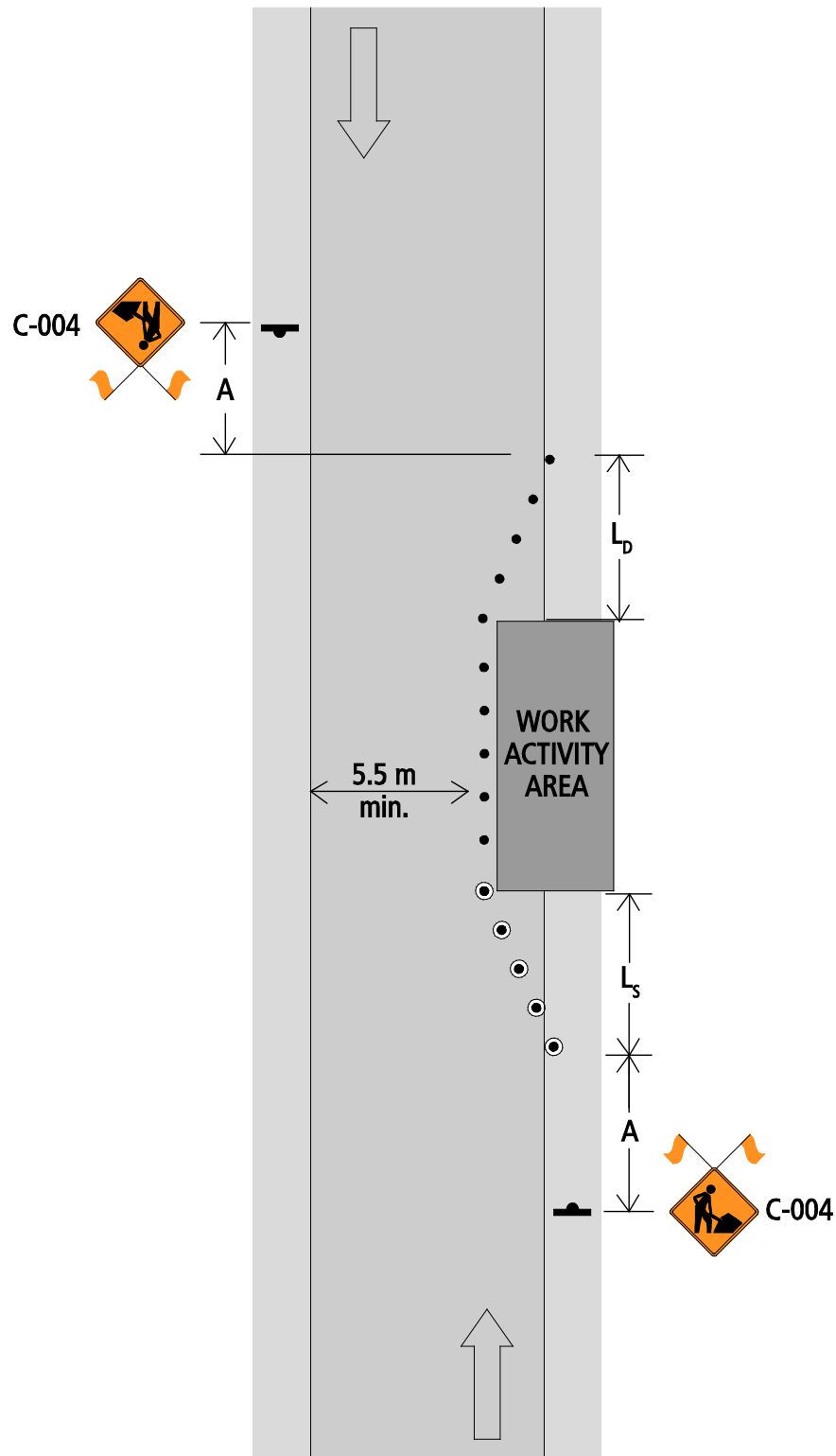
Guidance:

- Any stopped work vehicle should keep as far right as practicable by using shoulder space whenever possible.
- For speeds ≥ 70 km/h, a buffer space should be used.

Options:

- For speeds ≤ 60 km/h, tubular markers may be used instead of drums for leading tapers, and cones may be used instead of tubular markers for other channelizing devices.
- A vehicle-mounted dynamic message sign (DMS) or a flashing arrow board (FAB) in caution mode may be positioned within the taper.

Figure 7.11: Work on Low-Volume Roadway – No Centreline – Short Duration



7.12 Work on Low-Volume Roadway – No Centreline – Long Duration

Purpose:

This layout shows a typical setup on a low-volume roadway where work encroaches into the travelled portion of the roadway but sufficient space remains for vehicles to pass the works within their own lanes.

A low-volume roadway is one on which the total roadway volume is <1,000 vehicles per day. Traffic volumes may be obtained from the local Road Authority.

Standard:

- A Road Narrows Ahead C-134 sign is required for both directions of travel.
- A Flashing Arrow Board (FAB) is required if workers are present.
- Barricades are required at each end of the work activity area for long-duration work.

Guidance:

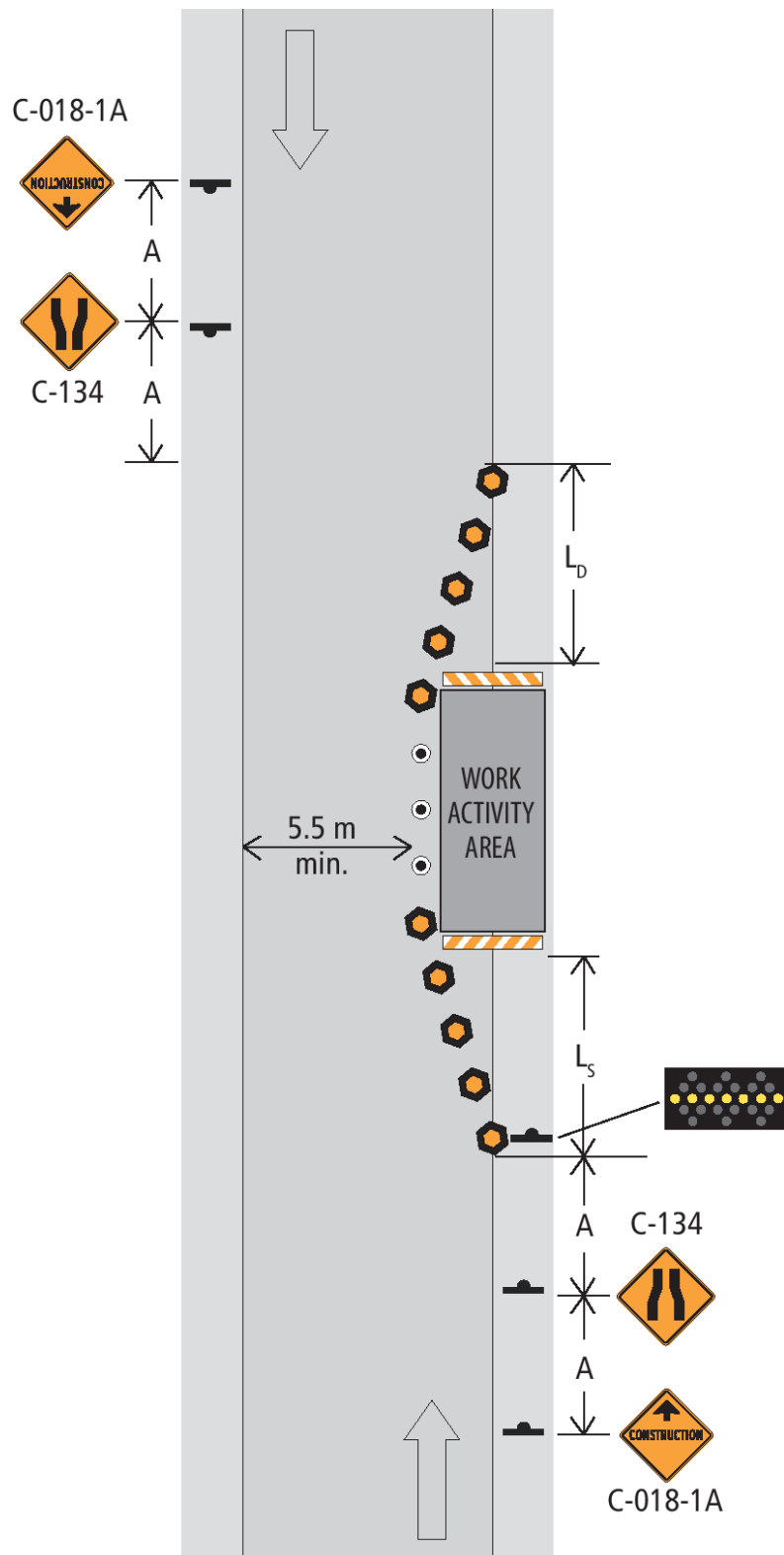
- If the opposite shoulder is suitable for carrying vehicles and at least 3.5 metres of space can be maintained for each travel lane, a lane shift may be implemented using the appropriate Lane Shift C-117-L/R signs.
- Any stopped work vehicle should keep as far right as practicable by using shoulder space whenever possible.

Options:

- The flashing arrow board (FAB) may be replaced as shown below.

	Workers or Work Vehicles Present	No Workers or Vehicles Present
Day	360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign.
Night	Use flashing arrow board (FAB).	Type A yellow warning lights on barricades and drums.

Figure 7.12: Work on Low-Volume Roadway – No Centreline – Long Duration



7.13 Two-Way Left-Turn Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of a two-way left-turn lane. If the work will encroach into either travel lane, a left lane closure for the affected lane(s) should be considered.

Standard:

- A flashing arrow board (FAB) in caution mode is required for each direction of travel.
- Barricades are required at each end of the work activity area for long-duration work.

Guidance:

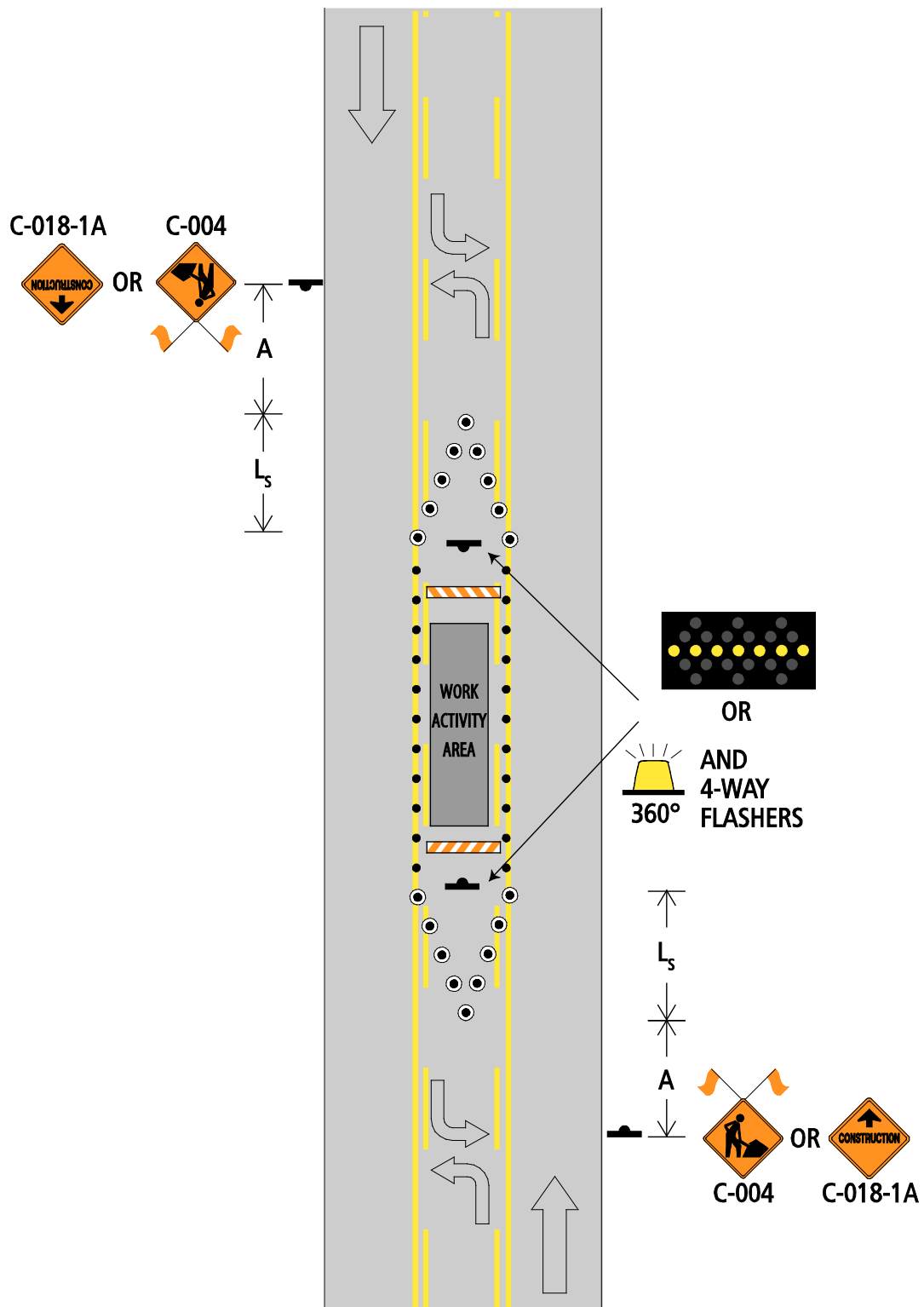
- Left-turning movements should be prohibited along the work activity area and taper.

Options:

- Depending on the nature of the work, one or both adjacent lanes may also have to be closed.
- For speeds ≤ 60 km/h, cones instead of tubular markers may be used to channelize traffic.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning lights.
≥ 70 km/h	No substitution.	

Figure 7.13: Two-Way Left-Turn Lane Closed – Short and Long Duration



7.14 Roadside Diversion – Long Duration

Purpose:

A roadside diversion provides a new alignment around the work area, typically adjacent to the original alignment.

Standard:

- A Road Diversion Ahead C-052-L/R sign shall be used in advance of the diversion to note the direction of the new alignment.
- Pavement markings no longer applicable to the traffic pattern of the roadway shall be covered, removed, or eradicated.
- If the diversion is paved, temporary pavement markings are required to mark the centreline (see [Section 4.4: Pavement Markings](#)).
- If the diversion is gravel, a Pavement Ends C-149 sign is required in advance of the graveled portion.
- Type 3 barricades shall be used to mark the closed portion of the roadway, with a Road Closed C-030-6A sign and a Detour Right C-006-R marker mounted on the barricades.
- The edges of the diversion shall be defined using channelizing devices or barriers.

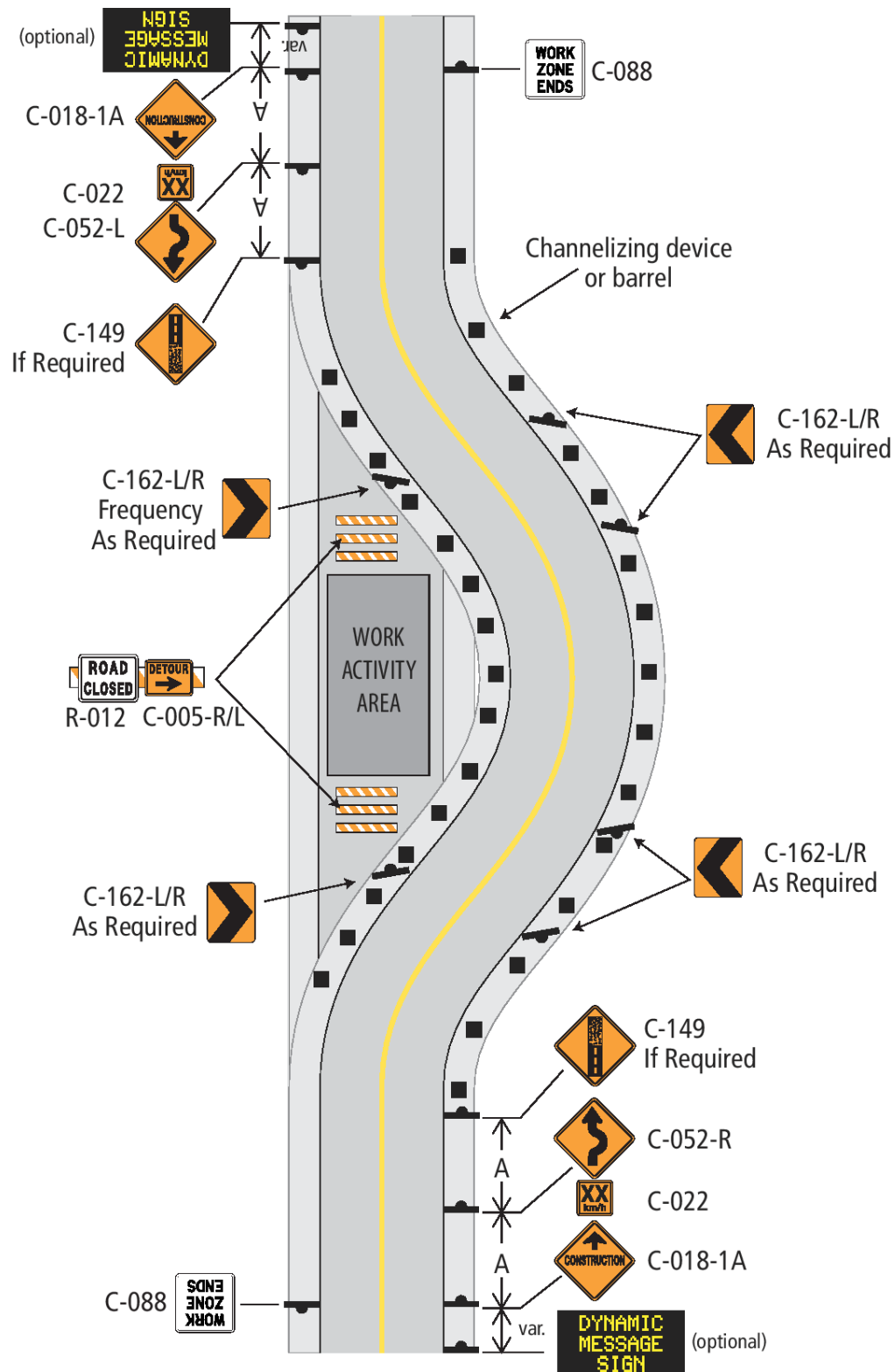
Guidance:

- A No Passing Zone should be created through the diversion by posting No Passing R-022-1 signs at the beginning of the diversion and periodically along the diversion route if required.
- If the tangent distance along the temporary diversion is more than 200 metres, chevrons should be applied separately for each curve.
- An Advisory Speed C-022 tab should be posted as recommended by a Traffic Engineer.

Options:

- Supplemental delineation devices such as additional chevrons, delineators, or raised pavement markers (RPMs) may be required.
- If the diversion is not paved, a centreline may be established by placing cones or tubular markers where a centreline would be.

Figure 7.14: Roadside Diversion – Long Duration



7.15 One-Lane Bridge or Roadway – Short and Long Duration

Purpose:

This layout shows the typical sign setup for traffic self-regulation as drivers approach a one-lane bridge or a one-lane section of roadway. It is typically used on low-volume roadways.

Standard:

- A Yield to Oncoming Traffic R-056-1 sign is used on the side of the bridge or the lane with the longest sight distance.
- A Narrow Structure Ahead C-135 sign shall be used for a one-lane bridge.
- A Road Narrows Ahead C-134 sign shall be used for a one-lane (narrow) road.
- On a roadway reduced to one lane, drums are required for the leading taper.
 - Flashing lights are required on taper devices for setups left in place overnight.
 - Where the speed limit is ≥ 70 km/h, a buffer space shall be used.
- Barricades are required at each end of the work activity area for long-duration work.

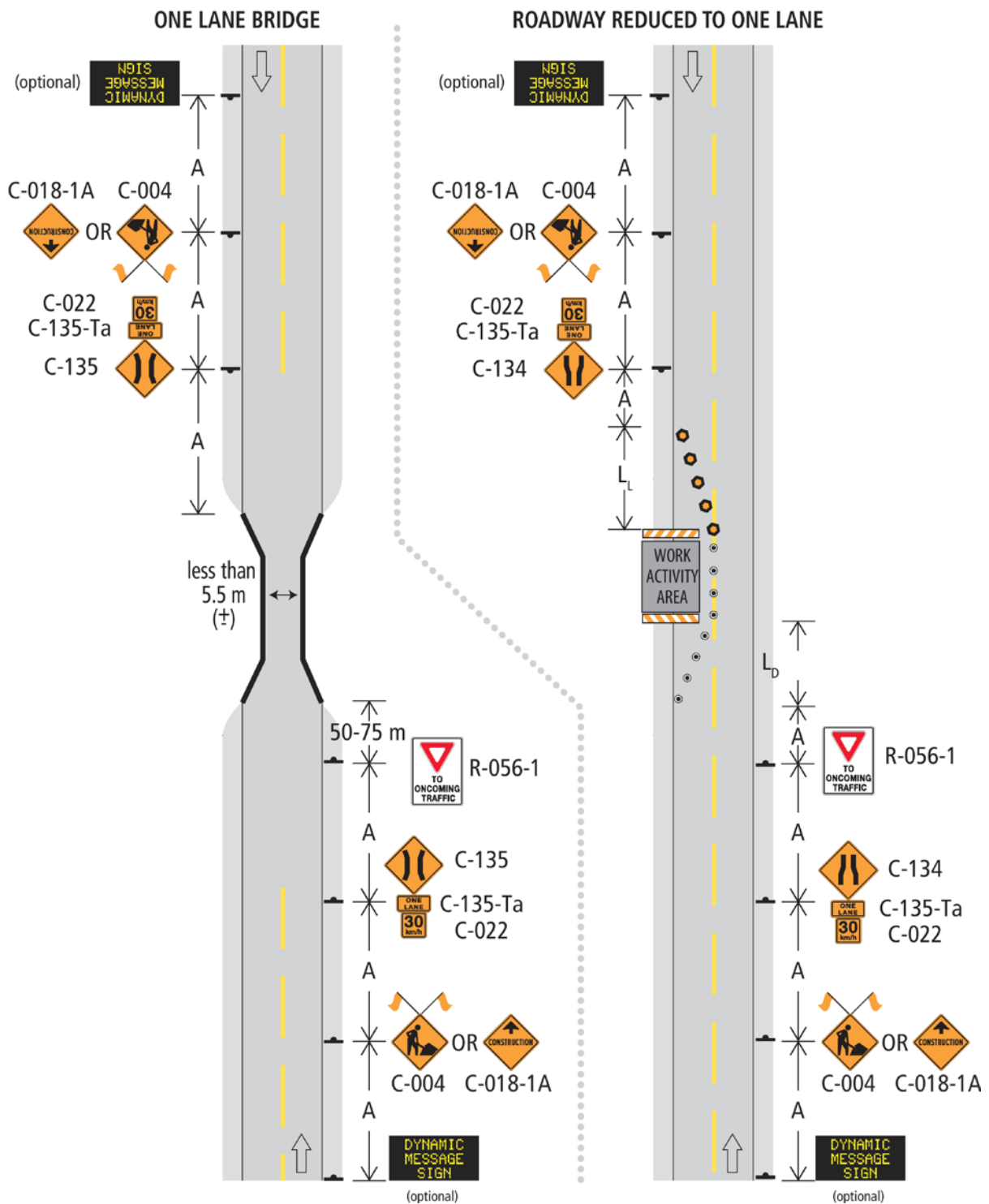
Guidance:

- Advisory speed tabs are typically posted at 30 km/h.
- Grade and curvature of the roadway should be considered to determine the appropriate direction of the R-056-1 sign.
- Where traffic volumes are higher or sight distance is limited causing difficulty navigating the work zone, other traffic control measures should be considered, such as portable traffic signals or TCPs.

Options:

- Additional advance warning may include a dynamic message sign (DMS), a Reduce Speed C-032 sign, or a Traffic Pattern Change C-063 sign.

Figure 7.15: One-Lane Bridge or Roadway – Short and Long Duration



7.16 Pilot Cars

Purpose:

A pilot car (pilot vehicle) is used to lead drivers through a work zone where traffic is single lane alternating where traffic volumes and conditions allow.

The work activity area is typically more than one kilometre long, or the complexity of the work activity area makes it difficult for drivers to navigate on their own (e.g., where there is a substantial change in alignment).

Using a pilot car may reduce the risk of incidents, help to prevent traffic from straying onto the work site, and help to manage driver compliance with construction speed limits.

See also [Section 4.11.9: Pilot Cars for Work Zones](#).

Standard:

- The Follow Pilot Car C-049 sign shall be used at each departure point.
- Pilot cars shall have 360-degree flash light and 4-way flashers. The double-sided Pilot Car C-048-1-DS sign or the Pilot Car C-048-2 overhead sign is required on each pilot car.
- TCPs shall regulate traffic at each end of the work zone.
- TCPs and pilot car operators shall remain in communication throughout the work zone.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

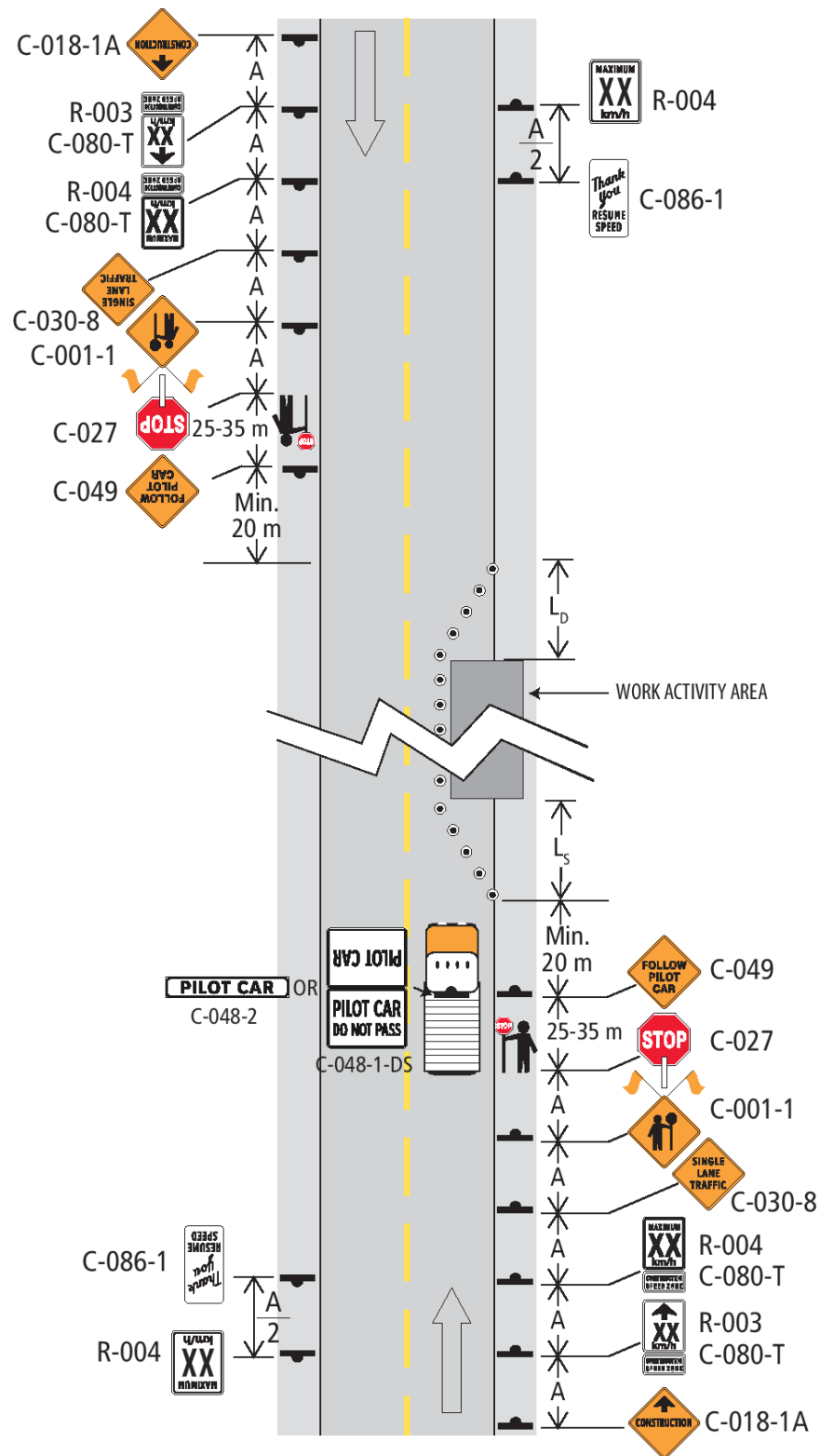
Guidance:

- Additional TCPs and Follow Pilot Car C-049 signs should be used between the TCPs at each end of the work zone for both of these situations:
 - at every intersection that may require additional guidance for motorists entering the roadway
 - at business driveways with sufficiently high traffic volumes, where there is a risk that motorists could enter the roadway against the flow of traffic
- Confirmatory Follow Pilot Car C-049 signs and intermittent centreline delineation should be used for long work zones to remind drivers of the pilot car operation.
- The travel speed should minimize gaps between the vehicles in the platoon to help prevent tar splatter, losing cars, or creating dust in the work zone.
 - When a pilot car is not operating, its 360-degree rotating lights and 4-way flashers should be turned off.
- Where cyclists are regularly observed using the shoulder, provisions for transporting cyclists past the work should be considered.

Options:

- To remind drivers that passing is not allowed within the zone, it may be beneficial to post No Passing R-022-1 signs through the site.
- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- A second Pilot Car may be used to follow or chase the back of the queue to maintain control and visibility of all vehicles.
- Temporary Traffic Signals may be used, controlled by the Pilot Car driver, to replace the TCP

Figure 7.16: Pilot Cars



7.17 Work Near a Rail System Grade Crossing

Purpose:

This layout shows a typical setup for a single lane closure on a two-lane, two-way highway where due to the proximity to a railway crossing, extra care should be taken to minimize the probability of conditions being created by:

- 1) lane restrictions,
- 2) flagging operations, and/or
- 3) other operations where vehicles may get stopped within the grade crossing.

Avoid stopping any vehicles within 5.0 metres on approaches to and departures from crossings, measured from either the closest or farthest rail.

Standard:

- Before work begins, users of this layout shall coordinate with the railroad company, or light rail transit agency operating the line. Getting approvals near rail could be a lengthy process. Therefore, early coordination with rail/transit organizations is required.
- Rail and transit organizations have specific rules for those working in the vicinity of their tracks. Therefore, their rules, and those of Transport Canada will have to be adhered to.
- TCP's shall determine the potential for upstream devices such as traffic signals leading to queuing of vehicles across active rail tracks. Coordination between TCP's to determine upstream storage capacity will help regulate the numbers of vehicles released per direction to mitigate queues stopping on tracks. The R-285 "KEEP TRACKS CLEAR" may be added.
- If the queuing of vehicles across active rail tracks cannot be avoided due to reasons such as the location of upstream traffic signals, an additional flagger shall be provided at the grade crossing to prevent vehicles from stopping within the grade crossing.
- TCP's shall obey the Railway Signals.
- When used at night, the TCP station shall be illuminated with overhead lighting.

Guidance:

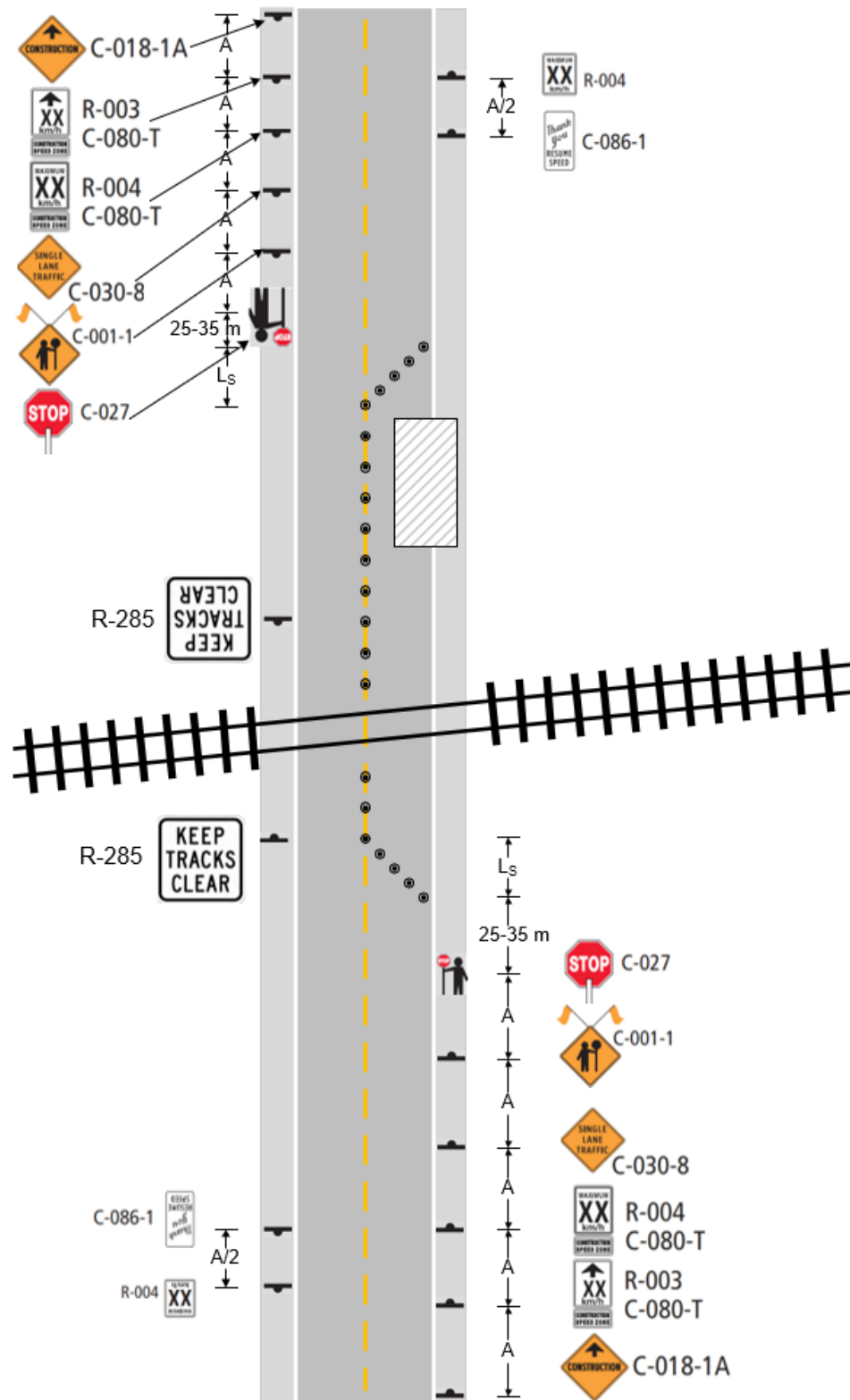
- Extending the buffer space (on the lane closure side) on the upstream side of the grade crossing will help prevent the backup of traffic across the railway crossing created by the TCP operation.
- Channelizing devices shall not be placed within 2.5 metres on either side of the closest and farthest rail.
- The distance between the TCP and the Traffic Control Person Ahead C-001-1 sign should not exceed 150 metres.
- Where Crew Working – Maximum Speed C-002-2 signs establish a Temporary Speed Zone, the C-002-2 should be placed upstream of the C-004 or C-018-1. - Thank You Resume Speed C-086-1 signs should be placed across from the Crew Working – Maximum Speed C-002-2 signs in the opposing lanes.

Options:

- An additional Traffic Control Person Ahead C-001-1 sign may be added to the far side of the road to provide queued drivers with increased awareness of the TCP position.
- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- A Prepare to Stop C-029 sign may replace the Single Lane Traffic C-030-8 sign for other applications that require traffic to stop (e.g., equipment crossing road).
- Run-in delineation, LR may be omitted during period where queues are low, permitting the full release of the queue in each direction.

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Figure 7.17: Work Near a Rail System Grade Crossing



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PART B – TRAFFIC CONTROL

Section 8: Traffic Control Layouts – Multilane Undivided Roadways

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PART B – TRAFFIC CONTROL

Section 8: Traffic Control Layouts – Multilane Undivided Roadways

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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8.1 General Information– Multilane Undivided Roadway

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign shall be used.
- For long-duration work, a Construction Ahead C-018-1A sign shall be used.
- Where the speed limit is ≥ 70 km/h, a buffer space shall be used.
- A flashing arrow board (FAB) shall be used when a lane is closed.
- All work, buffer, and shadow vehicles shall be equipped with a 360-degree flashing light and 4-way flashers.

Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.

Options:

- Where cyclists are regularly observed using the shoulder, a Share the Road W-132-1 sign may be used with an appropriate cycling hazard tab (see [Section 18: Traffic Control Layouts – Bicycle Lanes](#) for additional information).
- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.
- In low speed (≤ 60 km/h) urban areas (within municipal boundaries), customization of traffic control layouts, including closer device spacing and shorter taper lengths, may be necessary to maintain access and mobility. In these cases, document why adjustments are being made.

8.2 Typical Construction Speed Zone Signing – Multilane Undivided Roadway

Purpose:

Construction speed limits are regulatory speeds established in Construction Speed Zones within long-term construction and maintenance project areas where there are continuous hazards for motorists or where workers are in close proximity to active travel lanes.

Construction Speed Zones should be applied prudently because **overuse reduces effectiveness**. Drivers should be able to perceive the need to reduce speed.

Standard:

- Conflicting speed limit signs within the Construction Speed Zone shall be covered or removed.
- The same Construction Speed Zone signing is required in opposing directions.

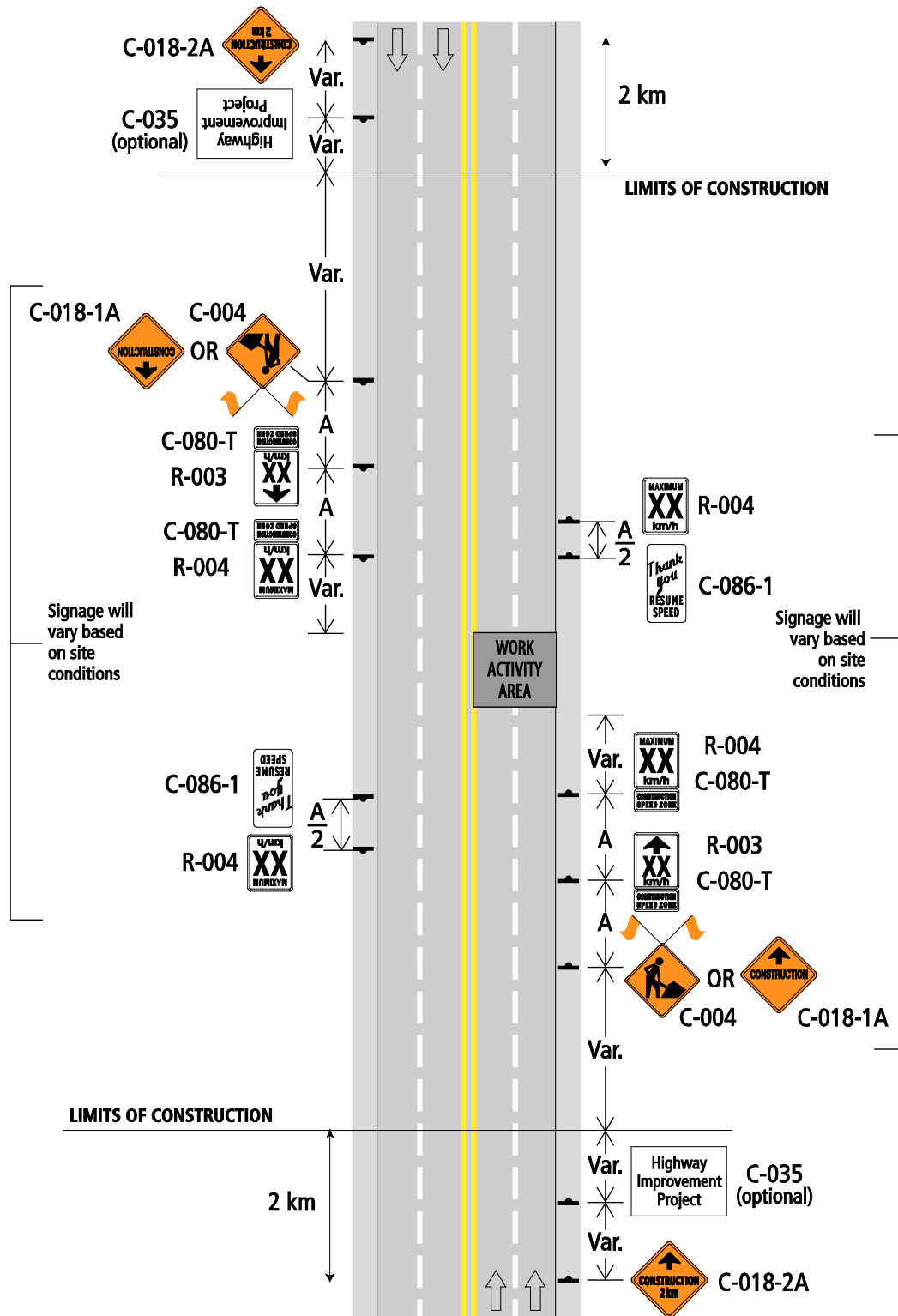
Guidance:

- The Maximum Speed R-004 speed sign with a Construction Speed Zone C-080-T distance tab should be positioned at the beginning of the active work area.
- Construction speed limit signs should be covered or removed when no work is occurring and other hazards are not present.
- It is important to record when construction speed limits are installed and covered/removed.
- See also [Section 2.4: Management of Speed](#) for information on using Construction Speed Zones.

Options:

- Use of the Construction Project C-035 sign is project-dependent. It is typically used only for large projects. See [Appendix B: Standard Construction Signs](#) for information on using this sign.
- If secondary signs are applied, they may be positioned based on:
 - If the median is more than 2 metres wide, secondary signs may be placed in the median.
 - If the median is 2 metres wide or less, secondary signs may be placed on the opposite shoulder.

Figure 8.2: Typical Construction Speed Zone Signing – Multilane Undivided Roadway



8.3 Emergent Work (<5 Minutes) – Multilane Undivided Roadway

Purpose:

Emergent work involves very short-duration activities for which setting up and taking down temporary traffic control devices may take more time than the actual work, and expose workers to greater risk. Each entry onto the travelled portion of the roadway lasts less than 1 minute, and the total time to complete the task is less than 5 minutes.

This does not include emergencies, which are situations which require immediate response to save lives or prevent serious injury using whatever resources are available.

It may occur when an unanticipated situation or event—one that presents a risk to the travelling public—is discovered during travel or work activities. It can be considered unplanned, urgent maintenance work. A Traffic Control Plan is not required for emergent work.

Emergent work may include the removal of debris from the roadway (e.g., tree limbs, lost cargo, dead animals, tire and other vehicle debris, and the manual removal of rock). Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A risk evaluation is required to determine whether or not the work activity is considered emergent (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The entire work activity shall be completed in less than 5 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

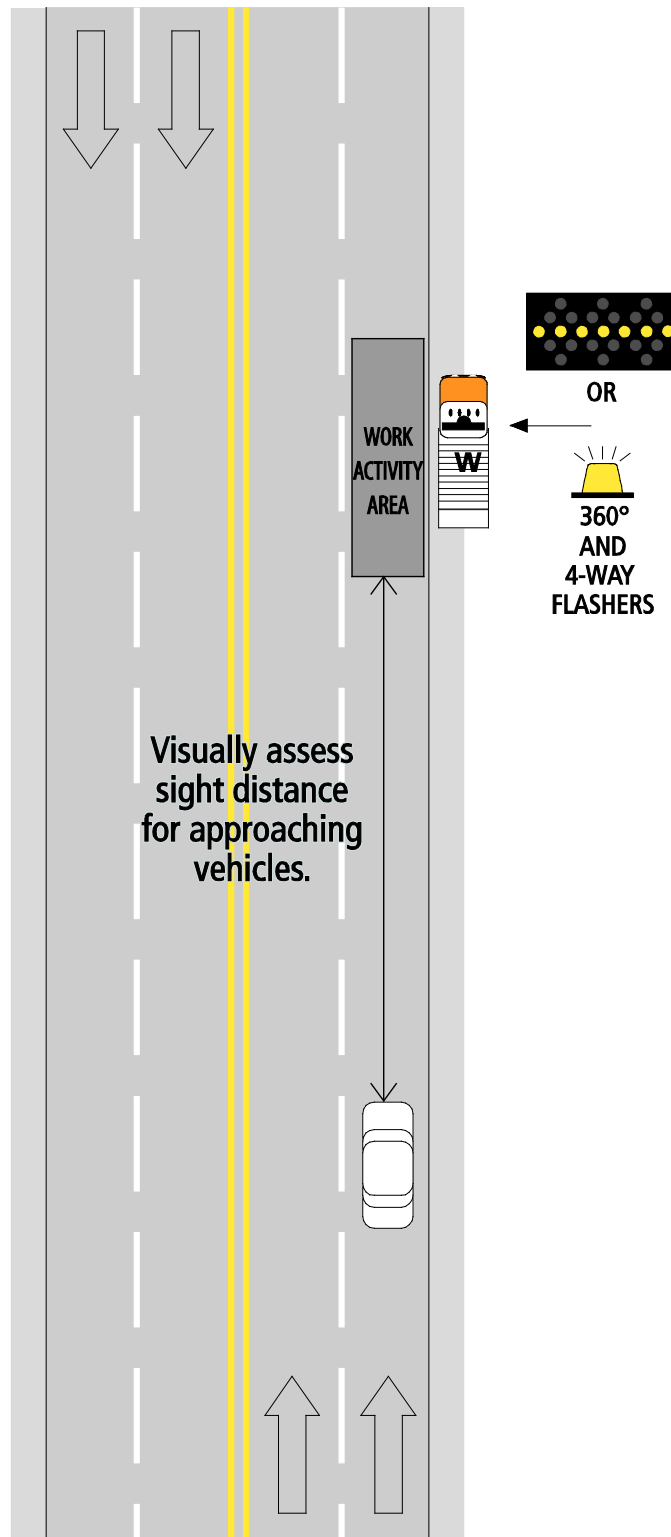
Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and work being performed.

Options:

- None at this time.

Figure 8.3: Emergent Work – Multilane Undivided Roadway



8.4 Brief-Duration Work (<15 Minutes) – Multilane Undivided Roadway

Purpose:

Brief-duration work is generally planned, although the exact location or extent of the work required may not be fully known. It requires less than 15 minutes to complete.

Brief-duration work may include:

- locating drainage structures or other roadway features or components
- cleanup of material spills and removing debris from the roadway (e.g., small fallen trees, larger tree limbs, crash debris, etc.)
- quick repairs intended as a partial or temporary response to damage or failure

If the work is expected to last more than 15 minutes, additional resources will be needed to implement a short-duration work zone. The work should be delayed until the appropriate work zone equipment and devices are available.

Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A Crew Working Ahead C-004 is required in advance of the work.
- A risk evaluation is required to determine whether or not the work activity is considered brief (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The work activity shall be completed in less than 15 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

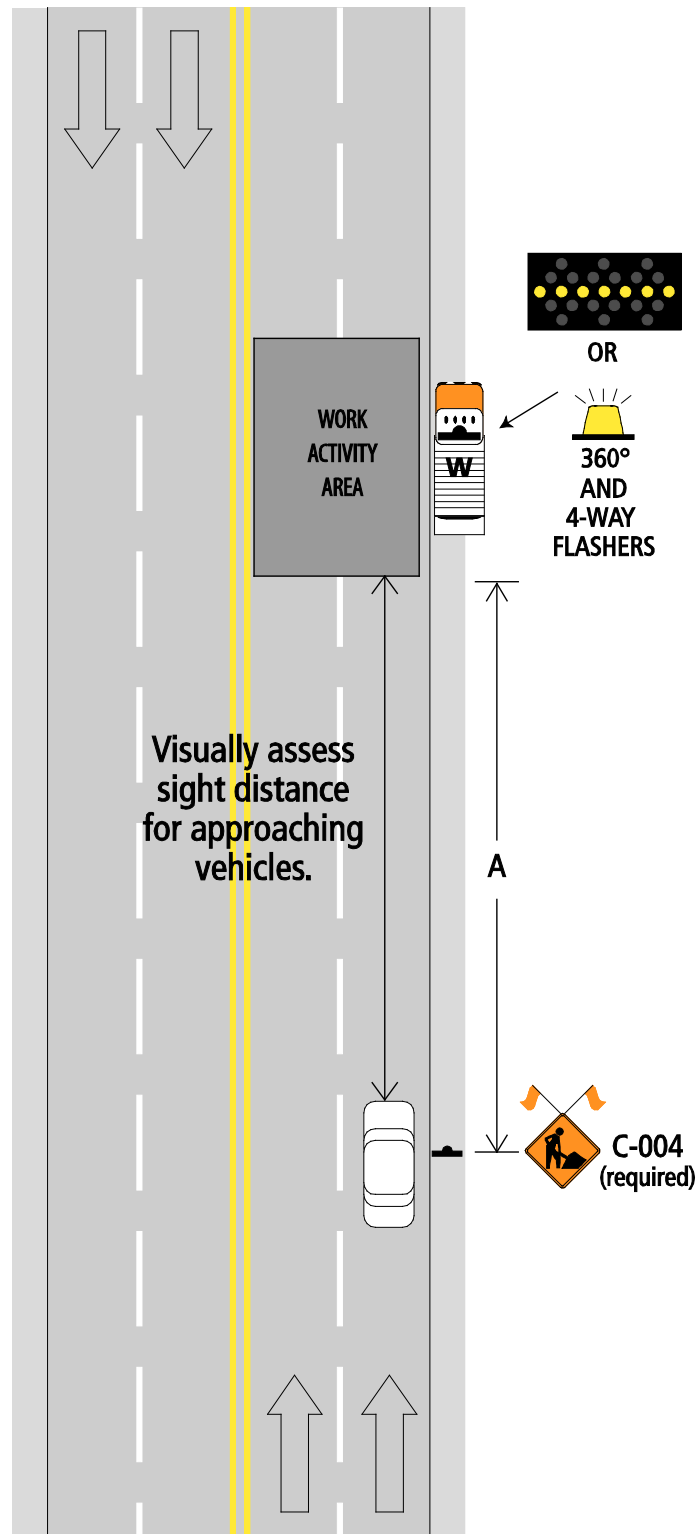
Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and the work being performed.

Options:

- None at this time.

Figure 8.4: Brief-Duration Work – Multilane Undivided Roadway



8.5 Work on Shoulder – Short and Long Duration

Purpose:

Stationary work on the shoulder takes place outside the travel lanes but occupies part or all of the shoulder area.

If shoulder work encroaches into a travel lane, a full lane closure shall be implemented.

Standard:

- When work is in progress and workers are present, a flashing arrow board (FAB) in caution mode is required in the taper or immediately in advance of the work area.
- A barricade is required on the approach side of the work activity area for long-duration work.

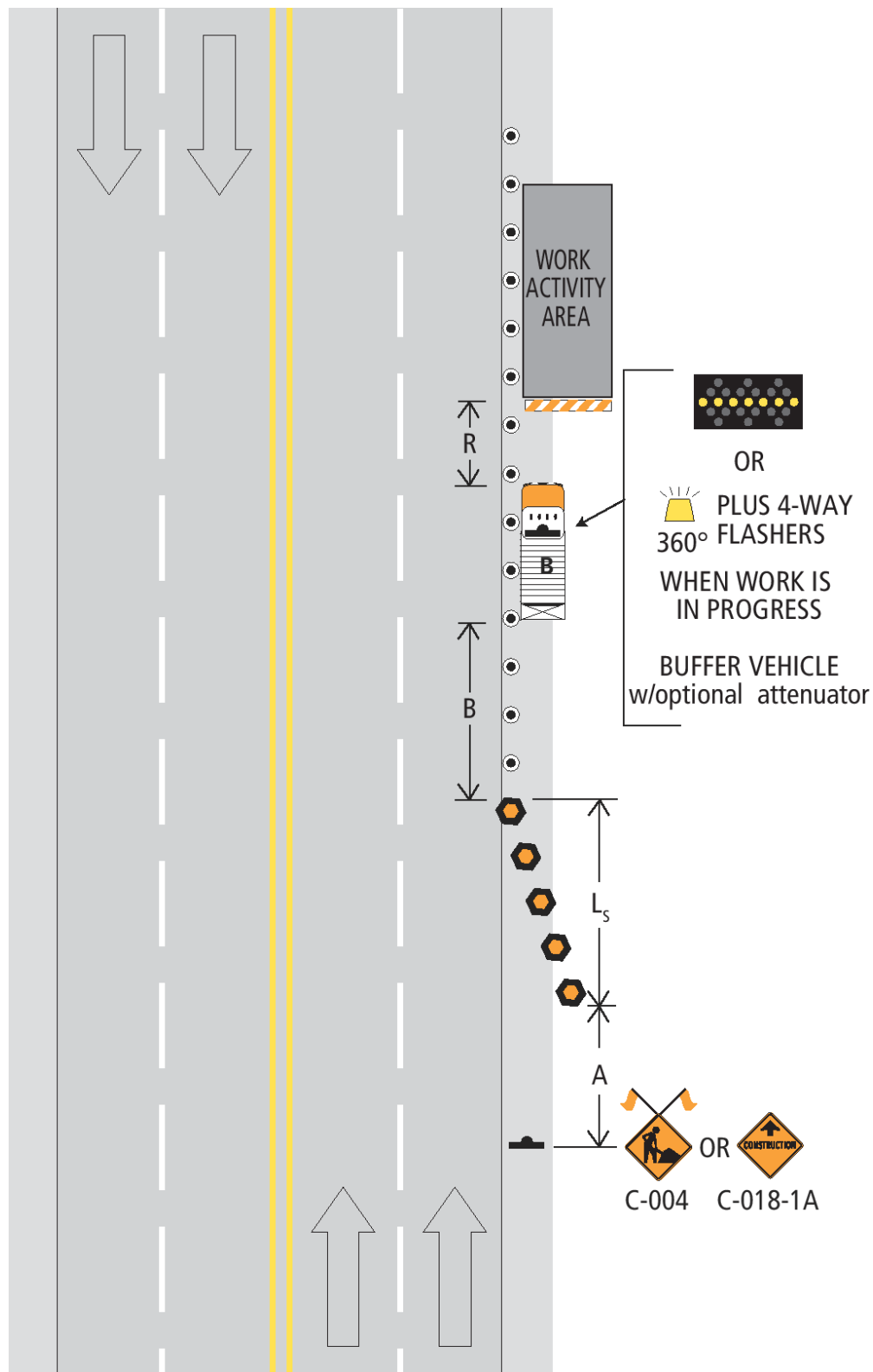
Guidance:

- When work is not in progress but the work area has not been cleared, care should be taken to isolate it from the travelled roadway

Options:

- Advance warning signs may be applied in the opposing direction of travel.
- If the speed limit is ≤ 60 km/h, or there is insufficient room, tubular markers may replace drums for the taper.
- The channelizing devices used alongside the work area may be tubular markers or cones.
- Advance warning signs may be omitted for short-duration work if the shadow vehicle displays a vehicle-mounted dynamic message sign (DMS) or flashing arrow board (FAB) in caution mode and uses a 360-degree flashing light and 4-way flashers.

Figure 8.5: Work on Shoulder – Short and Long Duration



8.6 Right Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for closure of the right travel lane on a multilane undivided highway.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign are required.
- A barricade is required on the approach side of the work activity area for long-duration work.

Guidance:

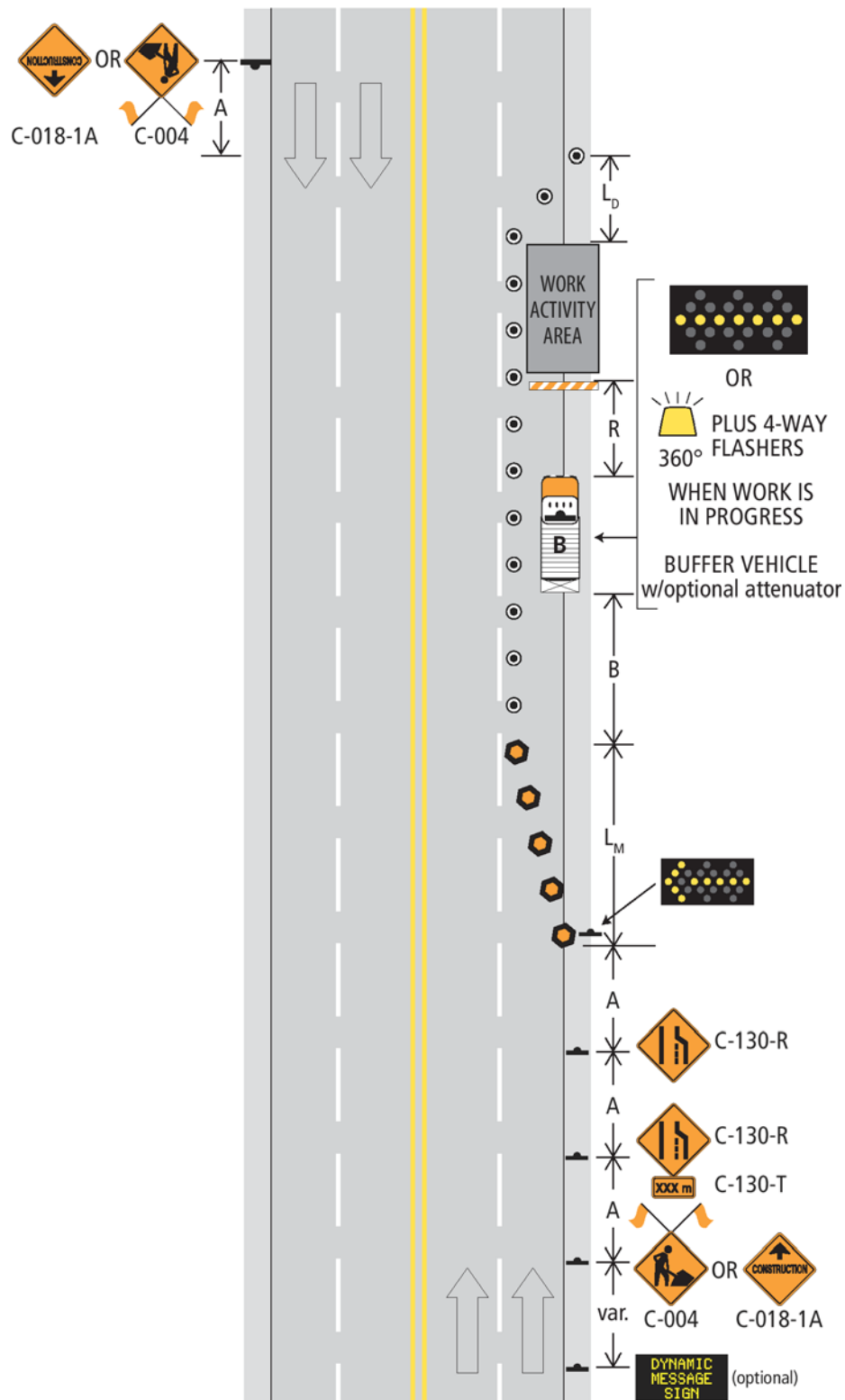
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with *Table A – Taper Lengths*.

Options:

- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B, Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus work vehicle with 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 8.6: Right Lane Closed – Short and Long Duration



8.7 Left Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for closure of the left travel lane on a multilane undivided highway.

Standard:

- A Left Lane Closed Ahead C-130-L sign with a C-130-T distance tab and a second Left Lane Closed Ahead C-130-L sign are required.
- A flashing arrow board (FAB) shall be used where the posted speed limit is ≥ 70 km/h.
- Barricades are required at each end of the work activity area for long-duration work.

Guidance:

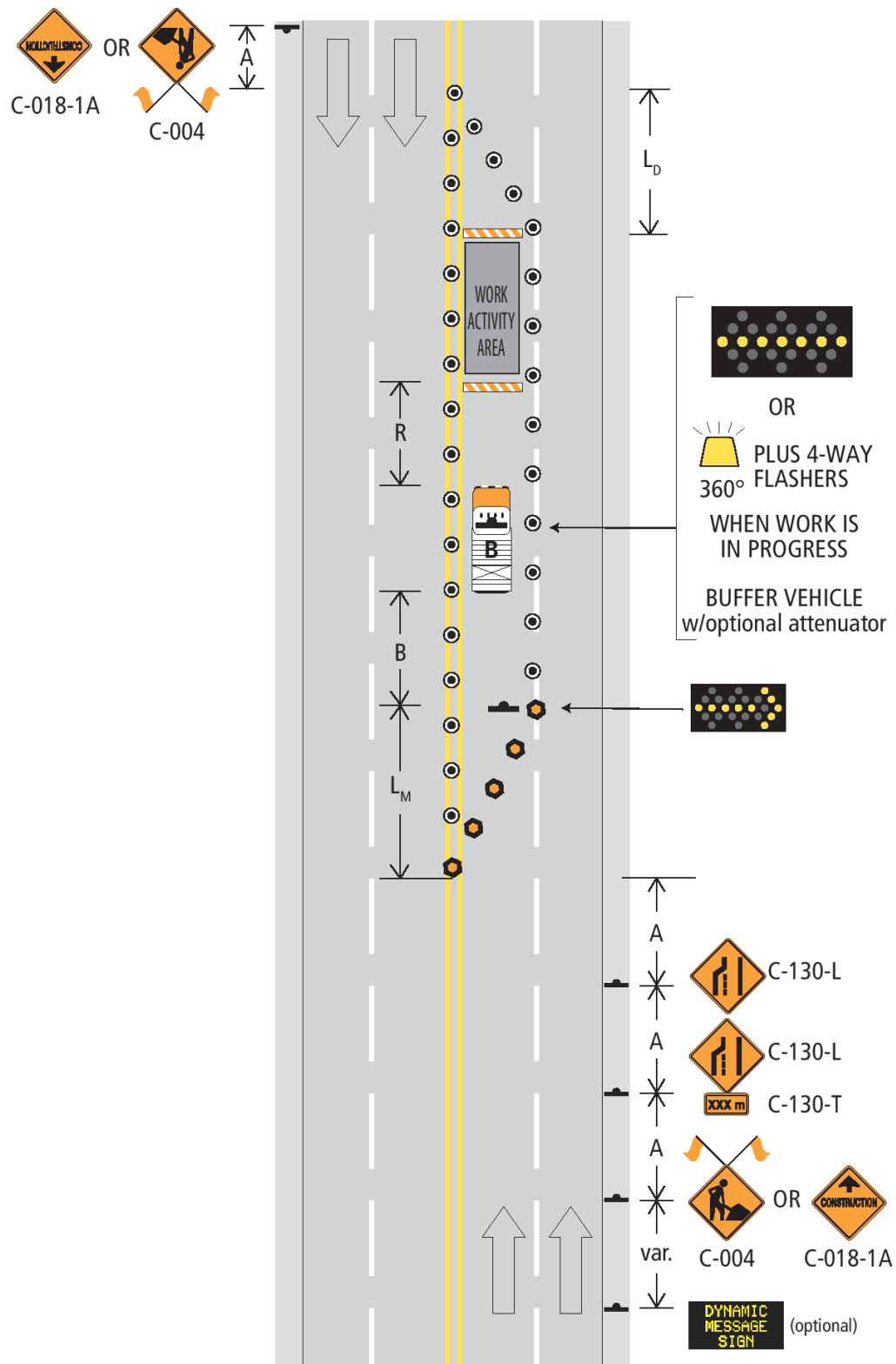
- If adequate space cannot be maintained for worker safety, it may be necessary to close the left lane in the opposing direction.

Options:

- Secondary Left Lane Closed C-130-L signs may be installed on the left side of the highway.
- If the speed limit is ≤ 60 km/h:
 - The upstream Left Lane Closed C-130-L sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B, Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 8.7: Left Lane Closed – Short and Long Duration



8.8 Centre Lane Closure (≤ 60 km/h) – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure of the centre lane on a low-speed multilane roadway.

Standard:

- A Centre Lane Closed Ahead C-030-1A sign with a C-130-T distance tab and a Centre Lane Closed C-030-2 sign are required in advance of the work.
- If there is insufficient room for signs in the centre median, a dynamic message sign (DMS) is required.
- A buffer space shall always be incorporated into the layout.
- A barricade is required on each end of the work activity area for long-duration work.

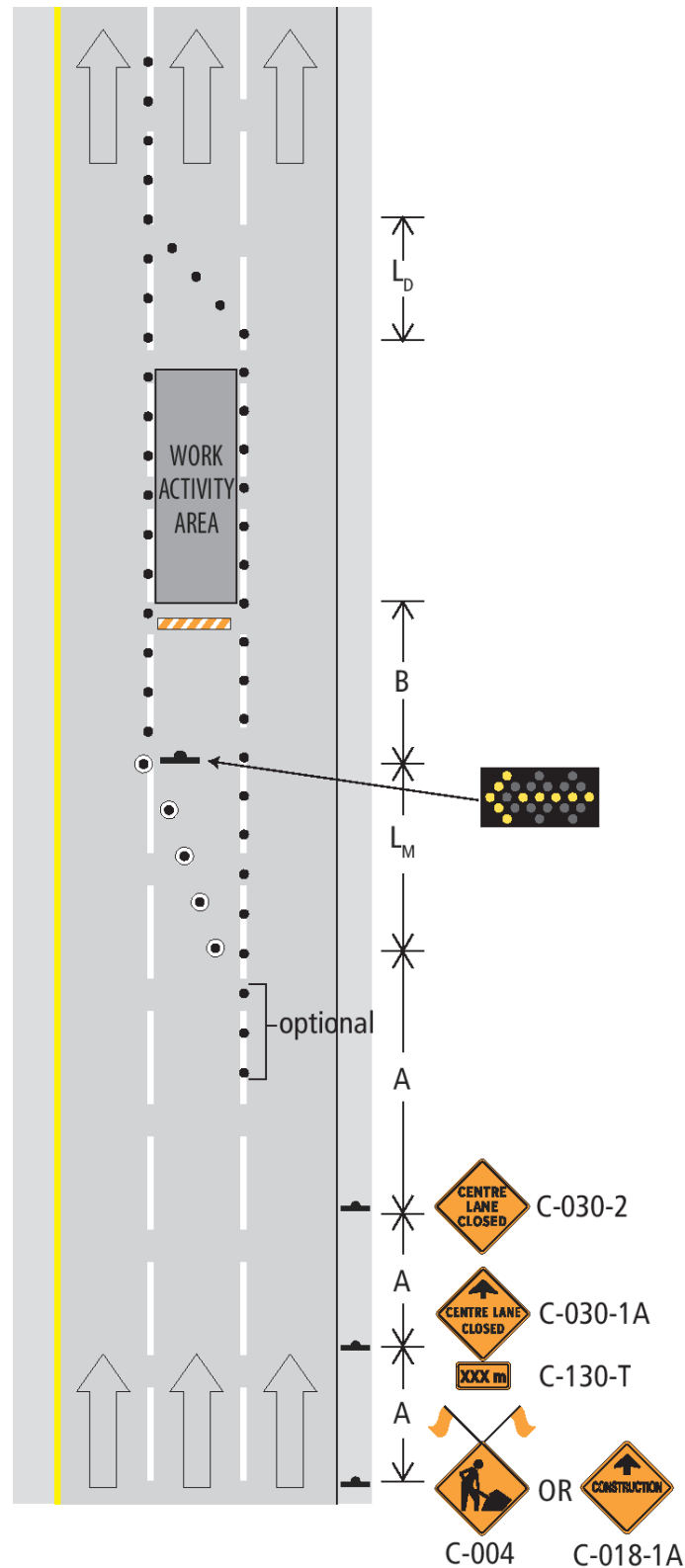
Guidance:

- The spacing of channelizing devices may be reduced to prevent traffic from entering the work area.
- Provided that traffic volumes are sufficiently low, it may be necessary to close two lanes to maintain adequate space for worker safety.
- If space is available, a short, single row of channelizing devices should be added in advance of the traffic split to keep vehicles in their lanes.

Options:

- Interior lane traffic may be directed to either the left or the right lane by using a flashing arrow board (FAB) with the arrow pointing in the direction of the merge taper.

Figure 8.8: Centre Lane Closure (≤ 60 km/h) – Short and Long Duration



8.9 Centre Lane Closure (≥ 70 km/h) – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure of the centre lane on a high-speed multilane roadway.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the work.
- A Centre Lane Closed C-030-2 sign is required in advance of the lane shift.
- If there is insufficient room for signs in the centre median, a dynamic message sign (DMS) is required.
- Two flashing arrow boards (FABs) shall be used, one in each taper, as shown in the diagram.
- A barricade is required on the approach side of the work activity area for long-duration work.

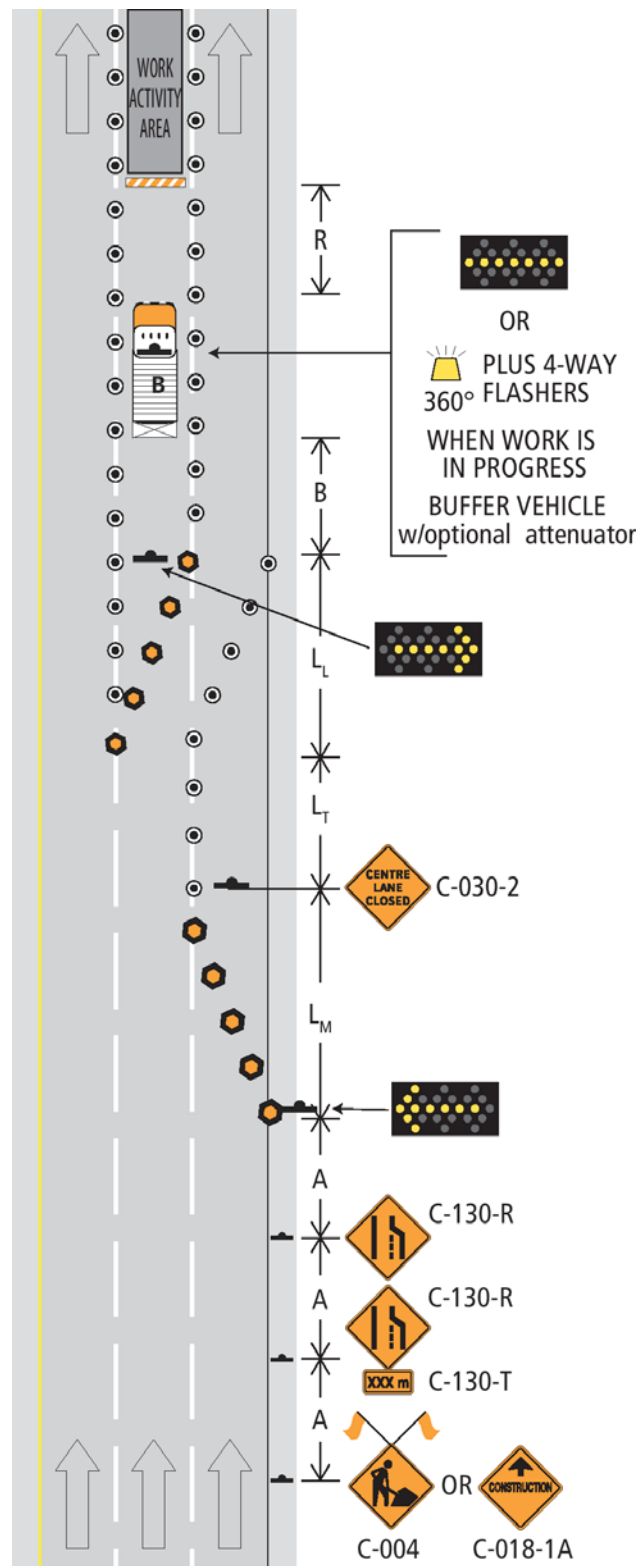
Guidance:

- If the alignment is such that the two flashing arrow boards (FABs) create confusion, the minimum tangent length (LT distance) between the end of the merging taper and beginning of the shift taper should be extended so that road users can focus on one flashing arrow board (FAB) at a time.
- The spacing of channelizing devices may be reduced to prevent traffic from entering the work area.
- Provided that traffic volumes are sufficiently low, it may be necessary to close two lanes to maintain adequate space for worker safety.
- A double lane closure (leaving only one lane open) may be implemented if traffic volumes are sufficiently low. A flashing arrow board (FAB) will be required for each closed lane.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- Interior lane traffic may be directed to either the left or the right lane by using a flashing arrow board (FAB) with the arrow pointing in the direction of the merge taper.

Figure 8.9: Centre Lane Closure (≥ 70 km/h) – Short and Long Duration



8.10 Centreline Crossover – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of all lanes in an entire direction of travel on a multilane roadway. Traffic from the closed lanes is re-routed across the centreline into the opposing travel lane, thereby reducing the number of lanes available for opposing traffic.

Using this layout reduces road capacity in both directions of travel so it is important to consider the best time of day for implementing this type of closure.

Standard:

- A Lane Closed Ahead C-130-L/R sign will be required for the left/right lane closure in advance of the work.
- Traffic shall be merged before it is shifted across the centreline.
- Two-Way Traffic Ahead C-132 signs shall be used in advance of sections where two-way traffic has been established.
- Two-Way Traffic R-010 signs shall be used where two-way traffic has been established.
- Channelizing devices or temporary traffic barriers shall be used to separate opposing lanes of traffic.
- A barricade is required in the last affected lane on the approach side of the work activity area for long-duration work.

Guidance:

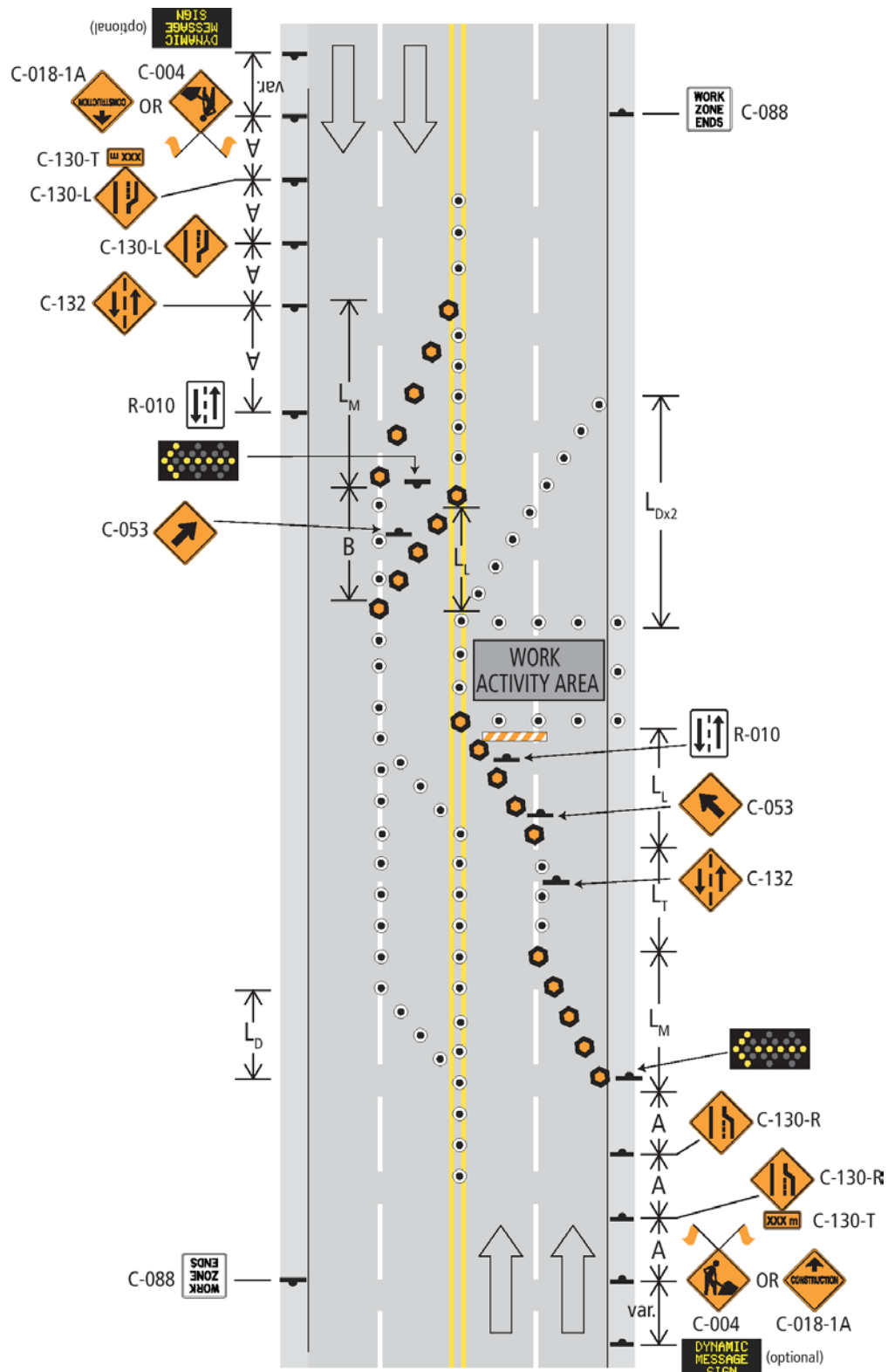
- A dynamic message sign (DMS) is recommended for night work over multiple night-time shifts.
- When re-establishing normal traffic flow, remove the signs and devices for the diverted lanes first, and then remove the devices for the opposing lanes.

Options:

- If the speed limit is ≤ 60 km/h, the upstream Right Lane Closed Ahead C-130-R sign with distance tab may be omitted, and the Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
- A custom Traffic Pattern Changed Zx-030 sign with an implementation plan on counterflow operations and transitions may be used as a supplement. See Zx-030 [Appendix B](#).
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 8.10: Centreline Crossover – Short and Long Duration



8.11 Two-Way Left-Turn Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of a two-way left-turn lane. If the work will encroach into either travel lane, a left lane closure for the affected lane(s) should be considered.

Standard:

- A flashing arrow board (FAB) in caution mode is required for each direction of travel.
- Barricades are required at each end of the work activity area for long-duration work.

Guidance:

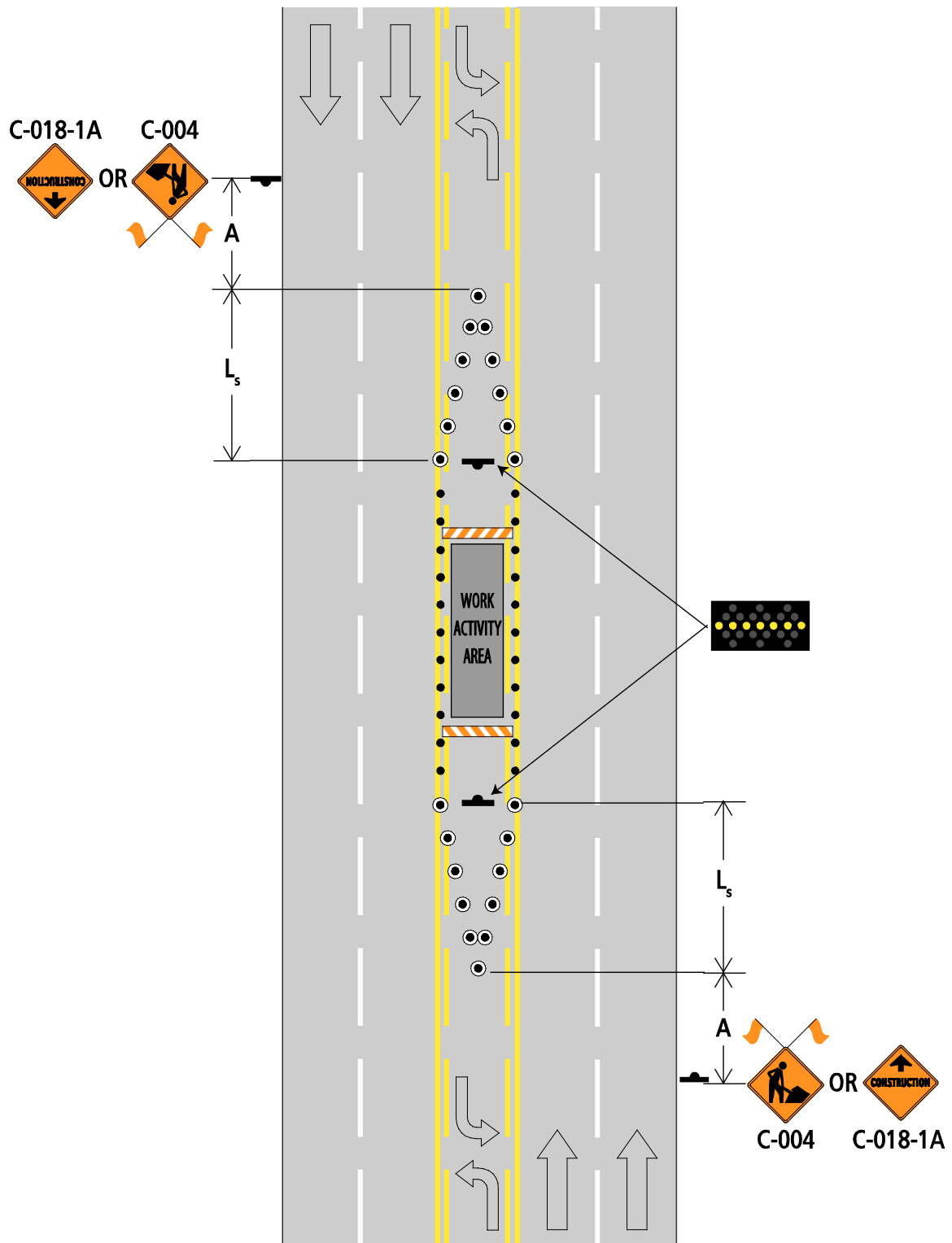
- Left-turning movements may be prohibited along the work activity area and taper.

Options:

- Depending on the nature of the work and whether or not it will encroach into either travel lane, one or both adjacent lanes may also have to be closed.
- For speeds ≤ 60 km/h, cones may be used instead of the tubular markers to channelize traffic.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 8.11: Two-Way Left-Turn Lane Closed – Short and Long Duration



8.12 Runaway Lane Open – Short and Long Duration

Purpose:

Runaway lanes are emergency escape ramps created for long, descending grades. On such grades, vehicle speeds may increase and brakes may overheat and fail because of the extensive braking used to slow the vehicle. The runaway lanes allow vehicles with brake problems to exit the roadway and stop. Runaway lanes should be kept open whenever possible because of their importance for roadway safety.

This layout shows the typical setup for work adjacent to a runaway lane that remains open. Effort should be made to **clearly communicate the open status of the runaway lane** to truck drivers and other approaching motorists.

Standard:

- Construction equipment shall never be left parked in—or blocking access to—an open runaway lane.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the exit ramp.
- A flashing arrow board (FAB) shall be placed inside the taper.
- A buffer space shall always be used.
- A barricade is required on the approach side of the work activity area for long-duration work.
- A dynamic message sign (DMS) shall be used to communicate the runaway lane status.

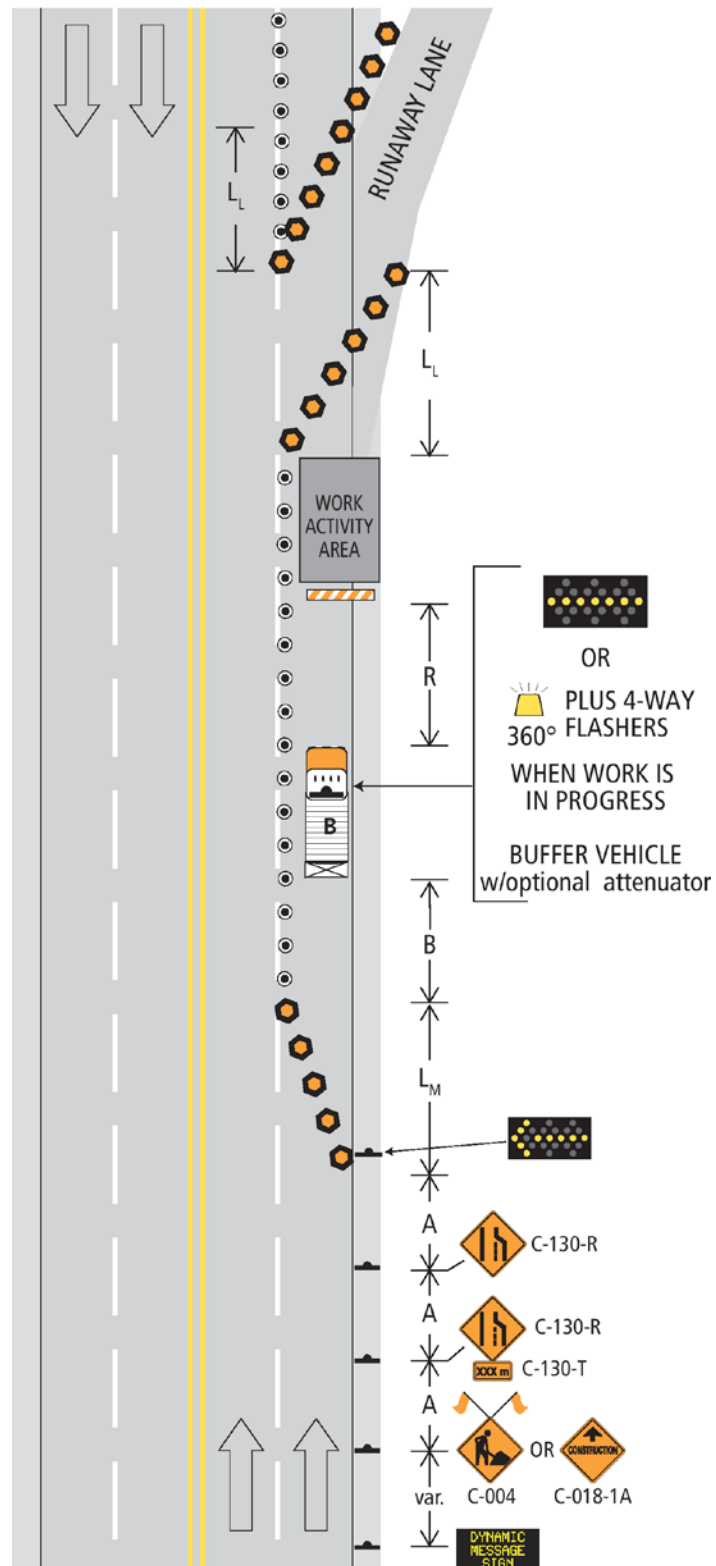
Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.
- Vehicles should not be queued in advance of—or through—the entrance to a runaway lane.

Options:

- None at this time.

Figure 8.12: Runaway Lane Open – Short and Long Duration



8.13 Runaway Lane Closed – Short and Long Duration

Purpose:

Runaway lanes are emergency escape ramps created for long, descending grades. On such grades, vehicle speeds may increase and brakes may overheat and fail because of the extensive braking used to slow the vehicle. The runaway lanes allow vehicles with brake problems to exit the roadway and stop. Runaway lanes should be kept open whenever possible because of their importance for roadway safety.

This layout shows the typical setup for work in front of a runaway lane that is closed. When work is occurring in front of runaway lanes, effort shall be made to clearly communicate the closed status of the runaway lane to truck drivers and other approaching motorists.

Even if a runaway lane is closed, extreme caution should be used when working in front of or across the runaway lane. Never assume that just because it is considered closed, a truck would not attempt to use it in an emergency.

Standard:

- Truck drivers shall be notified of runaway lane closures at (within or in advance of) the brake check and in advance of the grade.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the entrance ramp.
- The Runaway Lane Closed C-067 sign shall be positioned 200 metres or distance A, whichever is greater, in advance of the affected runaway lane. It shall be removed or covered as soon as possible once the runaway lane is available.
- For construction zones across runaway lanes, use the Closed C-061 tab mounted above or across the existing runaway signs.
- A dynamic message sign (DMS) shall be used to communicate the runaway lane closure. Appropriate positioning and messaging should be discussed with the Road Authority.
- A buffer space shall always be used.
- A barricade is required on the approach side of the work activity area for long-duration work.

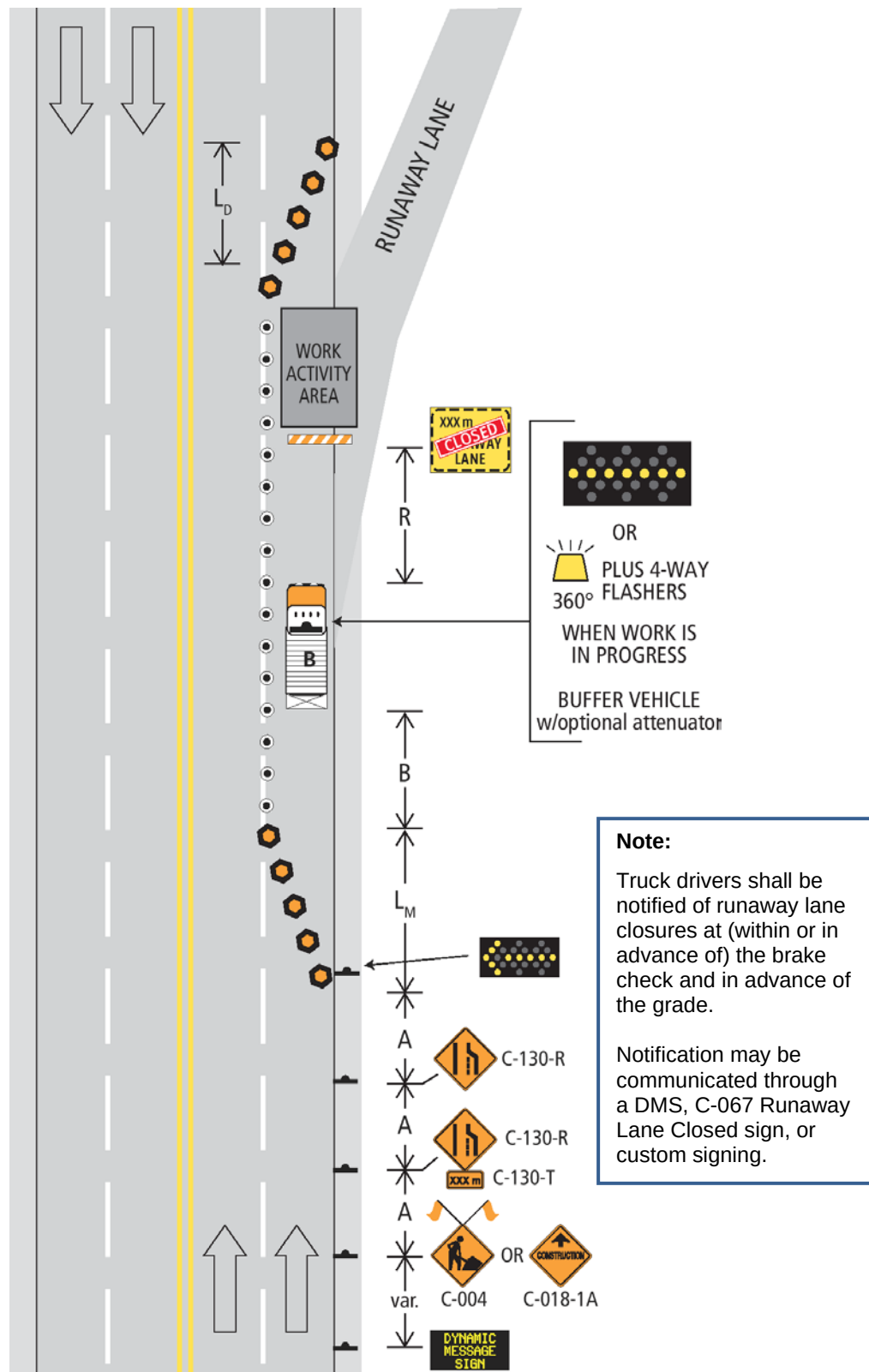
Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.
- Vehicles should not be queued in advance of—or through—the entrance to a runaway lane.
- If a lane closure is not required, the Right Lane Closed Ahead C-130 series and flashing arrow board (FAB) can be removed.

Options:

- Notification at the brake check may be communicated through a dynamic message sign (DMS), C-067 Runaway Lane Closed sign, or custom signing.

Figure 8.13: Runaway Lane Closed – Short and Long Duration



8.14 Passing/Climbing Lanes – Lane Shift – Short and Long Duration

Purpose:

In mountainous areas, the presence of truck climbing lanes or uphill passing lanes provides an opportunity to avoid single lane alternating traffic control when a lane closure is necessary in the downhill lane.

A lane shift may be used to move downhill traffic into the left-most uphill lane while uphill traffic is restricted to a single lane. Using a lane shift is preferable to stopping downhill traffic, but it may not always be feasible.

Standard:

- Two-Way Traffic Ahead C-132 signs shall be used in advance of sections where two-way traffic has been established.
- Two-Way Traffic R-010 signs shall be used along tangents where two-way traffic has been established.
- A flashing arrow board (FAB) shall be placed inside the tapers.
- Passing/climbing lane signs that are no longer applicable because of the lane shift shall be covered.
- A barricade is required on the approach side of the work activity area for long-duration work.

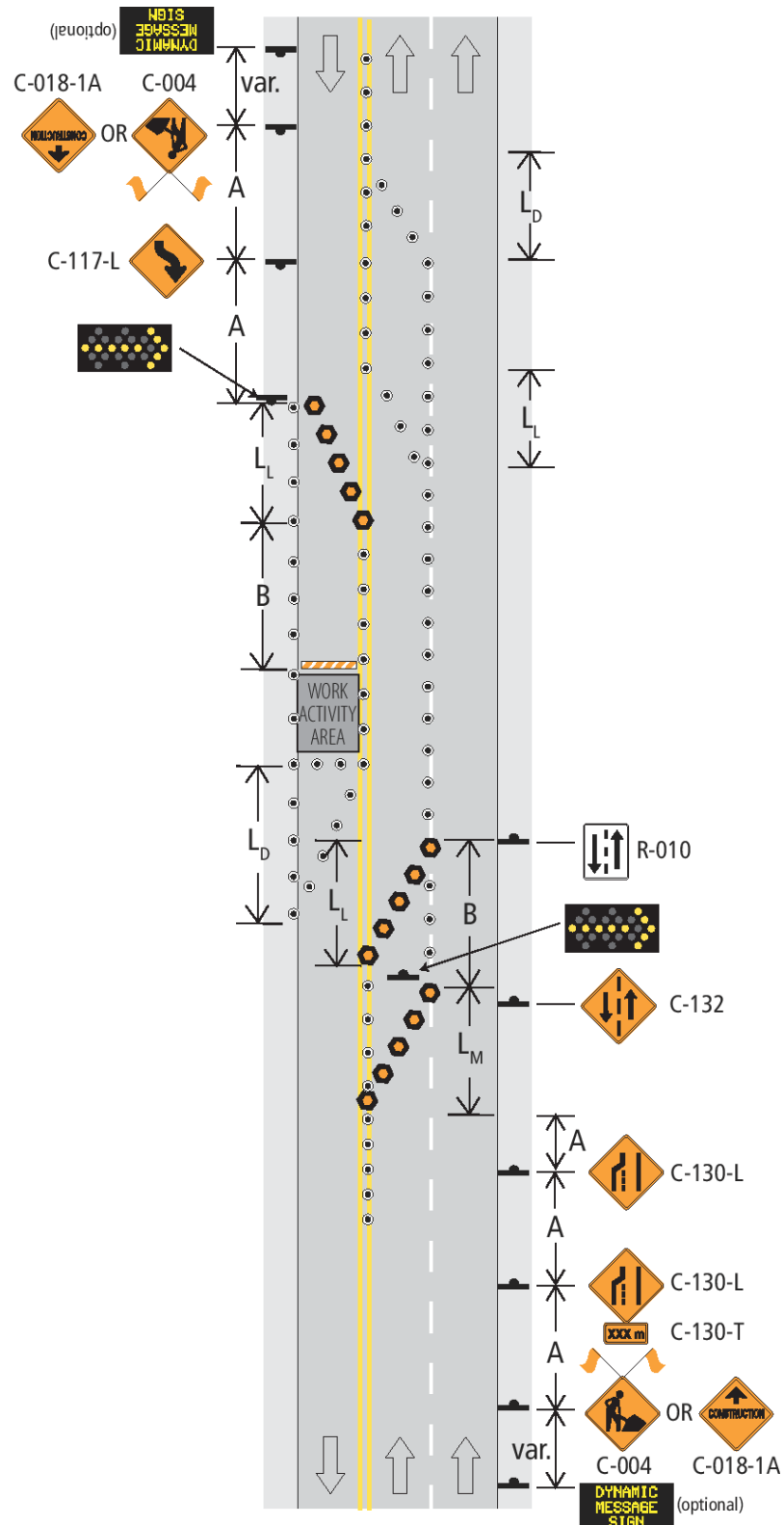
Guidance:

- Passing restrictions in both directions should be discussed with the Road Authority to determine whether or not traffic volumes will allow decreased capacity in the uphill direction.

Options:

- None at this time.

Figure 8.14: Passing/Climbing Lanes – Lane Shift – Short and Long Duration



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PART B – TRAFFIC CONTROL

Section 9: Traffic Control Layouts – Multilane Divided Roadways

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PART B – TRAFFIC CONTROL

Section 9: Traffic Control Layouts – Multilane Divided Roadways

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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9.1 General Information – Multilane Divided Roadway

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign shall be used.
- For long-duration work, a Construction Ahead C-018-1A sign shall be used.
- Where the speed limit is ≥ 70 km/h, a buffer space shall be used.
- A flashing arrow board (FAB) shall be used when a lane is closed.
- All work, buffer, and shadow vehicles shall be equipped with a 360-degree flashing light and 4-way flashers.
- A barricade is required in the last affected lane on the approach side of the work activity area for long-duration work.

Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.

Options:

- Where cyclists are regularly observed using the shoulder, a Share the Road W-132-1 sign may be used with an appropriate cycling hazard tab (see [Section 18: Traffic Control Layouts – Bicycle Lanes](#) for additional information).
- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.

9.2 Typical Construction Speed Zone Signing – Multilane Divided Roadway

Purpose:

Construction speed limits are regulatory speeds established in Construction Speed Zones within long-term construction and maintenance project areas where there are continuous hazards for motorists or where workers are in close proximity to active travel lanes.

Construction Speed Zones should be applied prudently because **overuse reduces effectiveness**. Drivers should be able to perceive the need to reduce speed.

Standard:

- Conflicting speed limit signs within the Construction Speed Zone shall be covered or removed.

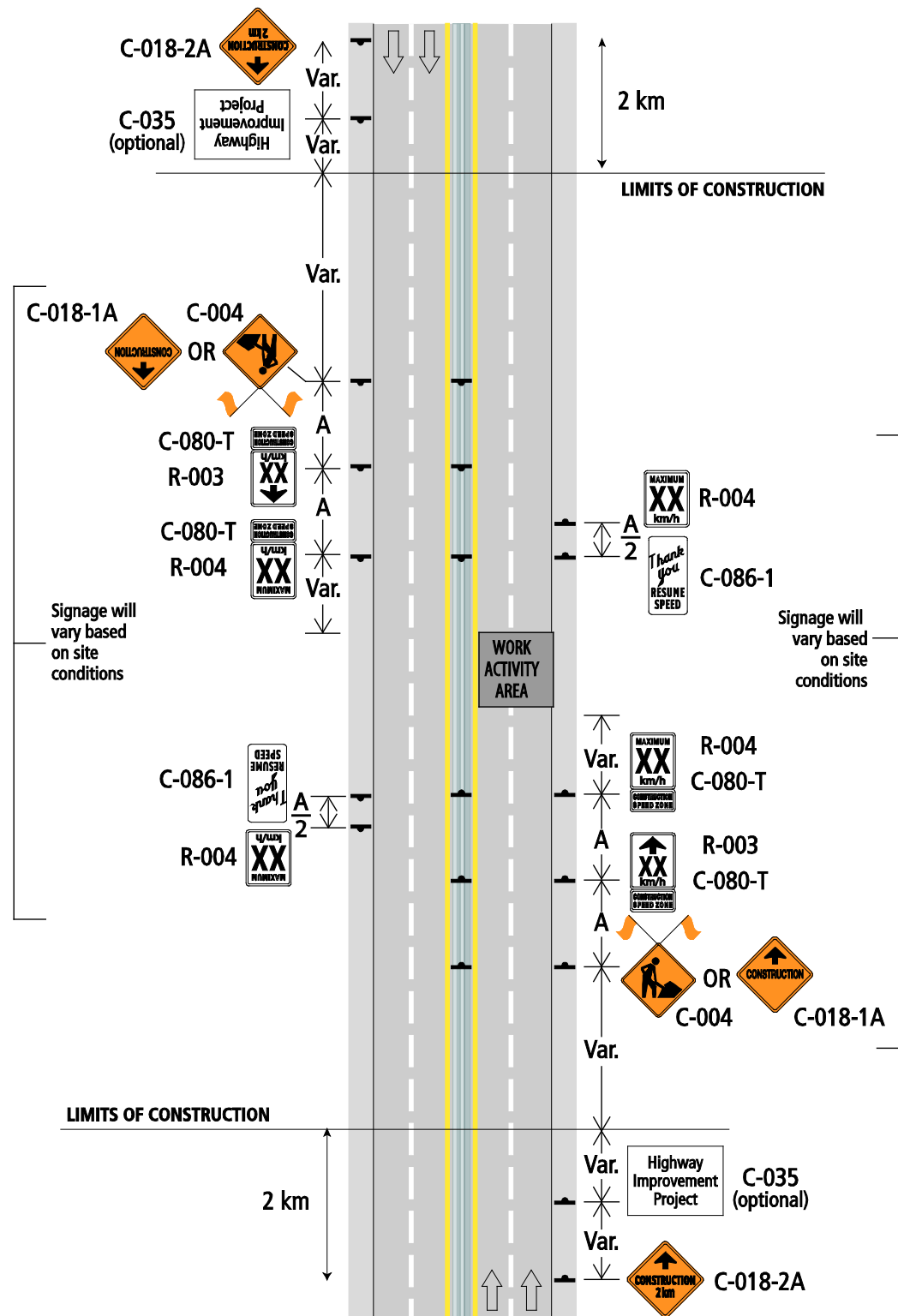
Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- The Maximum Speed R-004 speed sign with a Construction Speed Zone C-080-T distance tab should be positioned at the beginning of the active work area.
- Construction speed limit signs should be covered or removed when no work is occurring and other hazards are not present.
- It is important to record when construction speed limits are installed and covered/removed.
- See also [Section 2.4: Management of Speed](#) for information on using Construction Speed Zones.

Options:

- Use of the Construction Project C-035 sign is project-dependent. It is typically used only for large projects. See [Appendix B: Standard Construction Signs](#) for information on using this sign.
- If secondary signs are applied, they should be installed on the left side of the highway.

Figure 9.2: Typical Construction Speed Zone Signing – Multilane Divided Roadway



9.3 Emergent Work (<5 Minutes) – Multilane Divided Roadway

Purpose:

Emergent work involves very short-duration activities for which setting up and taking down temporary traffic control devices may take more time than the actual work, and expose workers to greater risk. Each entry onto the travelled portion of the roadway lasts less than 1 minute, and the total time to complete the task is less than 5 minutes.

This does not include emergencies, which are situations which require immediate response to save lives or prevent serious injury using whatever resources are available.

It may occur when an unanticipated situation or event—one that presents a risk to the travelling public—is discovered during travel or work activities. It can be considered unplanned, urgent maintenance work. A Traffic Control Plan is not required for emergent work.

Emergent work may include the removal of debris from the roadway (e.g., tree limbs, lost cargo, dead animals, tire and other vehicle debris, and the manual removal of rock). Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A risk evaluation is required to determine whether or not the work activity is considered emergent (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The entire work activity shall be completed in less than 5 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

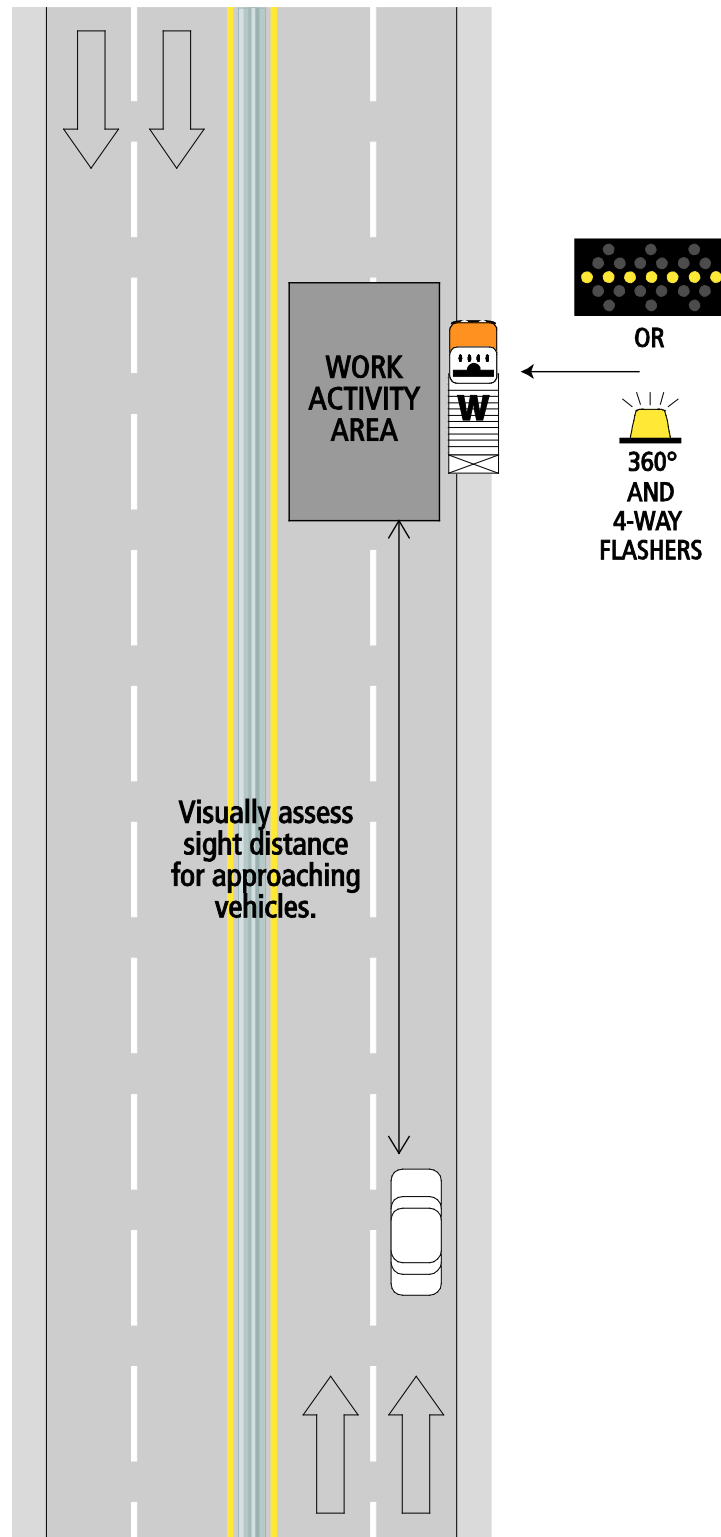
Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- Alternatively, a 360-degree flashing light and 4-way flashers should be used.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and work being performed.

Options:

- None at this time

Figure 9.3: Emergent Work (<5 Minutes) – Multilane Divided Roadway



9.4 Brief-Duration Work (<15 Minutes) – Multilane Divided Roadway

Purpose:

Brief-duration work is generally planned, although the exact location or extent of the work required may not be fully known. It requires less than 15 minutes to complete.

Brief-duration work may include:

- locating drainage structures or other roadway features or components
- cleanup of material spills and removing debris from the roadway (e.g., small fallen trees, larger tree limbs, crash debris, etc.)
- quick repairs intended as a partial or temporary response to damage or failure

If the work is expected to last 15 minutes or longer, additional resources will be needed to implement a short-duration work zone. The work should be delayed until the appropriate work zone equipment and devices are available.

Isolated pothole patching—patching 1 or 2 potholes in a 1-kilometre section of road—may be considered emergent or brief-duration work. However, it is mobile work when the work crew has to stop several times in succession within a 1-kilometre section to patch multiple potholes.

Standard:

- A Crew Working Ahead C-004 is required in advance of the work.
- A risk evaluation is required to determine whether or not the work activity is considered emergent (see [Table C – Risk Evaluation for Emergent or Brief-Duration Work](#) in [Section 6.10](#) or [Appendix F](#)).
- The work activity shall be completed in less than 15 minutes.
- The work vehicle shall use a flashing arrow board (FAB) in caution mode or a 360-degree flashing light and 4-way flashers.

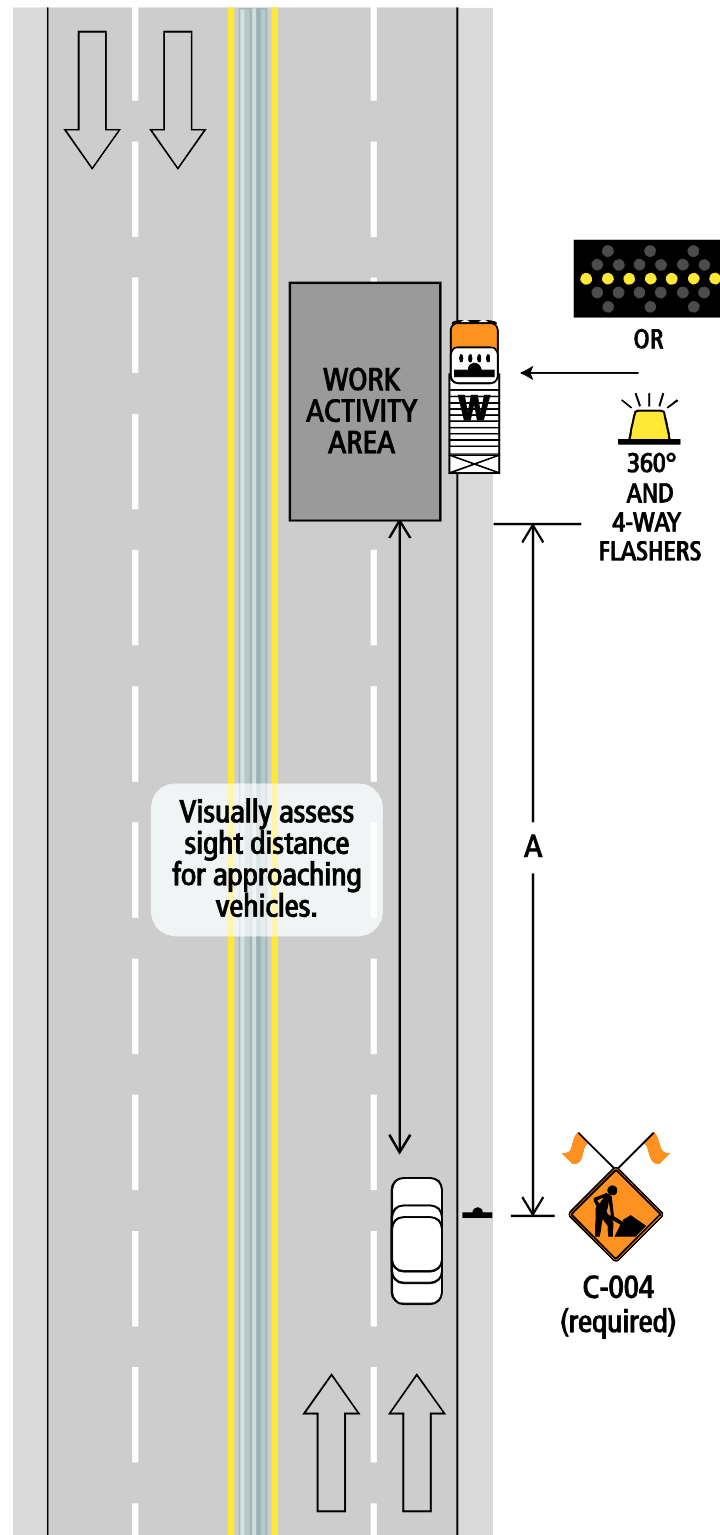
Guidance:

- If a dynamic message sign (DMS) or flashing arrow board (FAB) is used for an operation on the shoulder, it should be set to caution mode.
- The position of the work vehicle in relation to the work area may be adjusted based on the available sight distance, shoulder/off-roadway conditions, and the work being performed.

Options:

- None at this time.

Figure 9.4: Brief-Duration Work (<15 Minutes) – Multilane Divided Roadway



9.5 Work on Shoulder – Short and Long Duration

Purpose:

Stationary work on the shoulder takes place outside the travel lanes but occupies part or all of the shoulder area.

If shoulder work encroaches into a travel lane, a full lane closure shall be implemented.

Standard:

- When work is in progress and workers are present, a flashing arrow board (FAB) in caution mode is required in the taper or immediately in advance of the work area.
- A barricade is required on the approach side of the work activity area for long-duration work.

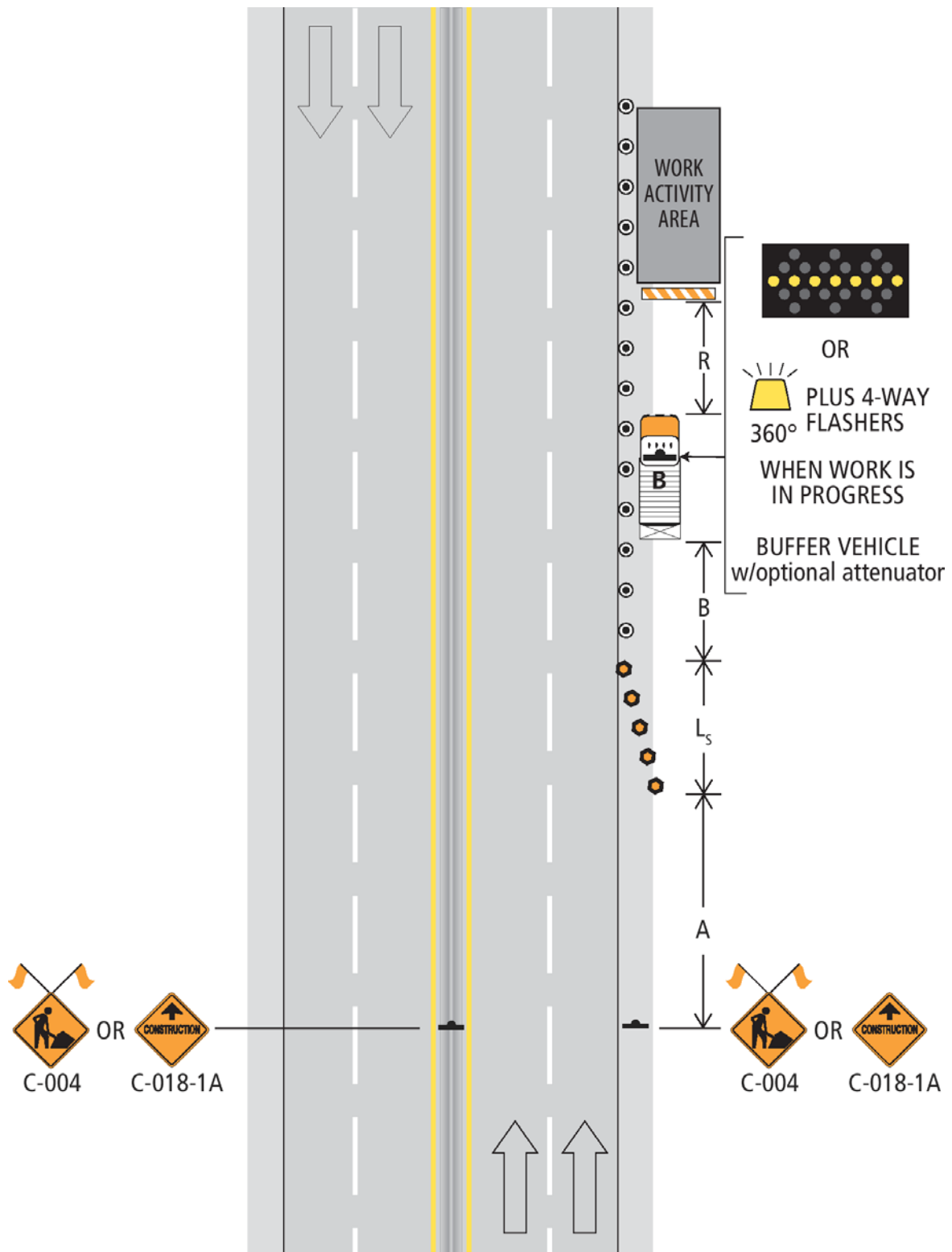
Guidance:

- When work is not in progress but the work area has not been cleared, care should be taken to isolate it from the travelled roadway.

Options:

- Signage may be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Advance warning signs may be applied in the opposing direction of travel.
- If the speed limit is ≤ 60 km/h, or there is insufficient room, tubular markers may replace drums for the taper.
- The channelizing devices used alongside the work area may be tubular markers or cones.
- Advance warning signs may be omitted for short-duration work if the shadow vehicle displays a vehicle-mounted dynamic message sign (DMS) or flashing arrow board (FAB) in caution mode and uses a 360-degree flashing light and 4-way flashers.

Figure 9.5: Work on Shoulder – Short and Long Duration



9.6 Right Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for closure of the right travel lane on a multilane divided highway.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the work.

Guidance:

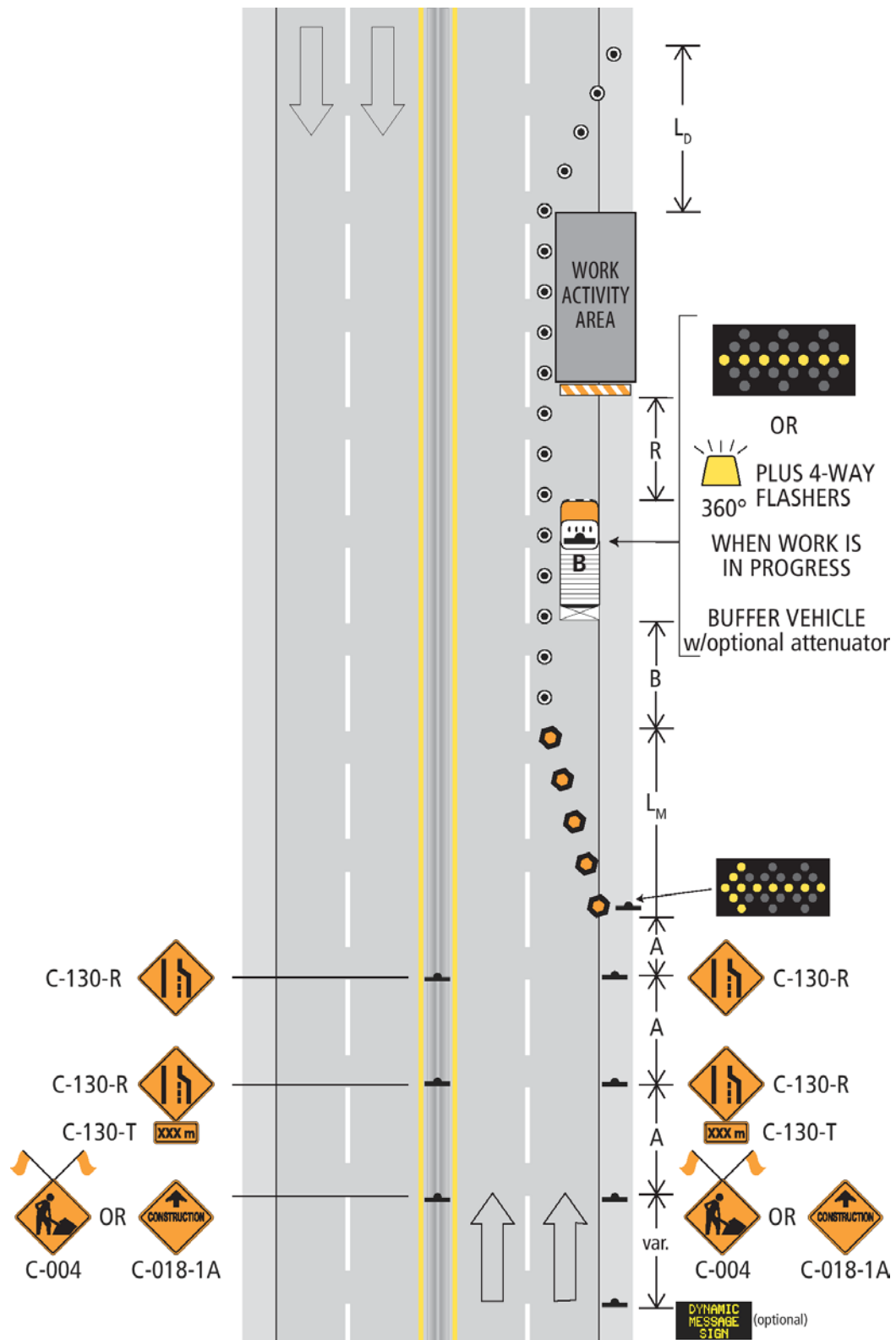
- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- If the regular posted speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed C-130-R sign with distance tab may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 9.6: Right Lane Closed – Short and Long Duration



9.7 Left Lane Closed – Short and Long Duration

Purpose:

This layout shows the typical setup for closure of the left travel lane on a multilane divided highway.

Standard:

- A Left Lane Closed Ahead C-130-L sign with a C-130-T distance tab and a second Left Lane Closed Ahead C-130-L sign shall be placed in advance of the work.
- Where the posted speed limit is ≥ 70 km/h, a flashing arrow board (FAB) is required.

Guidance:

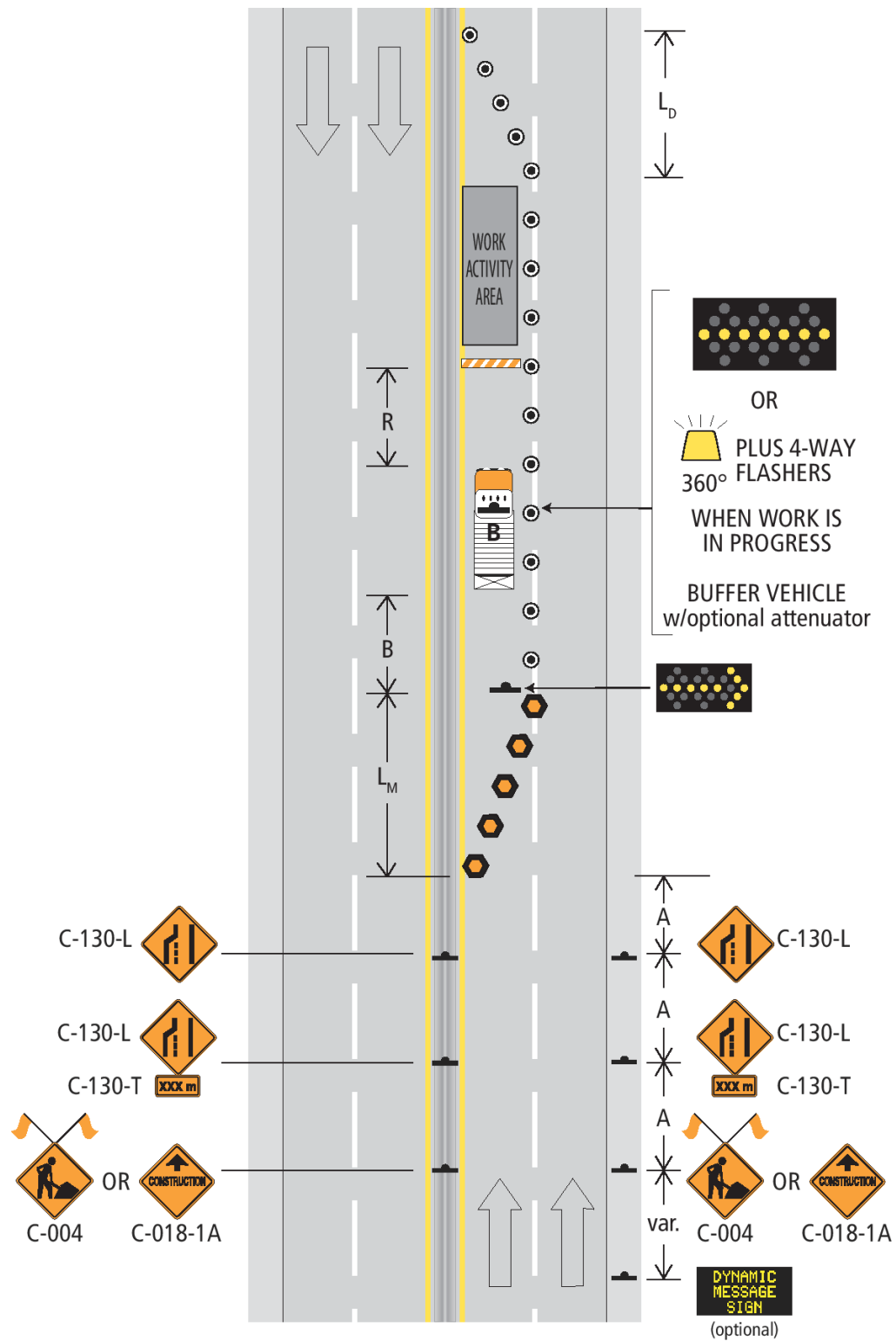
- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.

Options:

- If the regular posted speed limit is ≤ 60 km/h:
 - The upstream Left Lane Closed C-130-L sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 9.7: Left Lane Closed – Short and Long Duration



9.8 Centre Lane Closure (≤ 60 km/h) – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure of the centre lane on a low-speed multilane roadway.

Standard:

- A Centre Lane Closed Ahead C-030-1A sign with a C-130-T distance tab and a Centre Lane Closed C-030-2 sign are required in advance of the work.
- A buffer space shall be incorporated into the layout.

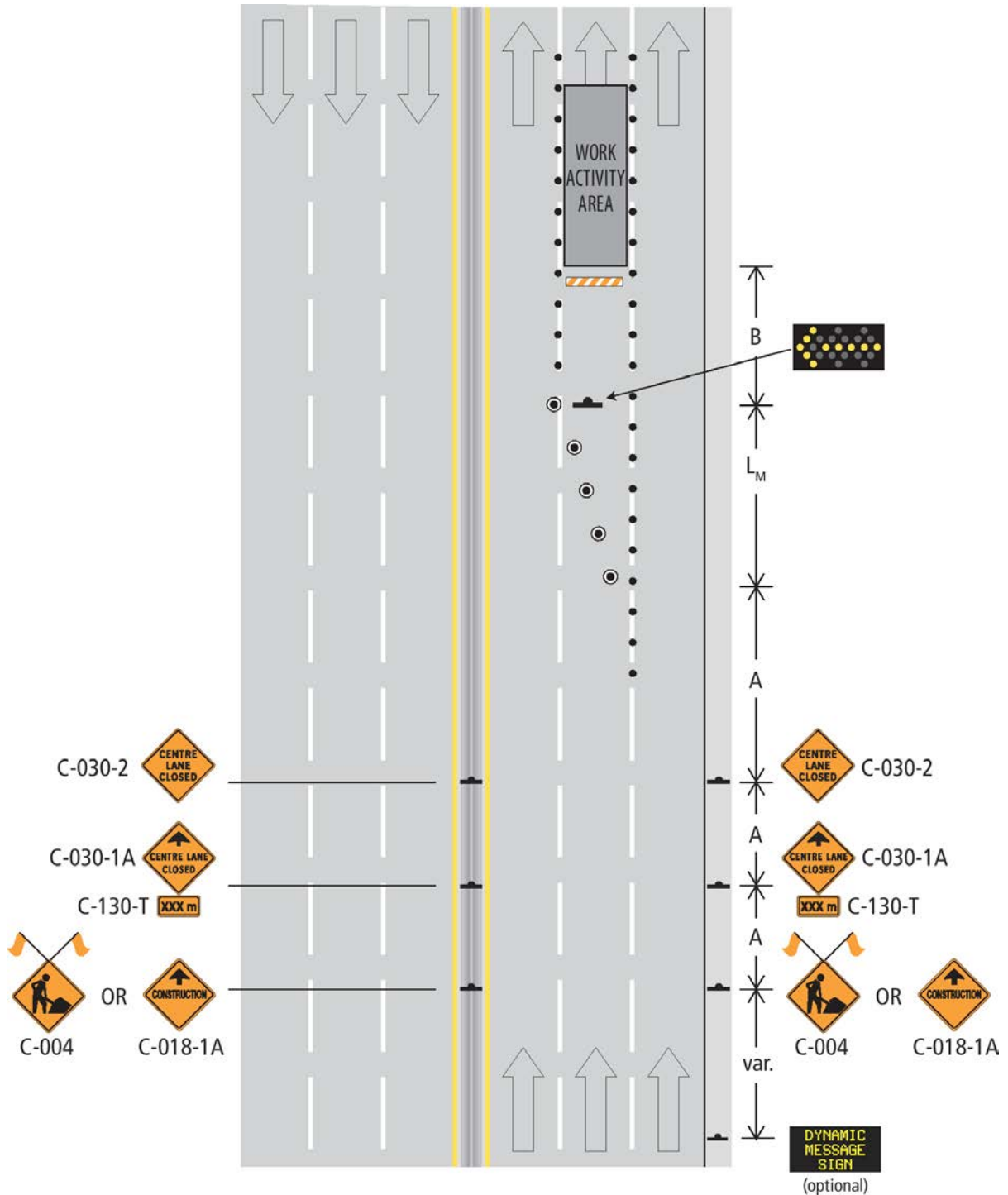
Guidance:

- The spacing of channelizing devices may be reduced to prevent traffic from entering the work area.
- Provided that traffic volumes are sufficiently low, it may be necessary to close two lanes to maintain adequate space for worker safety.
- If space is available, a short, single row of channelizing devices should be installed in advance of the traffic split to keep vehicles in their lanes.

Options:

- Signage may be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Interior lane traffic may be directed to either the left or the right lane by using a flashing arrow board (FAB) with the arrow pointing in the direction of the merge taper.

Figure 9.8: Centre Lane Closure (≤ 60 km/h) – Short and Long Duration



9.9 Centre Lane Closure (≥ 70 km/h) – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure of the centre lane on a high-speed multilane roadway.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the work.
- A Centre Lane Closed C-030-2 sign is required in advance of the lane shift.
- If signs are not installed on the divided median, a dynamic message sign (DMS) is required with the message “CENTRE LANE CLOSED”.
- Two flashing arrow boards (FABs) shall be used—one in each taper—as illustrated in the diagram.

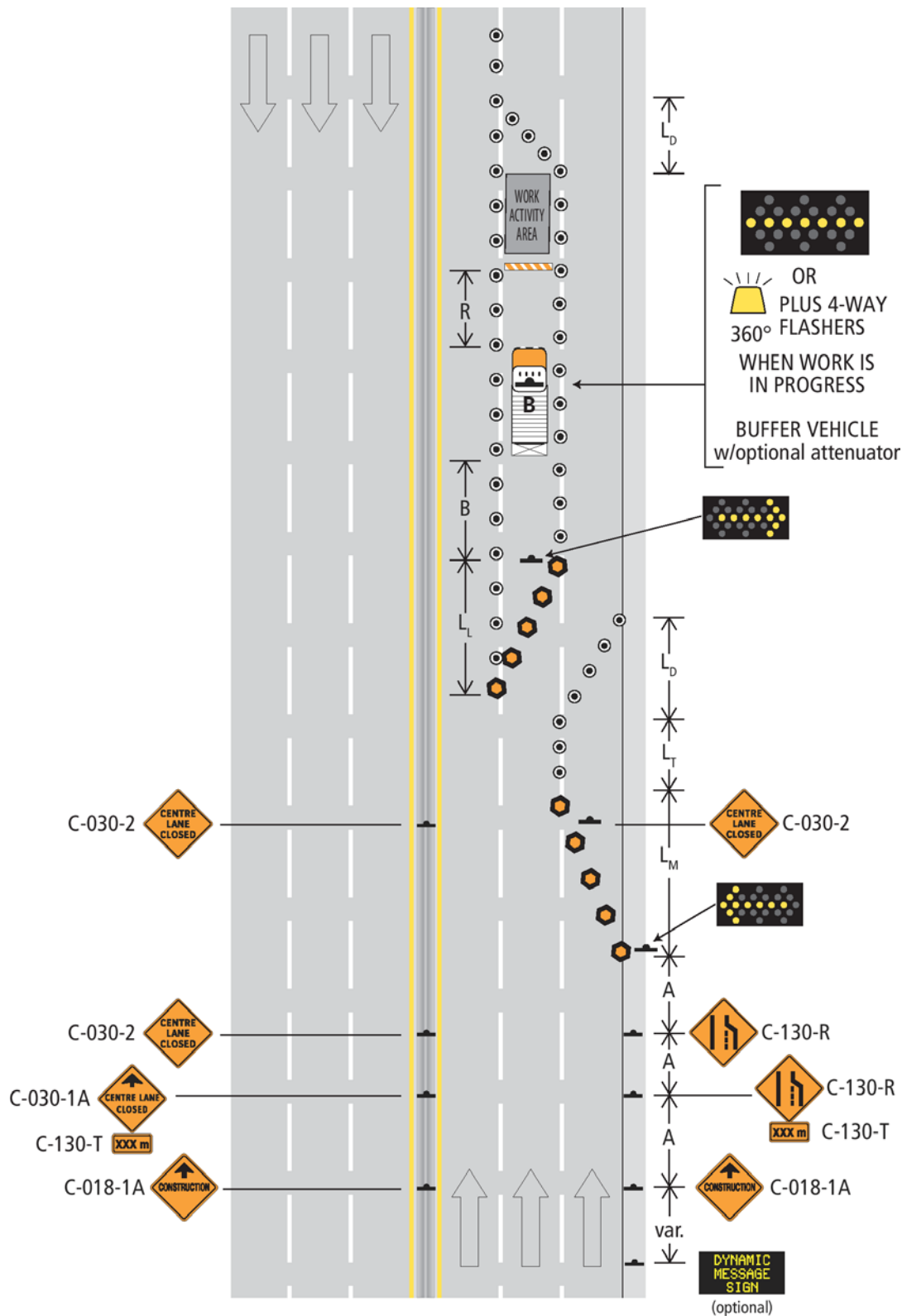
Guidance:

- If the alignment is such that the two flashing arrow boards (FABs) create confusion, the minimum tangent length (L_T distance) between the end of the merging taper and beginning of the shift taper should be extended so that road users can focus on one flashing arrow board (FAB) at a time.
- The spacing of channelizing devices may be reduced to prevent traffic from entering the work area.
- A double lane closure (leaving only one lane open) may be implemented if traffic volumes are sufficiently low, using a flashing arrow board (FAB) in the tapers for each closed lane.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- Interior lane traffic may be directed to either the left or the right lane by using a flashing arrow board (FAB) with the arrow pointing in the direction of the merge taper.

Figure 9.9: Centre Lane Closure (≥ 70 km/h) – Short and Long Duration



9.10.1 Double Right Lane Closure – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of two right lanes in a single travel direction on a multilane divided highway where at least one lane in the same direction of travel remains available to traffic.

For closures of multiple lanes, it is important that drivers have to navigate only one lane closure at a time (i.e., each closed lane will have a separate taper and merge setup). In other words, double lane closures should never require drivers to make two lane merges at one location.

Standard:

- Each lane shall be closed one at a time as shown in the layout.
- A separate flashing arrow board (FAB) shall be used for each closed lane.

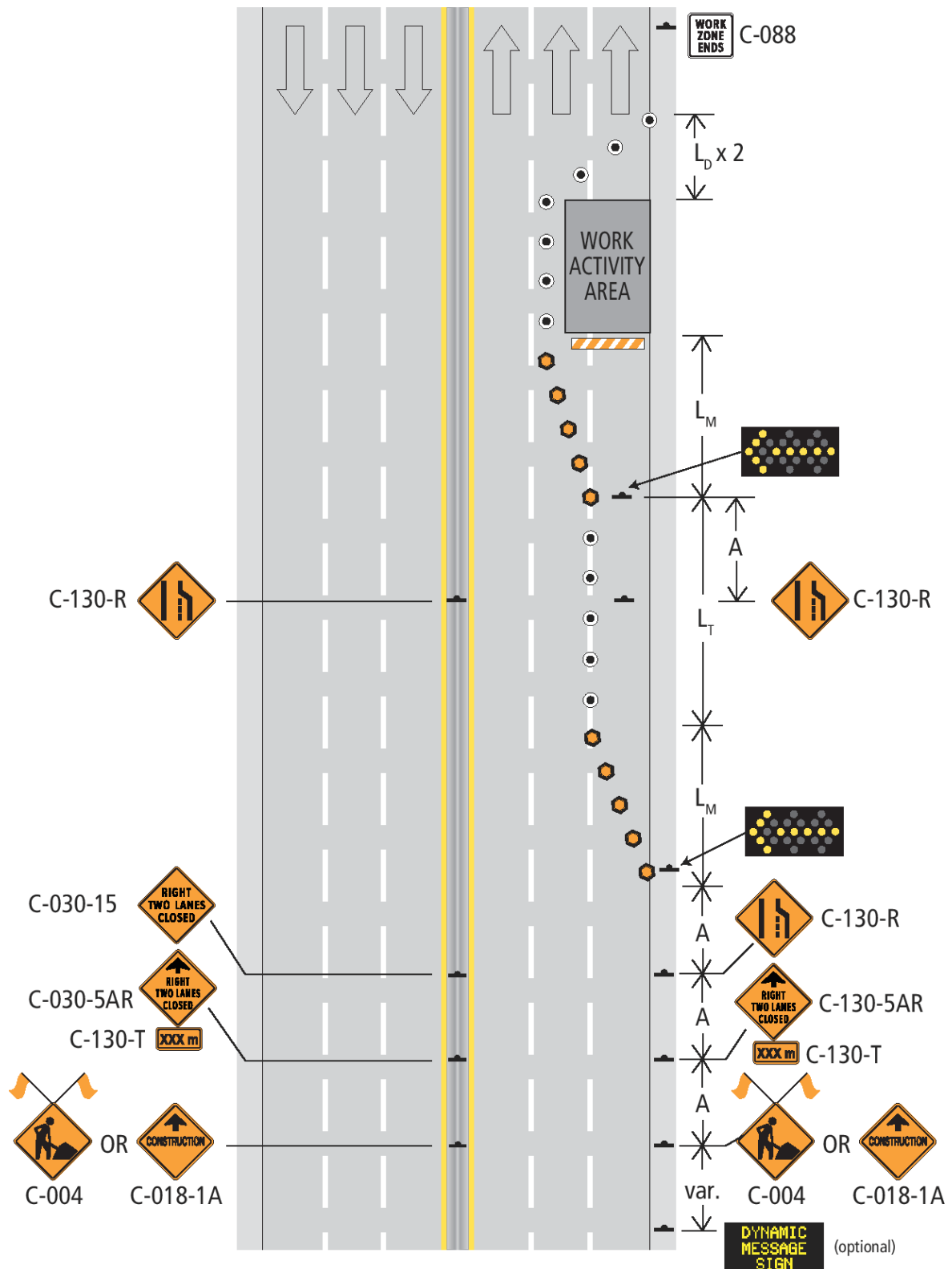
Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- For long-duration work, a dynamic message sign (DMS) may be used in advance of the Construction Ahead C-018-1A sign.
- L_T and the positioning of the second FAB may be adjusted if the alignment creates confusion about which lane closure is being indicated by the second FAB.

Figure 9.10.1: Double Right Lane Closure – Short and Long Duration



9.10.2 Double Left Lane Closure – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of two left lanes in a single travel direction on a multilane divided highway where at least one lane in the same direction of travel remains available to traffic.

For closures of multiple lanes, it is important that drivers have to navigate only one lane closure at a time (i.e., each closed lane will have a separate taper and merge setup). In other words, double lane closures should never require drivers to make two lane merges at one location.

Standard:

- Each lane shall be closed one at a time as shown in the layout.
- A separate flashing arrow board (FAB) shall be used for each closed lane.

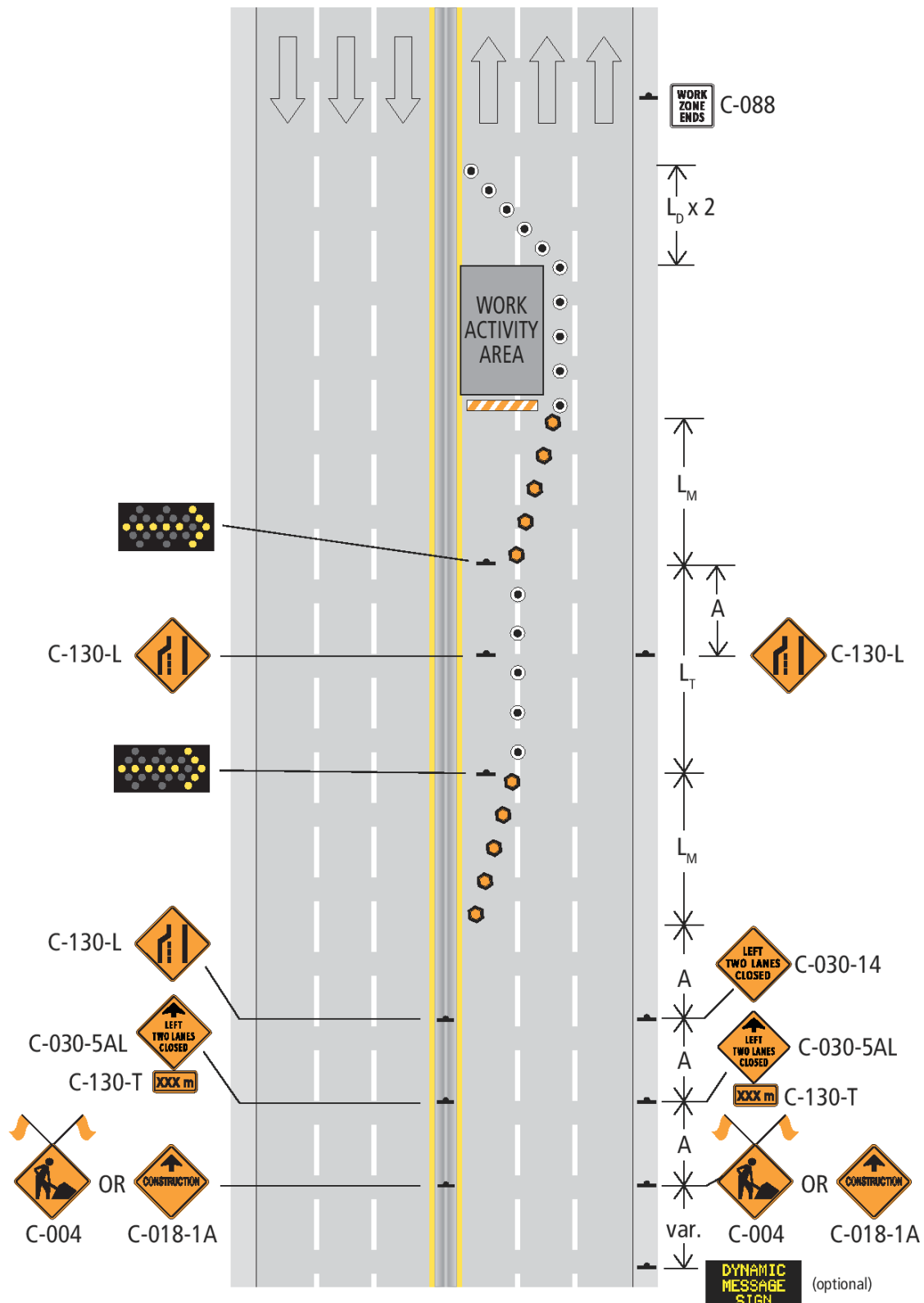
Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- For long-duration work, a dynamic message sign (DMS) may be used in advance of the Construction Ahead C-018-1A sign.
- L_T and the positioning of the second FAB may be adjusted if the alignment creates confusion about which lane closure is being indicated by the second FAB.

Figure 9.10.2: Double Left Lane Closure – Short and Long Duration



9.11 Median Crossover – Short and Long Duration

Purpose:

This layout shows the typical setup for the closure of all lanes in an entire direction of travel on a multilane roadway. Traffic from the closed lanes is re-routed across the median into the opposing travel lane, reducing the number of lanes available for opposing traffic.

This layout reduces road capacity in both directions of travel so consideration shall be given to the best time of day for implementing this type of closure.

Standard:

- A Lane Closed Ahead C-130-L/R sign will be required for the left/right lane closure in advance of the work.
- Channelizing devices or temporary barriers shall be used to separate opposing traffic.
- Two-Way Traffic Ahead C-132 signs shall be used when concrete median barrier is not used to define the new centreline.
- If median barrier is removed to enable the median crossover, the remaining exposed barrier ends shall be marked by an appropriate Hazard C-154 marker and a Type B flasher.
- If the ends of the barrier will be exposed for longer than 48 hours, suitable end treatment shall be applied as determined by the Road Authority.
- If signs are not installed on the divided median, a dynamic message sign (DMS) is required.

Guidance:

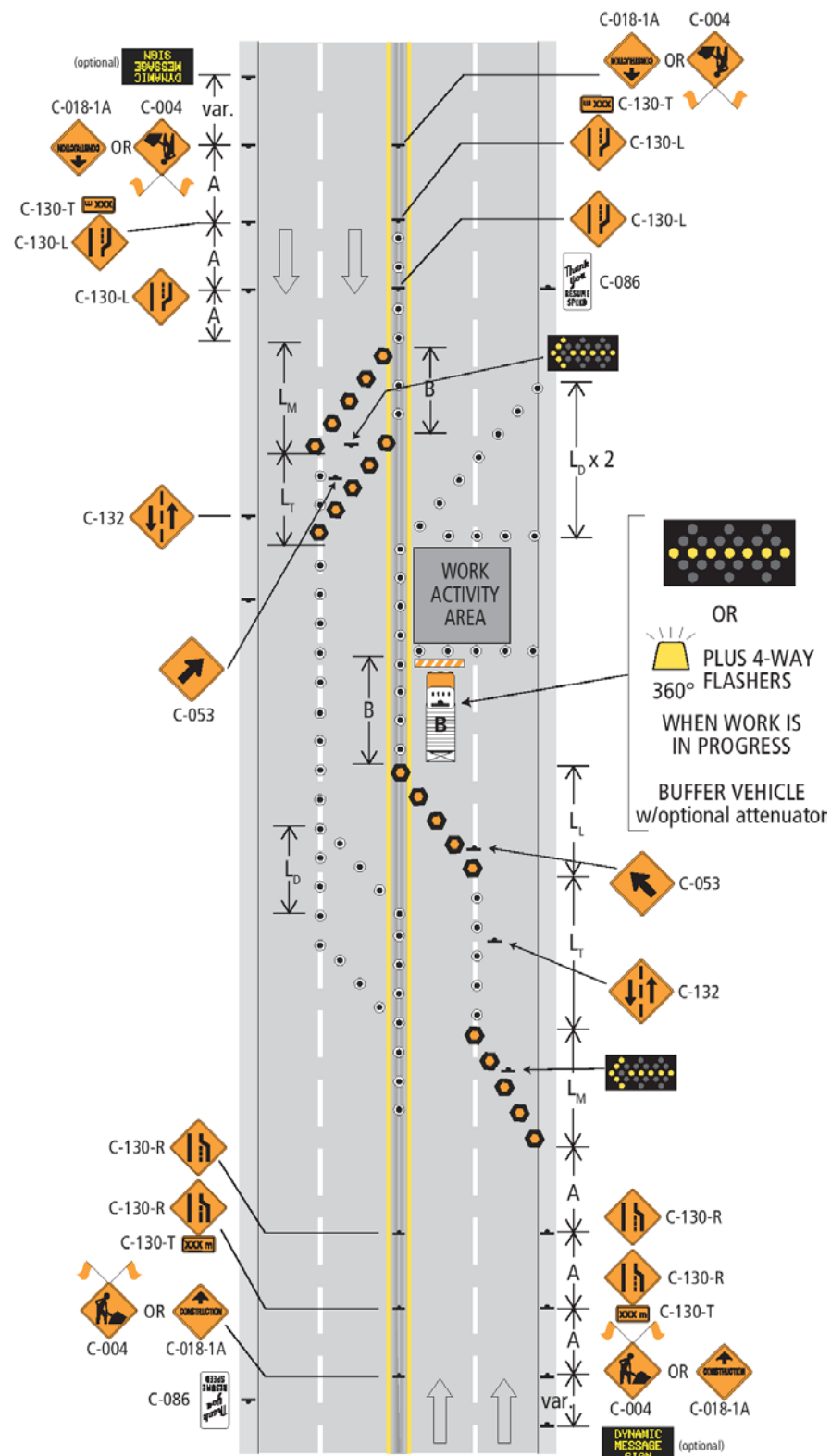
- Temporary crash attenuators should be used to protect the exposed ends of median barriers.
- The Barrier Removed C-069 sign should be used in advance of locations where the existing median barrier has been removed.
- When re-establishing normal traffic flow, remove the signs and devices for the diverted lanes first, and then remove the devices for the opposing lanes.
- A dynamic message sign (DMS) is recommended for night work over multiple night-time shifts.

Options:

- A custom Traffic Pattern Changed Zx-030 sign with an implementation plan on counterflow operations and transitions may be used as a supplement. See Zx-030 [Appendix B](#).
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 9.11: Median Crossover – Short and Long Duration



9.12 Lane Closure at Open Exit Ramp – Short and Long Duration

Purpose:

This layout shows the typical setup where there is a lane closure in the vicinity of an exit ramp but the ramp itself remains open.

The presence of construction activity and traffic control devices associated with the lane closure may cause driver uncertainty about the status of the exit ramp so it is important to use appropriate delineation and signage to let drivers know in advance—and at the exit—that the exit is open.

Standard:

- The Exit Open C-204 sign with a C-130-T distance tab shall be used in advance of the open exit to identify the distance to the new exit point.
- An additional Exit Open C-204 sign shall be used in advance of the new exit point.

Guidance:

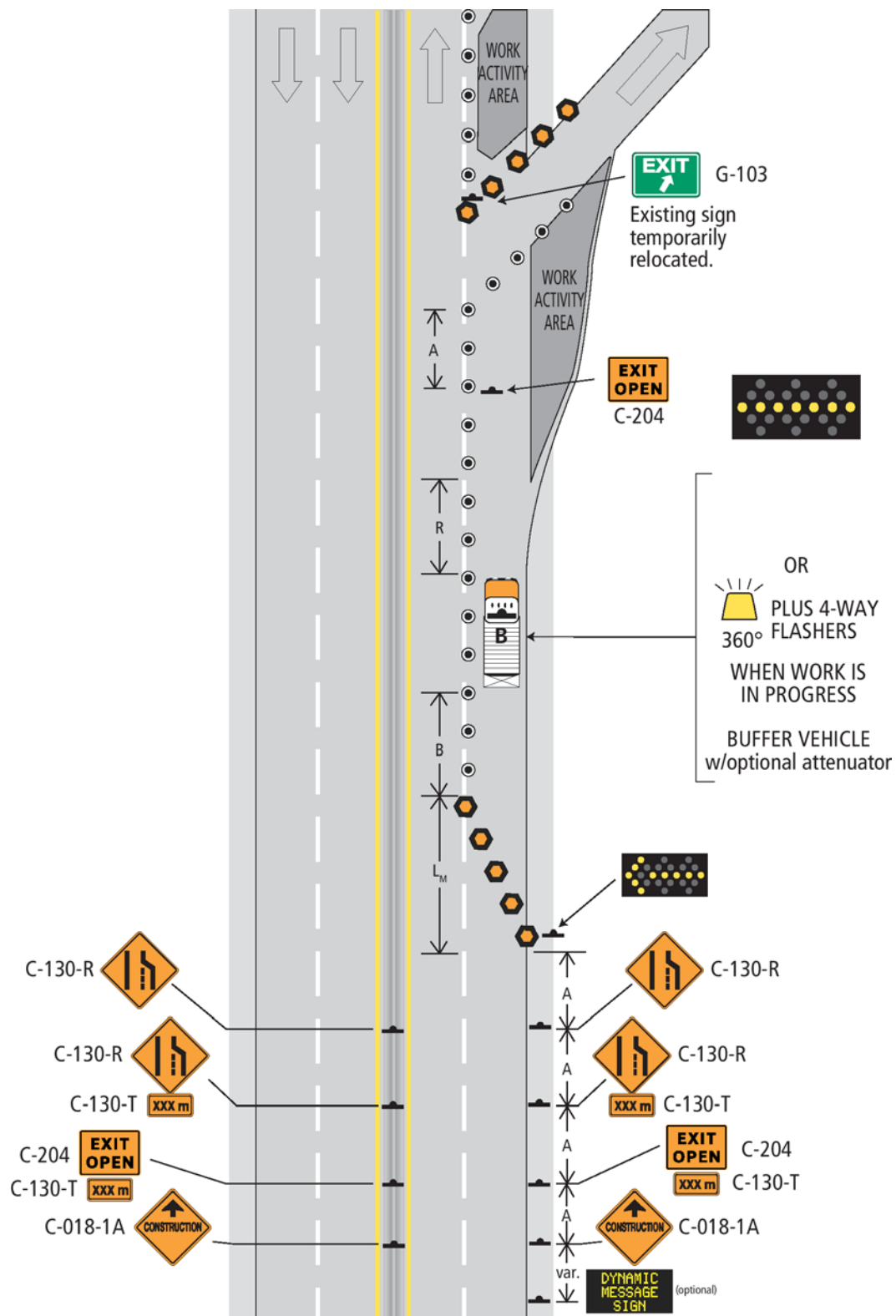
- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- The Exit G-103 sign should be used at the temporary exit to define the exit point, mounted over temporary channelizing devices in a manner that makes it highly visible to drivers.
- A dynamic message sign (DMS) is recommended for night work over multiple night-time shifts.
- Channelizing devices used to define the path to the exit ramp should be tapered so that they are consistent with the ramp approach.

Options:

- A dynamic message sign (DMS) may be used to advise drivers that the exit is open.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 9.12: Lane Closure at Open Exit Ramp – Short and Long Duration



9.13 Lane Closure at Open Entrance Ramp – Yield Condition – Short and Long Duration

Purpose:

This layout shows the typical setup where there is a lane closure in the vicinity of an entrance ramp but the ramp remains open. Construction activity near the entrance ramp may necessitate changing how vehicles enter the highway.

This layout specifically illustrates a yield condition for the entrance ramp. A yield condition shall be implemented when sufficient length cannot be maintained for a merge condition.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign are required in advance of the entrance ramp.
- A Merging Traffic Ahead C-136-R sign is required in advance of the entrance ramp to advise drivers that traffic is merging from the right in the new location.
- The entrance ramp requires a Crew Working Ahead C-004 sign or a Construction Ahead C-018-1A sign and a Yield R-002 sign to advise those entering the roadway that they are in a yield condition.

Guidance:

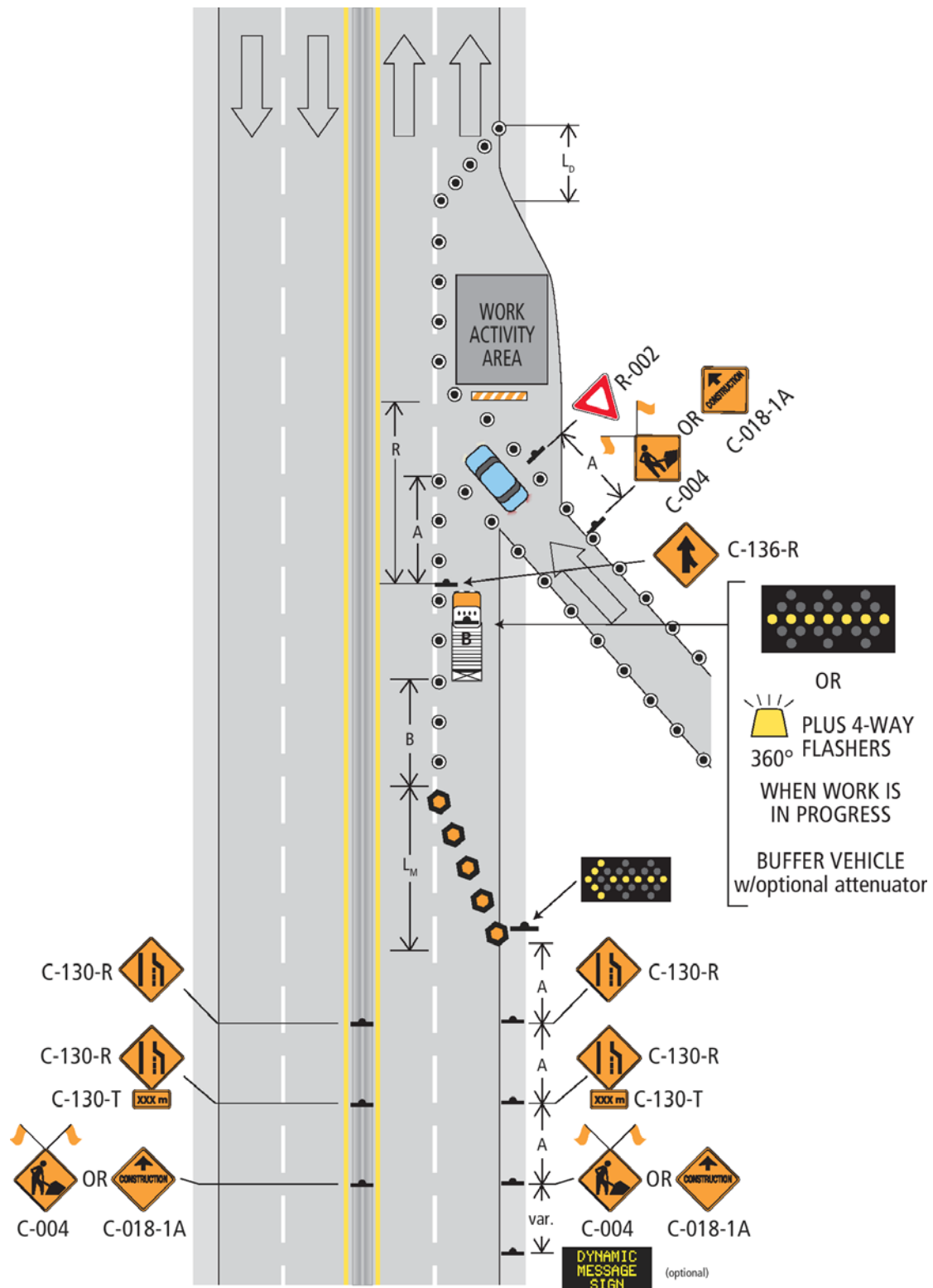
- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- The Yield R-002 sign should be positioned so that ramp traffic has adequate sight distance to select an acceptable gap in the traffic flow but not so far forward that drivers are tempted to stop in the major road traffic path.
- If insufficient gaps are available, consideration should be given to closing the ramp.
- Signs and devices should be positioned so they do not block major road drivers' view of the Merging Traffic C-136-R sign and the merging traffic.
- A dynamic message sign (DMS) is recommended for night work over multiple night-time shifts.

Options:

- If there is a construction speed limit in place, consider installing a confirmatory Maximum Speed Limit R-004 sign with a Construction Speed Limit C-080-T tab downstream of the on-ramp.
- To improve sight distance for the merging traffic, tubular markers between the ramp and the leading taper may be substituted with cones.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

**Figure 9.13: Lane Closure at Open Entrance Ramp – Yield Condition
– Short and Long Duration**



9.14 Lane Closure at Open Entrance Ramp – Merge Condition – Short and Long Duration

Purpose:

This layout shows the typical setup where there is a lane closure in the vicinity of an entrance ramp but the ramp remains open. Construction activity near the entrance ramp may necessitate changing how vehicles enter the highway.

This layout specifically illustrates a merge condition for the entrance ramp, which means that drivers entering the highway from the ramp are still able to use an acceleration lane to merge into traffic.

It is generally preferable to maintain ramp operations using a merge condition if an acceleration lane of sufficient length can be maintained.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign are required in advance of the entrance ramp.
- A Merging Traffic Ahead C-136-R sign is required along the work zone tangent and in advance of the new entrance ramp location to advise drivers that traffic is merging from the right in the new location.
- An acceleration lane of sufficient length shall be provided for a merge condition.

Guidance:

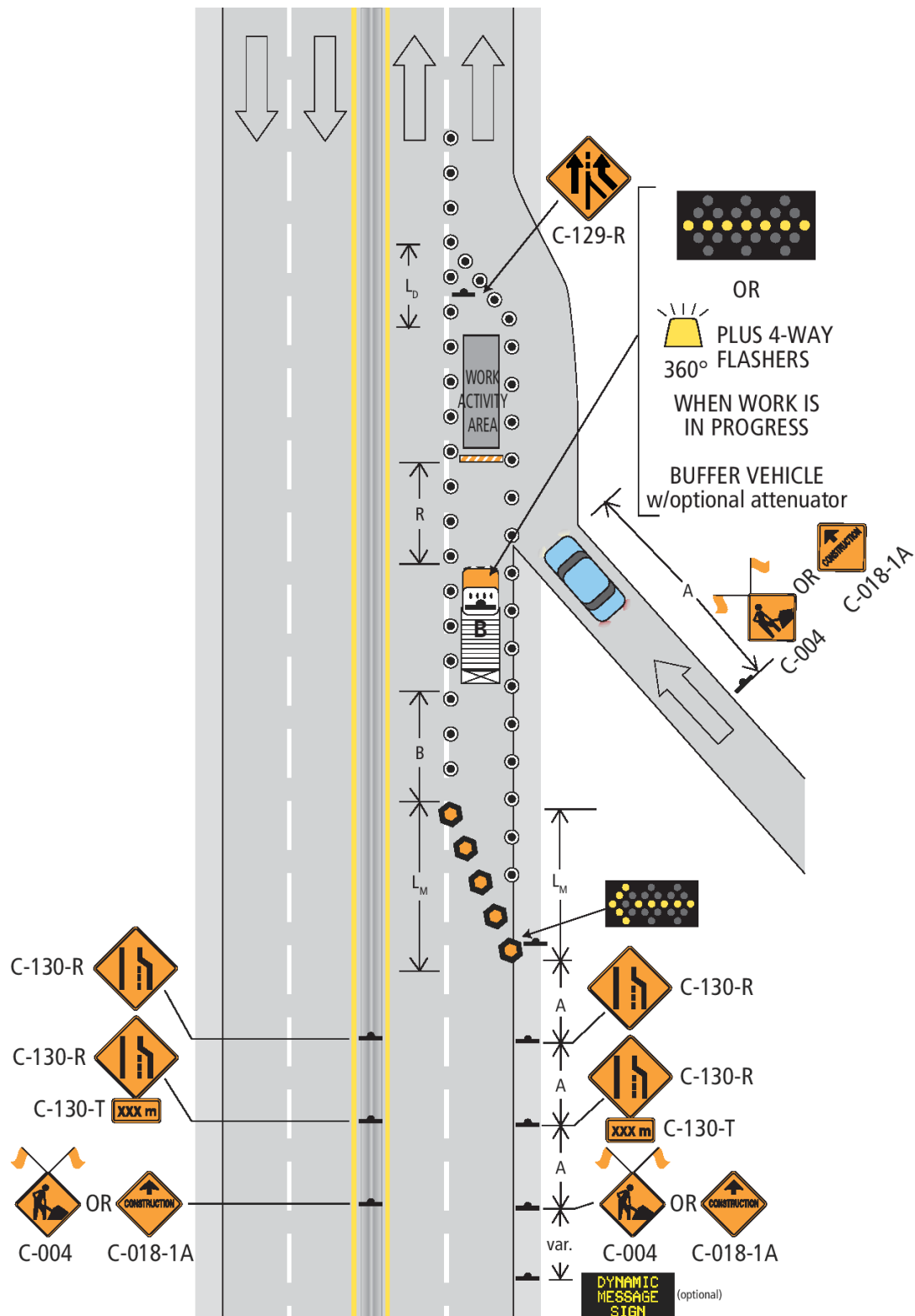
- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Signs and devices should be positioned so that they do not block major road drivers' view of the Merging Traffic C-136-R sign and the merging traffic.
- A dynamic message sign (DMS) is recommended for night work over multiple night-time shifts.

Options:

- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

**Figure 9.14: Lane Closure at Open Entrance Ramp – Merge Condition
– Short and Long Duration**



9.15 Temporary Closure of Exit Ramp – Short and Long Duration

Purpose:

This layout shows the typical setup where an exit ramp is closed.

The presence of construction activity and traffic control devices associated with the lane closure may cause driver uncertainty about the status of the exit ramp so it is important to use appropriate delineation and signage to let drivers know in advance—and at the exit—that the exit is closed.

It is important to clearly block off the entrance to the closed exit ramp and any deceleration lane.

Standard:

- The Exit Closed Ahead C-205-A sign shall be used in advance of a temporarily closed exit ramp.
- Drums shall be used to close off the deceleration lane and the exit ramp.
- An Exit Closed C-062 banner shall be attached to the existing Exit G-103 sign to indicate the closure.

Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Additional Exit Closed Ahead C-205-A signs may be required for higher-volume routes.
- Exit Closed C-062 banners should be used for long-duration closures, overlaid across existing G-5 (exit information) signs at a 45-degree angle.
- When planning the temporary closure of an exit ramp, consideration should be given to where traffic will go when it cannot use the exit.
- Alternative exit(s) should be identified to drivers by using dynamic message signs (DMS).

Options:

- A Distance C-130-T tab may be used with the Exit Closed Ahead C-205-A sign if the exit is not visible ahead or there are multiple exits in close proximity.
- For longer duration closures, roadside barriers may be used instead of flexible drums to close the exit.
- For longer duration closures, custom signs or additional dynamic message signs (DMS) providing information on alternative exit(s) may be used.
- Roadside barriers may be offset from the fog line by at least one metre and may include crash attenuation or an appropriate approach flare.
- Where permanent overhead dynamic message signs (DMS) are located in advance of the closure, exit closure information may also be provided on these signs.

9.16 Runaway Lane Open – Short and Long Duration

Purpose:

Runaway lanes are emergency escape ramps created for long, descending grades. On such grades, vehicle speeds may increase and brakes may overheat and fail because of the extensive braking used to slow the vehicle. The runaway lanes allow vehicles with brake problems to exit the roadway and stop. Runaway lanes should be kept open whenever possible because of their importance for roadway safety.

This layout shows the typical setup for work adjacent to a runaway lane that remains open. Effort should be made to **clearly communicate the open status of the runaway lane** to truck drivers and other approaching motorists.

Standard:

- Construction equipment shall never be left parked in—or blocking access to—an open runaway lane.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the exit ramp.
- A flashing arrow board (FAB) shall be placed inside the taper.
- A buffer space shall always be used.
- A dynamic message sign (DMS) shall be used to communicate the runaway lane status.

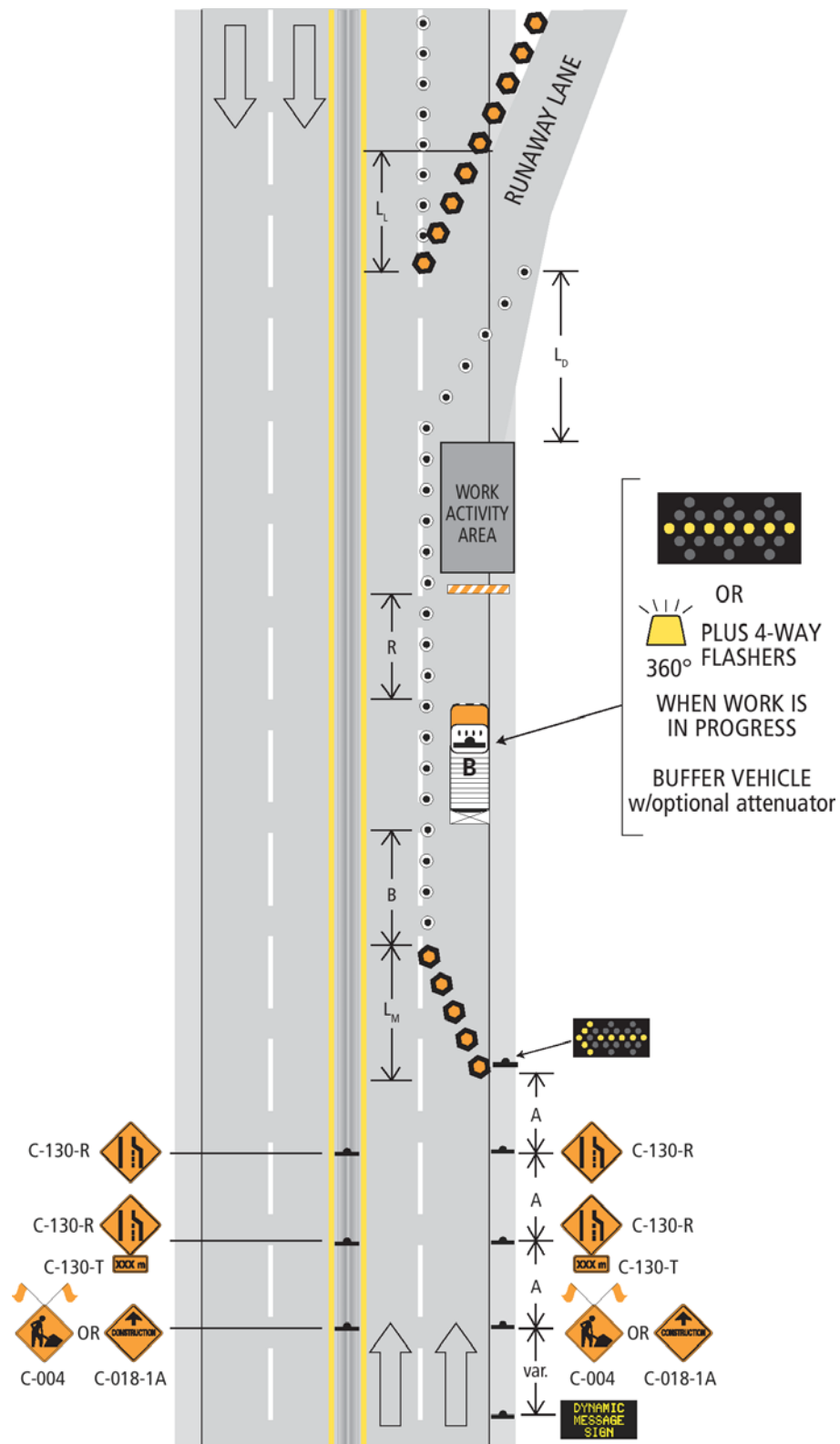
Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.
- Vehicles should not be queued in advance of—or through—the entrance to a runaway lane.

Options:

- None at this time.

Figure 9.16: Runaway Lane Open – Short and Long Duration



9.17 Runaway Lane Closed – Short and Long Duration

Purpose:

Runaway lanes are emergency escape ramps created for long, descending grades. On such grades, vehicle speeds may increase and brakes may overheat and fail because of the extensive braking used to slow the vehicle. The runaway lanes allow vehicles with brake problems to exit the roadway and stop. Runaway lanes should be kept open whenever possible because of their importance for roadway safety.

This layout shows the typical setup for work in front of a runaway lane that is closed. When work is occurring in front of runaway lanes, effort shall be made to clearly communicate the closed status of the runaway lane to truck drivers and other approaching motorists.

Even if a runaway lane is closed, extreme caution should be used when working in front of or across the runaway lane. Never assume that just because it is considered closed, a truck would not attempt to use it in an emergency.

Standard:

- Truck drivers shall be notified of runaway lane closures at (within or in advance of) the brake check and in advance of the grade.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab and a second Right Lane Closed Ahead C-130-R sign shall be placed in advance of the entrance ramp.
- The Runaway Lane Closed C-067 sign shall be positioned 200 metres or distance A, whichever is greater, in advance of the affected runaway lane. It shall be removed or covered as soon as possible once the runaway lane is available.
- For construction zones across runaway lanes, use the Closed C-061 tab mounted above or across the existing runaway signs.
- A dynamic message sign (DMS) shall be used to communicate the runaway lane closure. Appropriate positioning and messaging should be discussed with the Road Authority.
- A buffer space shall always be used.

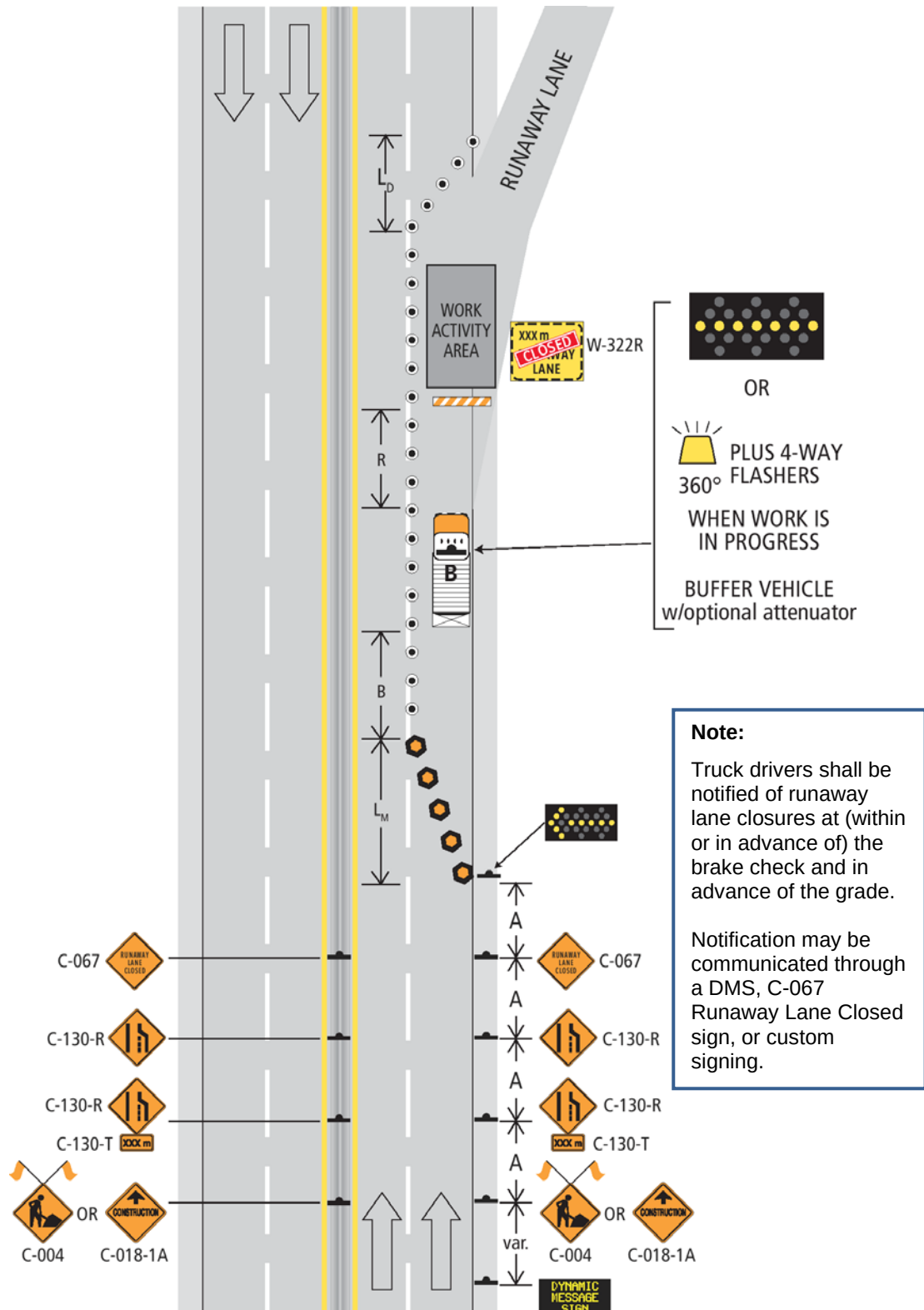
Guidance:

- Signage should be installed along the divided median. If the median space is limited, smaller sized signs may be used.
- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.
- Vehicles should not be queued in advance of—or through—the entrance to a runaway lane.
- If a lane closure is not required, the Right Lane Closed Ahead C-130 series and flashing arrow board (FAB) can be removed.

Options:

- Notification at the brake check may be communicated through a dynamic message sign (DMS), C-067 Runaway Lane Closed sign, or custom signing.

Figure 9.17: Runaway Lane Closed – Short and Long Duration



9.18 Lane Closure with Zipper Merge Signing (Queues < 800 m)

Purpose:

Late merge signs (zipper merge) may be used as an alternate to standard lane closure guidelines in high volume areas where queuing conditions are expected. Late merge signs encourage drivers to utilize both lanes until a merge point which improves efficiency by reducing congestion and aggressive driving. Late merge signs should not be used within intersections or on sharp horizontal or vertical curves. This layout shows the typical setup of late merge signs for the closure of a left travel lane on a multilane undivided highway.

For locations where queueing may extend more than 800 m upstream of the taper, refer to [Section 9.19: Lane Closure with Zipper Merge Signing \(Queues ≥ 800 m\)](#).

Standard:

- A Lane Closed Ahead C-130 sign with a C-130-T distance tab is required on both sides of the roadway
- A barricade is required on the approach side of the work activity for long-duration work

Guidance:

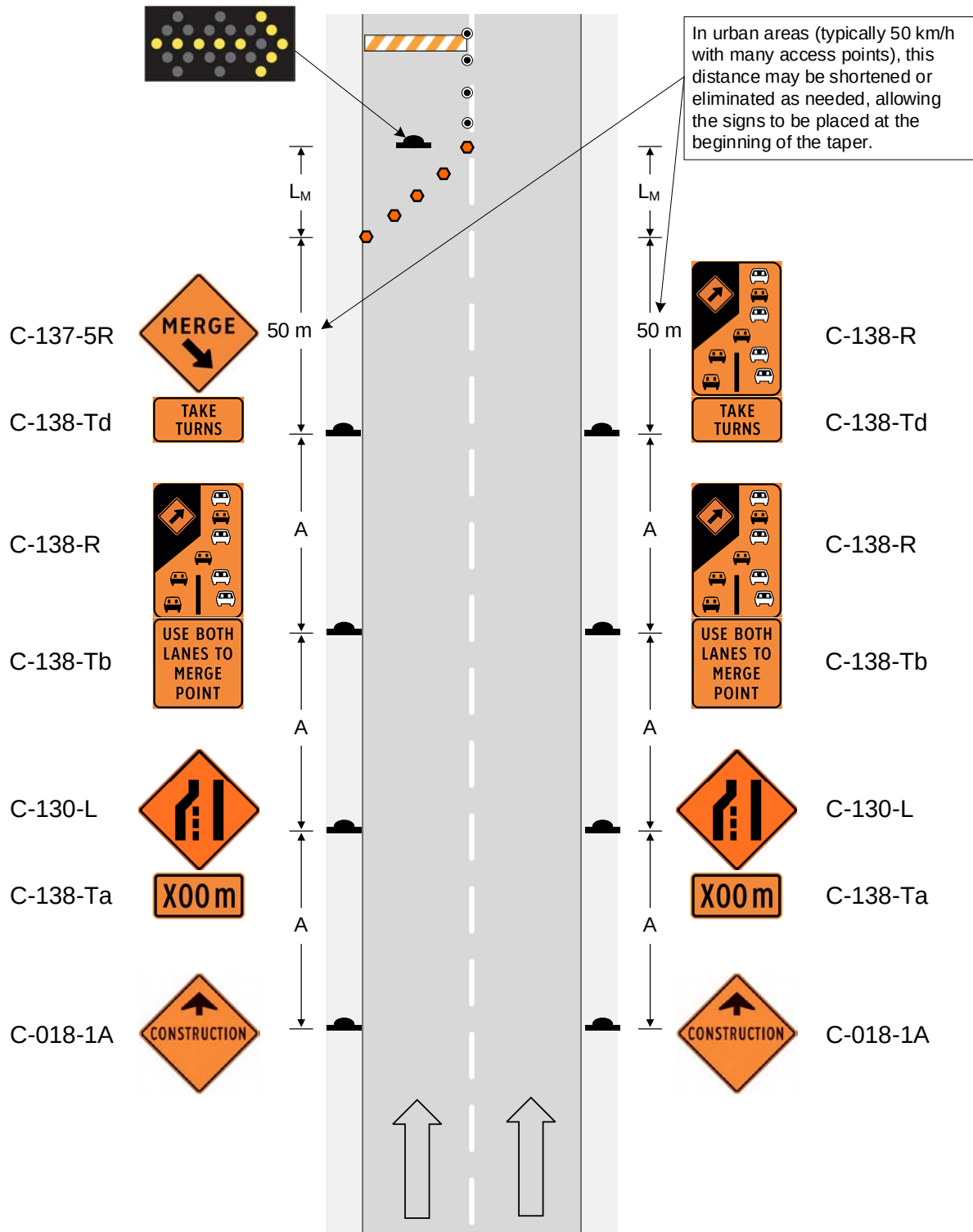
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#)

Options:

- Additional confirmatory Zipper Merge C-138-LR signs with accompanying C-138-Ta distance tabs may be used with a maximum 2km spacing where queuing extends beyond the C-130 signs or as considered necessary
- If the regular posted speed limit is ≤ 60 km/h, tubular markers may be used for leading tapers instead of drums.
- Dynamic message sign (DMS) may be used in place of the first set of C-138-LR and accompanying C-138-Tb (on both sides of roadway) but should include the messaging “Zipper Merge. Use Both Lanes to Merge Point,” or similar
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 9.18: Lane Closure with Zipper Merge Signing (Queues < 800 m)



9.19 Lane Closure with Zipper Merge Signing (Queues $\geq$ 800 m)

Purpose:

The late merge (zipper merge) sign layouts are alternatives to standard lane closure set-ups on multilane divided highways. The goal of the zipper merge sign layout is to achieve better lane utilization and merging behavior to minimize delays and lengths of queues.

Late merge signs encourage drivers to utilize both lanes until a merge point. The signs also seek to improve merge behaviour (take turns) which will improve efficiency and safety by reducing congestion and aggressive driving. Late merge signs should not be used within intersections or on sharp horizontal or vertical curves.

This layout shows the typical late merge signage for the closure of a left travel lane on a multilane divided highway. This layout may be used where the regular posted speed limit is $\geq$ 70 km/h and traffic queues may extend $\geq$ 800 m upstream of the taper.

Standard:

- Signs shall be placed on both the left and right side of the roadway.
- A barricade is required on the approach side of the work activity for long-duration work

Guidance:

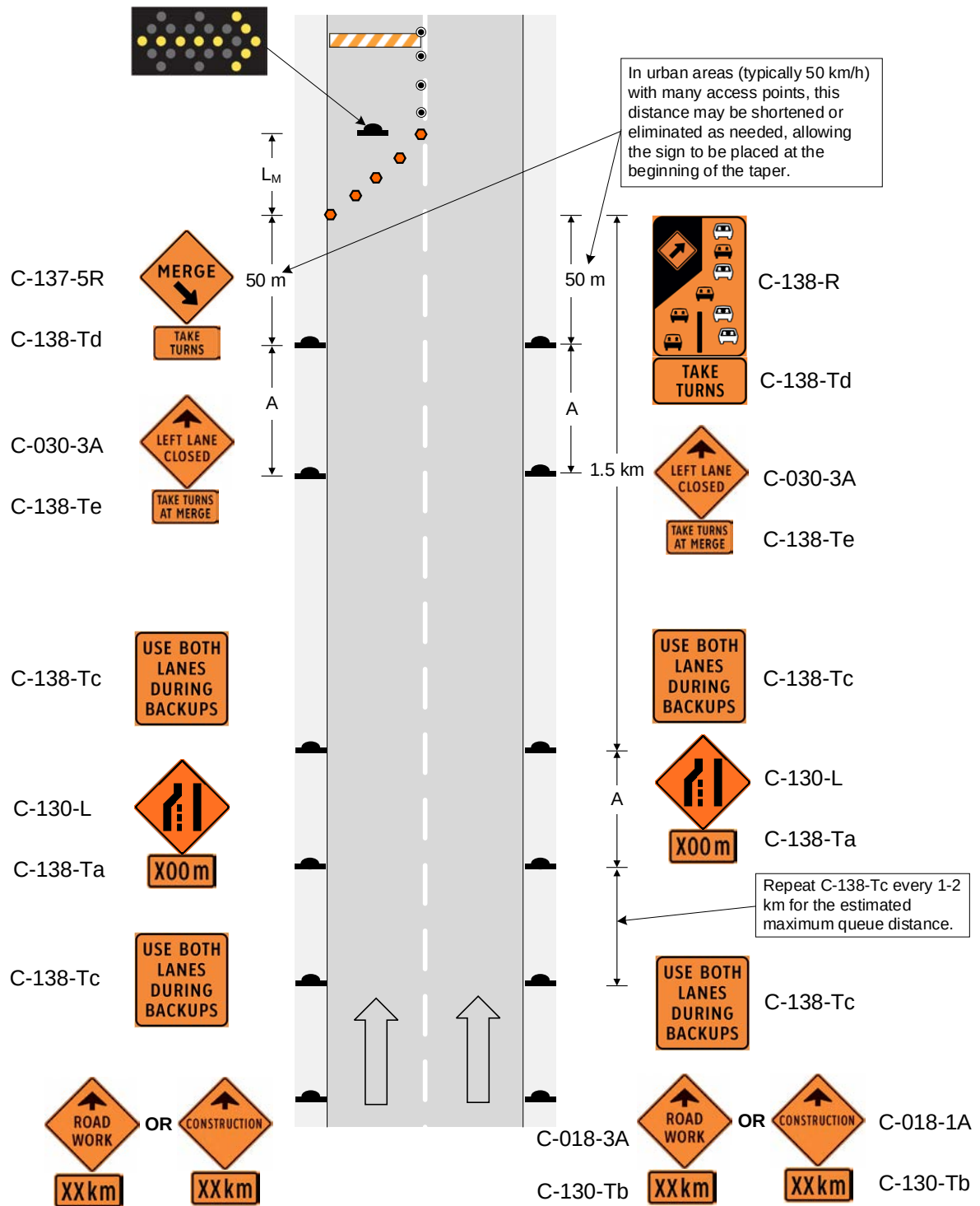
- The Road Work Ahead C-018-3A or Construction Ahead C-018-1A signs should be placed outside the location of where the maximum queue distance is anticipated to develop.
- Distance advisory tabs should be utilized with the Road Work Ahead C-018-3A or Construction Ahead C-018-1A signs to inform drivers where the merge location is located.
- For queue lengths greater than 1.5 km, adding additional Use Both Lanes During Backups C-138-Tc signs improves driver compliance.
- Where shoulders are wide and may be mistaken for travel lanes, shoulder tapers should be considered and installed in accordance with [Table A – Taper Lengths](#).

Options:

- Additional confirmatory Zipper Merge C-138-LR signs with accompanying C-138-Ta distance tabs may be used with a maximum 2km spacing where queuing extends beyond the C-130 signs or as considered necessary
- If the regular posted speed limit is $\leq$ 60 km/h, tubular markers may be used for leading tapers instead of drums.
- A dynamic message sign (DMS) with similar messaging may be used in place of a pair of USE BOTH LANES DURING BACKUPS C-136-T7 signs
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
$\leq$ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
$\geq$ 70 km/h	No substitution.	

Figure 9.19: Lane Closure with Zipper Merge Signing (Queues ≥ 800 m)



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PART B – TRAFFIC CONTROL

Section 10: Traffic Control Layouts – Mobile Work

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PART B – TRAFFIC CONTROL

Section 10: Traffic Control Layouts – Mobile Work

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

10.1 General Information - Mobile Work

Mobile work is an operation that is either continuously slow-moving work or intermittently-moving work with short stops. It may include:

- shouldering
- gravel road grading
- multiple pothole patching
- mowing
- brushing
- sweeping
- hydro-seeding
- sign cleaning
- litter bag pick-up
- spraying for dust control
- concrete barrier scupper flushing

Mobile work does not include debris removal or emergency response.

Traffic control devices are typically vehicle-mounted and include Slow Vehicle Next X km C-044 signs with the specified distance not exceeding 8 kilometres (the distance between the two C-044 signs in opposing directions) or Truck Stopped on Road Next 2 km C-038 signs.

If an advance Slow Vehicle Next X km C-044 sign is not used, a shadow vehicle with vehicle-mounted traffic control devices is required.

The distance between the work and shadow vehicles is typically Distance A found in Table B. It may vary on the basis of site factors such as traffic volume, sight distance, and terrain.

Table D shall be used to determine whether or not the operation is mobile work.¹

TABLE D – MINIMUM DISTANCES FOR MOBILE WORK						
Minimum Distance Moved (m) Every 30 Minutes	Regulatory Speed Limit (km/h)					
	≤50	60	70 - 80	90	100	≥ 110
	100	130	170	220	260	300

Table D Notes
To be considered mobile work, the operation shall move at least the distance shown in Table D for the posted speed limit every 30 minutes or less.
If the work does not regularly move the specified distance, it should be treated as a stationary operation, and the appropriate layout should be used.

¹ Table D values are derived from the Minnesota Department of Transportation's Temporary Traffic Control Manual (2011).

Section 10: Traffic Control Layouts – Mobile Work

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- All work and shadow vehicles shall be equipped with a flashing arrow board (FAB) in caution mode, a 360 degree flashing light, and 4-way flashers.
- Work and shadow vehicles shall display rear-mounted Slow Moving Vehicle C-036 signs.

Guidance:

- All temporary signs should be removed or covered when work is not under way.
- When the regular posted speed limit is ≥ 70 km/h, a rear-mounted crash attenuator is recommended for the shadow vehicles.

Options:

- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.

10.2 Continuously Slow-Moving Work – Two-Lane, Two-Way Roadway

Purpose:

Continuously slow-moving work is done while continuously moving at slow speeds. These operations normally do not involve stopping, but infrequent stops of up to 15 minutes may occur.

Examples include:

- shouldering
- concrete barrier scupper flushing
- hydro-seeding
- mowing
- gravel road grading
- brushing
- sweeping
- spraying for dust control

For pavement marking layouts (i.e., intersection marking and quick-dry pavement marking), see [Section 14: Traffic Control Layouts – Pavement Marking](#).

Standard:

- Work and shadow vehicles shall display Yield to Oncoming Traffic R-56-1 signs.
- Slow Vehicle Next X km C-044 signs shall be used, and they shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the signs.
- If the speed limit is ≥ 70 km/h, a shadow vehicle displaying the Slow Vehicle(s) Ahead C-045-X sign is required.

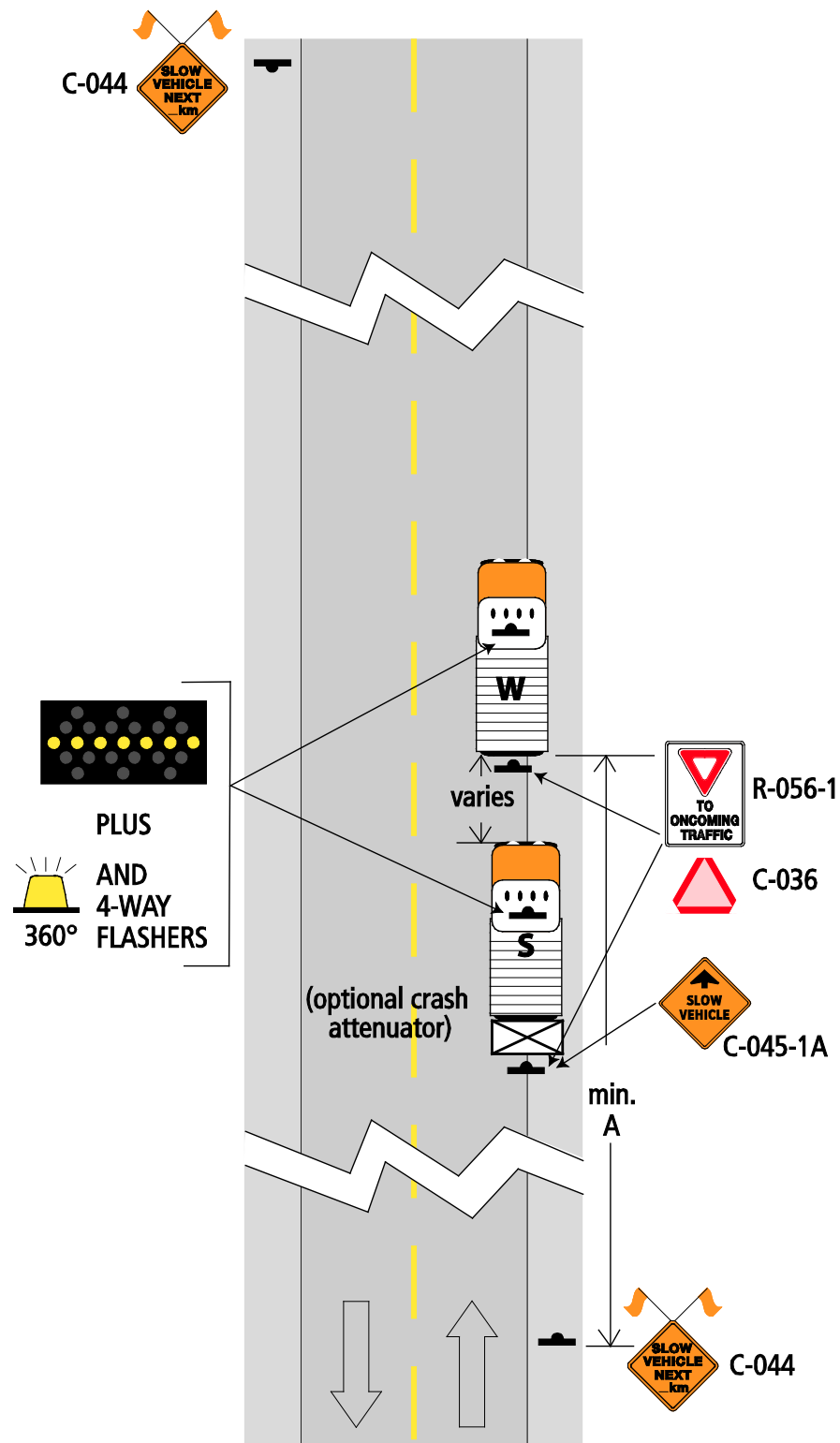
Guidance:

- The distance on Slow Vehicle Next X km C-044 signs should not exceed 8 kilometres.
- Work and shadow vehicles should pull over periodically to allow queued traffic to pass.
- The shadow vehicle should keep as far right as practicable, but may encroach into the travel lane when the shoulder is too narrow to drive on.
- Work vehicles may travel at posted speeds when work is not under way.

Options:

- The shadow vehicle may be omitted for work on low volume roadways (<1000 vpd) with a speed limit ≤ 80 km/h. These are typically non-numbered highways and may include rural highways with statutory speed limits of 80 km/h and appropriate sight distances.
- The Slow Vehicle(s) Ahead C-045-X sign may be replaced with other appropriate signs related to the type of work (see [Appendix B: Standard Construction Signs](#)).
- If the speed limit is ≤ 60 km/h:
 - For low-volume roadways, the Slow Vehicle Next X km C-044 sign and/or shadow vehicle and its accessories may be omitted.
 - The flashing arrow board (FAB) on the work vehicle may be omitted but the 360-degree flashing light and 4-way flashers are always required.
- The Yield to Oncoming Traffic R-056-1 sign may be omitted from large, line-type utility vehicles if it is impractical to mount the sign.

Figure 10.2: Continuously Slow-Moving Work – Two-Lane, Two-Way Roadway



10.3 Intermittently-Moving Work – Two-Lane, Two-Way Roadway

Purpose:

Intermittently-moving work is a maintenance activity for which the work zone changes frequently or a work operation that involves frequent short stops not exceeding 30 minutes in duration.

Examples include:

- group relamping of street lights
- multiple pothole patching (several stops within 1 km)
- traffic control device placement and/or removal
- crack sealing
- sign cleaning
- catch basin flushing
- station measurement
- litter bag pick-up
- raised pavement marker installation

Standard:

- Work and shadow vehicles shall display Yield to Oncoming Traffic R-56-1 signs.
- The shadow vehicle shall display a rear-mounted Caution This Truck Stops Frequently C-039 sign.
- A Truck Stopped on Road Next 2 km C-038 sign is required, and it shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the sign.

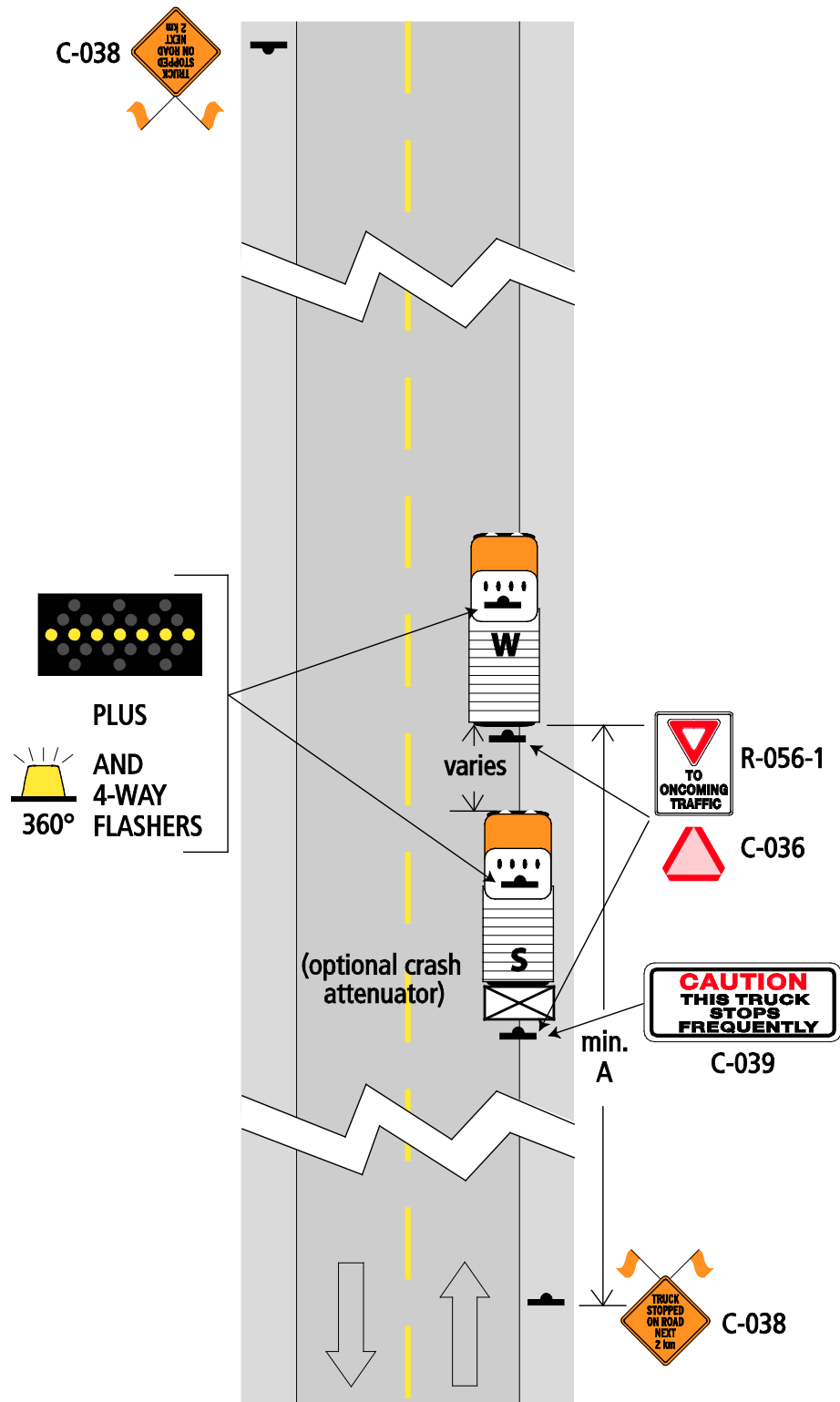
Guidance:

- The shadow vehicle should keep as far right as practicable—or as far left as practicable if working in the left lane—but may encroach into the travel lane when the shoulder is too narrow to drive on.
- Work vehicles may resume travelling at posted speeds when work stops.

Options:

- A shadow vehicle may not be required for work that typically occurs off the roadway on the shoulder (e.g., litter bag pick-up or sign-cleaning activities).
- If the construction speed limit is ≤ 60 km/h:
 - Where an advance Truck Stopped on Road Next 2 km C-038 sign is used, using a shadow vehicle is optional.
 - For low-volume roadways, the Truck Stopped on Road Next 2 km C-038 sign and/or a shadow vehicle and its accessories may be omitted.
 - The flashing arrow board (FAB) on the work vehicle may be omitted, but the double-sided Prepare to Stop C-040D sign must be used in its place. The 360-degree light and 4-way flashers are always required
- An arrow stick or a shadow vehicle may be substituted for the flashing arrow board (FAB) on large, line-type utility vehicles if it is impractical to mount the FAB.

Figure 10.3: Intermittently-Moving Work – Two-Lane, Two-Way Roadway



10.4 Continuously Slow-Moving Work – Multilane Undivided or Divided Roadway

Purpose:

Continuously slow-moving work is done while continuously moving at slow speeds. These operations normally do not involve stopping, but infrequent stops of up to 15 minutes may occur.

Examples include:

- grading/shouldering
- concrete barrier flushing
- hydro-seeding
- mowing
- dust control
- sweeping

For pavement marking layouts (i.e., intersection marking and quick-dry pavement marking), see [Section 14: Traffic Control Layouts – Pavement Marking](#).

Standard:

- Shadow vehicles shall display a Slow Vehicle(s) Ahead C-045-X sign.
- At least one shadow vehicle shall be used for undivided roadways.
- Two shadow vehicles shall be used for divided roadways.
- Slow Vehicle Next X km C-044 signs shall be used, and they shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the signs.

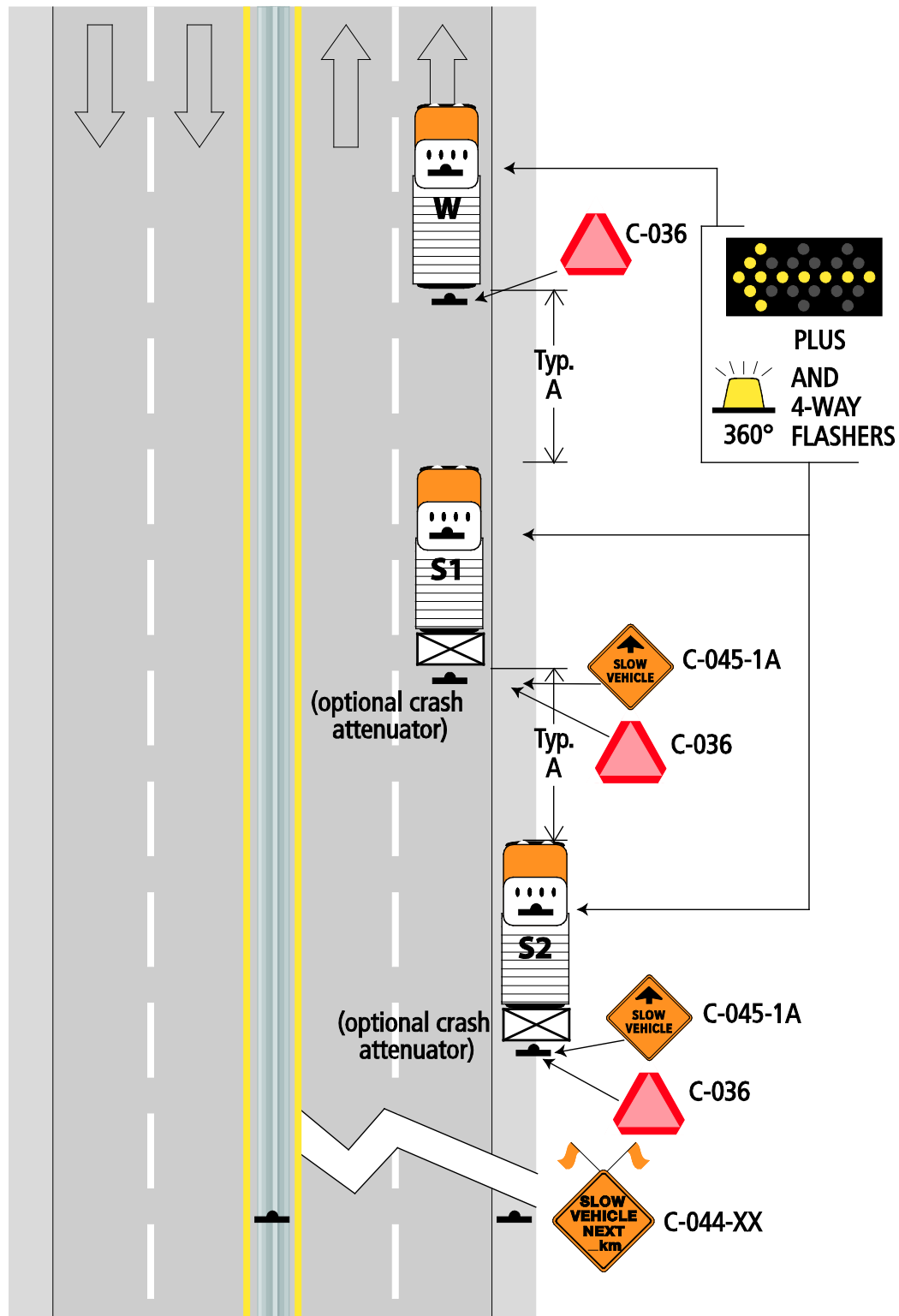
Guidance:

- The distance on the Slow Vehicle Next X km C-044 signs should not exceed 8 kilometres.
- Typical spacing between the shadow vehicle and the work vehicle is Table B Distance A.
- For divided roadways, the shadow vehicle should keep as far right as practicable—or as far left as practicable if working in the left lane—but may encroach into the travel lane when the shoulder is too narrow to drive on.
- The space between the shadow vehicle and the work vehicle may be adjusted as follows:
 - decreased in areas with heavy traffic to deter road users from driving between the two vehicles
 - increased to provide adequate sight distance for vehicles approaching from the rear

Options:

- If the speed limit is ≤ 60 km/h:
 - Where a Slow Vehicle Next X km C-044 sign is used, using one less shadow vehicle is optional.
 - The flashing arrow board (FAB) on the work vehicle may be omitted but the 360-degree flashing light and 4-way flashers are always required.

Figure 10.4: Continuously Slow-Moving Work – Multilane Undivided or Divided Roadway



10.5 Intermittently-Moving Work – Multilane Undivided or Divided Roadway

Purpose:

Intermittently-moving work is a maintenance activity for which the work zone changes frequently or a work operation that involves frequent short stops not exceeding 30 minutes in duration.

Examples include:

- group relamping of street lights
- multiple pothole patching (several stops within 1 km)
- traffic control device placement and/or removal
- crack sealing
- sign cleaning
- catch basin flushing
- station measurement
- litter bag pick-up
- pavement marker installation

Standard:

- Work vehicles shall display rear-mounted Slow Moving Vehicle C-036 signs and Caution This Truck Stops Frequently C-039 signs.
- Shadow vehicle shall display rear-mounted Slow Moving Vehicle C-036 signs and Slow Vehicle(s) Ahead C-045-X signs.
- At least one shadow vehicle shall be used for undivided roadways.
- Two shadow vehicles shall be used for divided roadways.
- A Truck Stopped on Road Next 2 km C-038 sign is required, and it shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the sign.

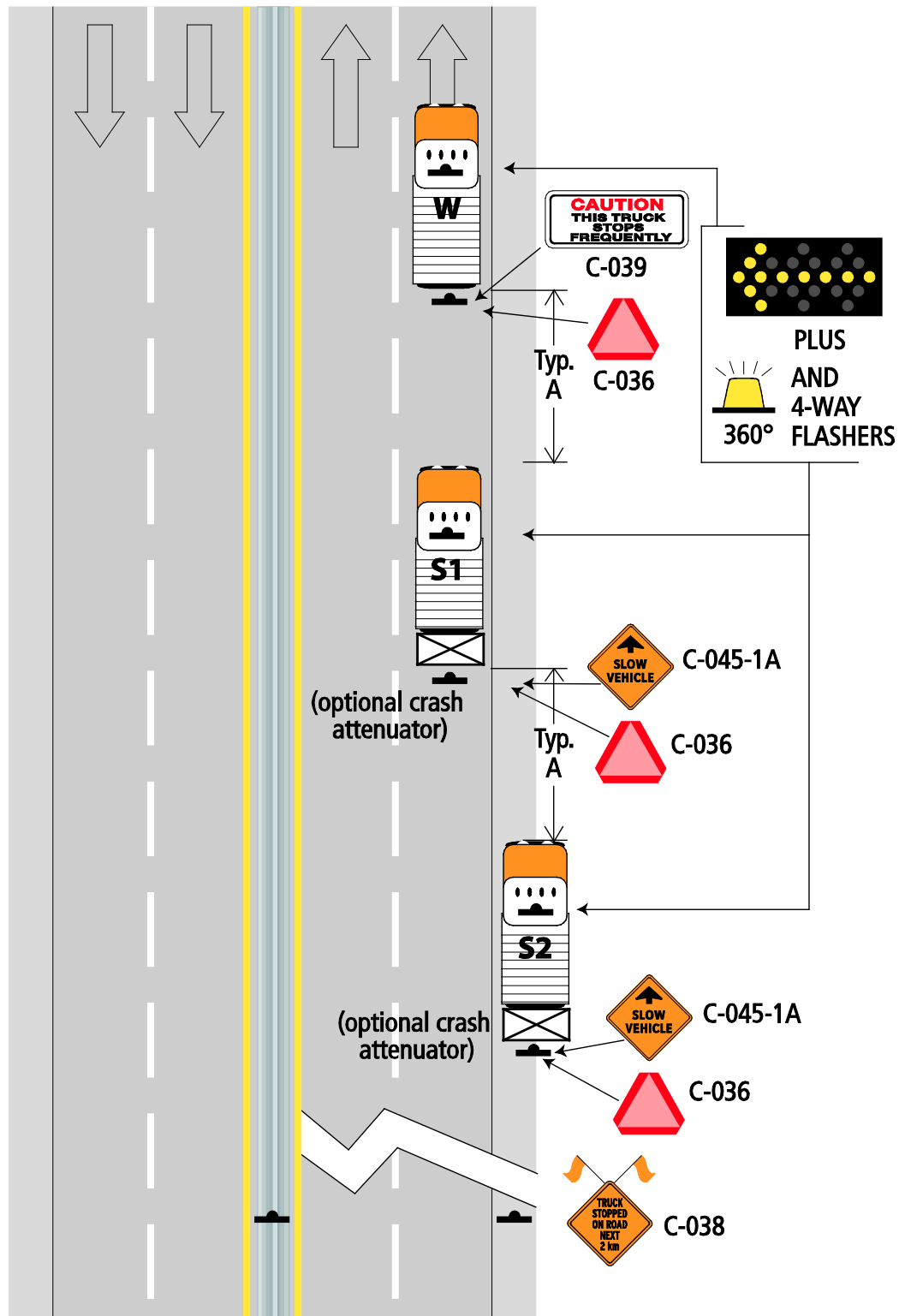
Guidance:

- For divided roadways, the shadow vehicle should keep as far right as practicable—or as far left as practicable if working in the left lane—but may encroach into the travel lane when the shoulder is too narrow to drive on.
- Typical spacing between the shadow vehicle and the work vehicle is Table B Distance A.
- The space between the shadow vehicle and the work vehicle may be adjusted as follows:
 - decreased in areas with heavy traffic to deter road users from driving between the two vehicles
 - increased to provide adequate sight distance for vehicles approaching from the rear

Options:

- If the speed limit is ≤ 60 km/h and if two shadow vehicles are used:
 - Where a Truck Stopped on Road Next 2 km C-038 sign is used, using one less shadow vehicle is optional.
 - The flashing arrow board (FAB) on the work vehicle may be omitted but the 360-degree flashing light and 4-way flashers are always required.

Figure 10.5: Intermittently-Moving Work – Multilane Undivided or Divided Roadway



10.6 Rolling Slowdown

Purpose:

A rolling slowdown uses shadow vehicles to protect moving work in the travel lanes, and can be implemented only on a multilane roadway on which passing over the centreline is not permitted.

The shadow vehicles form a moving blockade across all lanes, thereby reducing traffic speeds and creating a large gap in traffic—a clear area in which work can be accomplished without completely stopping the traffic.

This setup is typically used in circumstance where a full road closure would otherwise be required for short-duration work operations, and for which implementing traffic control measures would take more time than the actual work (e.g., a film company taking a scenic shot along a roadway).

Using this type of setup is resource-intensive and requires consultation with the Road Authority before it can be initiated.

Standard:

- All ramps and entrances to the roadway between the moving blockade and the work operation shall be temporarily closed using a shadow vehicle.
- Each of those ramps shall remain closed until the crew doing the work gives the “all clear” signal or until the front of the moving blockade passes the closed on-ramps and entrances.
- At least one shadow vehicle shall be used in each lane,
- The shadow vehicles blocking traffic shall enter the roadway far enough upstream from the work area to allow a clear area to develop in front of them.
- The shadow vehicles shall move into position so that they form a moving blockade across the travel lanes.
- A separate chase vehicle with a 360-degree flashing light and 4-way flashers shall follow the last public vehicle ahead of the blockade, travelling in front of the moving blockade of shadow vehicles.
- As the blockade slows down, it creates the work area between the blockade and the chase vehicle.
- Communications shall be maintained between the work crew and the moving blockade so that the speed of the blockade can be adjusted to increase or decrease the closure time if necessary.
- Traffic can be released only after all workers and their vehicles have been confirmed to be clear of the roadway.

To calculate the distance upstream of the work area at which to start the slowdown:

A long enough gap in traffic shall be created for traffic moving at a fixed, reduced speed to provide the estimated time needed for the work to be done.

Rolling Slowdown Calculations:

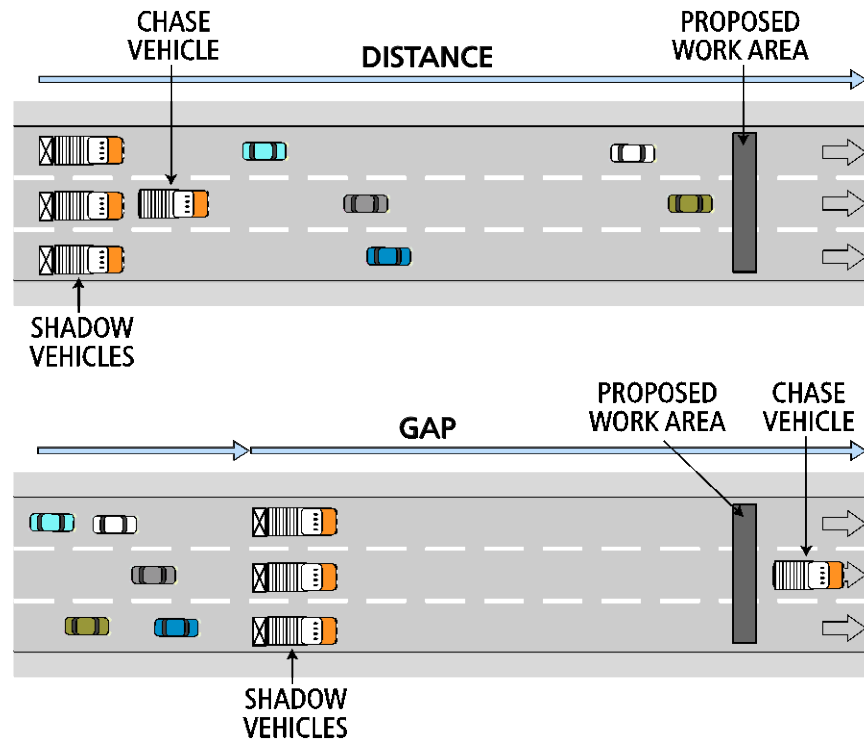
Known:

- T = Time needed with no traffic (in minutes).
- Vs = Speed of slowdown vehicles (in km/h). A minimum 30 km/h speed limit is recommended.
- Vc = Speed of chase vehicle in front of slowdown (in km/h). It should generally be the posted speed limit.

Calculations:

- G = Gap needed (in km).
- G = $T (Vs/60)$
- C = Clearance time needed to create the required gap (in minutes).
- C = $G / (Vc/60 - Vs/60)$
- D = Distance ahead of the work area at which to start the slowdown (in km).

Example:



continued →

Calculations (continued):

A 5-minute gap is required on a 100 km/h freeway to move a large piece of equipment across the roadway and into the median work area, so a 30 km/h rolling slowdown is proposed during the off-peak or lowest traffic volume hours for the freeway.

$$G = 5 (30/60) = 2.5 \text{ km}$$

$$C = 2.5 / (100/60 - 30/60) = 2.9 \text{ minutes}$$

D = Distance ahead of the work area at which to start the slowdown (in km).

$$D = 2.9 (100/60) = 4.9 \text{ km}$$

Guidance:

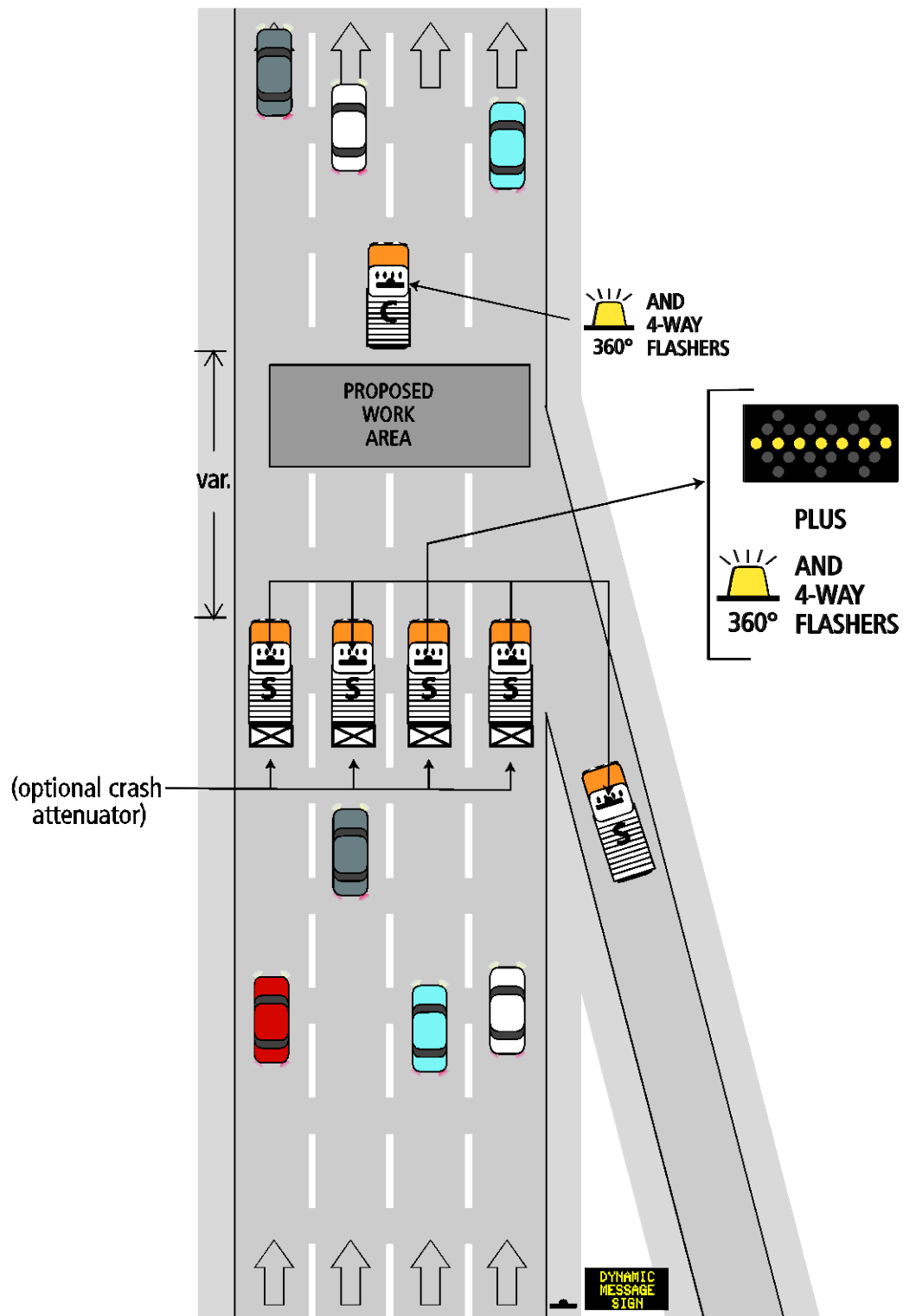
- The shadow vehicles in the rolling slowdown should travel on the lane lines.

Options:

- A truck-mounted dynamic message sign (DMS) may be used to display this message:

Slow or Stopped Vehicles Ahead

Figure 10.6: Rolling Slowdown



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PART B – TRAFFIC CONTROL

Section 11: Traffic Control Layouts – Intersections¹

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¹ See [Section 12: Traffic Control Layouts – Roundabouts](#) for information on traffic control layouts for roundabouts.

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PART B – TRAFFIC CONTROL

Section 11: Traffic Control Layouts – Intersections

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

11.1 General Information - Intersections¹

1. Traffic control within an intersection requires careful consideration of all the approaches and accesses, the nature of adjacent land uses, and the intersection control type.
2. To control each leg of an intersection, multiple Traffic Control Persons are typically required.
3. Signalized intersections typically exist on high-volume corridors that may experience peak traffic periods. This shall be considered when determining the appropriate traffic control for the project. If excessive queues develop, traffic control should be removed as soon as possible to restore normal traffic operations.
4. Within a signalized intersection, the direction provided by Traffic Control Persons cannot conflict with the direction provided by the signal heads so the signal shall be either turned off or bagged.
5. Good communication between the Traffic Control Persons who are operating an intersection helps to maintain reasonable delay periods on each approach and ensures that multiple traffic streams are not simultaneously given conflicting right-of-way through the intersection.
6. Careful consideration should also be given to other road users, such as pedestrians and cyclists, to ensure that they can negotiate through the intersection satisfactorily. This may require the use of additional Traffic Control Persons who are dedicated to serving pedestrian demand.

¹ See [Section 12: Traffic Control Layouts – Roundabouts](#) for information on traffic control layouts for roundabouts.

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign shall be used.
- For long-duration work, a Construction Ahead C-018-1A sign shall be used.
- Traffic Control Person Ahead C-001-1 signs shall be used in advance of TCPs.
- On undivided roadways, barricades are required at each end of the work activity area for long-duration work. They are required on the approach side only for divided roadways.
- Where the speed limit is ≥ 70 km/h, a buffer space shall be used.
- All work, buffer, and shadow vehicles shall be equipped with a 360-degree flashing light and 4-way flashers.

Guidance:

- Where the speed limit is ≥ 70 km/h a buffer vehicle should be used when workers are present.
- A vehicle-mounted crash attenuator is recommended for use on buffer vehicles.
- When a detour is not implemented, to maintain traffic flow, it may be necessary to restrict turning movements at the intersection (i.e., prohibit left and/or right turns using Turn Control R-015-L/R signs).

Options:

- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic
- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.
- When traffic volumes are high or the intersection is signalized, consult the Road Authority.
- In low speed (≤ 60 km/h) urban areas (within municipal boundaries), customization of traffic control layouts, including closer device spacing and shorter taper lengths, may be necessary to maintain access and mobility. In these cases, document why adjustments are being made.

11.2 Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCPs (Near Side) – Short and Long Duration

Purpose:

This layout shows the typical setup for a lane closure using Traffic Control Persons on a two-lane, two-way roadway when the closure is on the approach to (near side of) an intersection. It may be used where the intersection is signalized or stop-controlled.

One TCP is typically needed for each leg of the intersection because traffic control is complex at intersections, especially for turning traffic.

Standard:

- Single Lane Traffic C-030-8 signs are required in both directions along the roadway where the work is being conducted.
- A Prepare to Stop C-029 sign shall be placed on the cross street in advance of the intersection.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

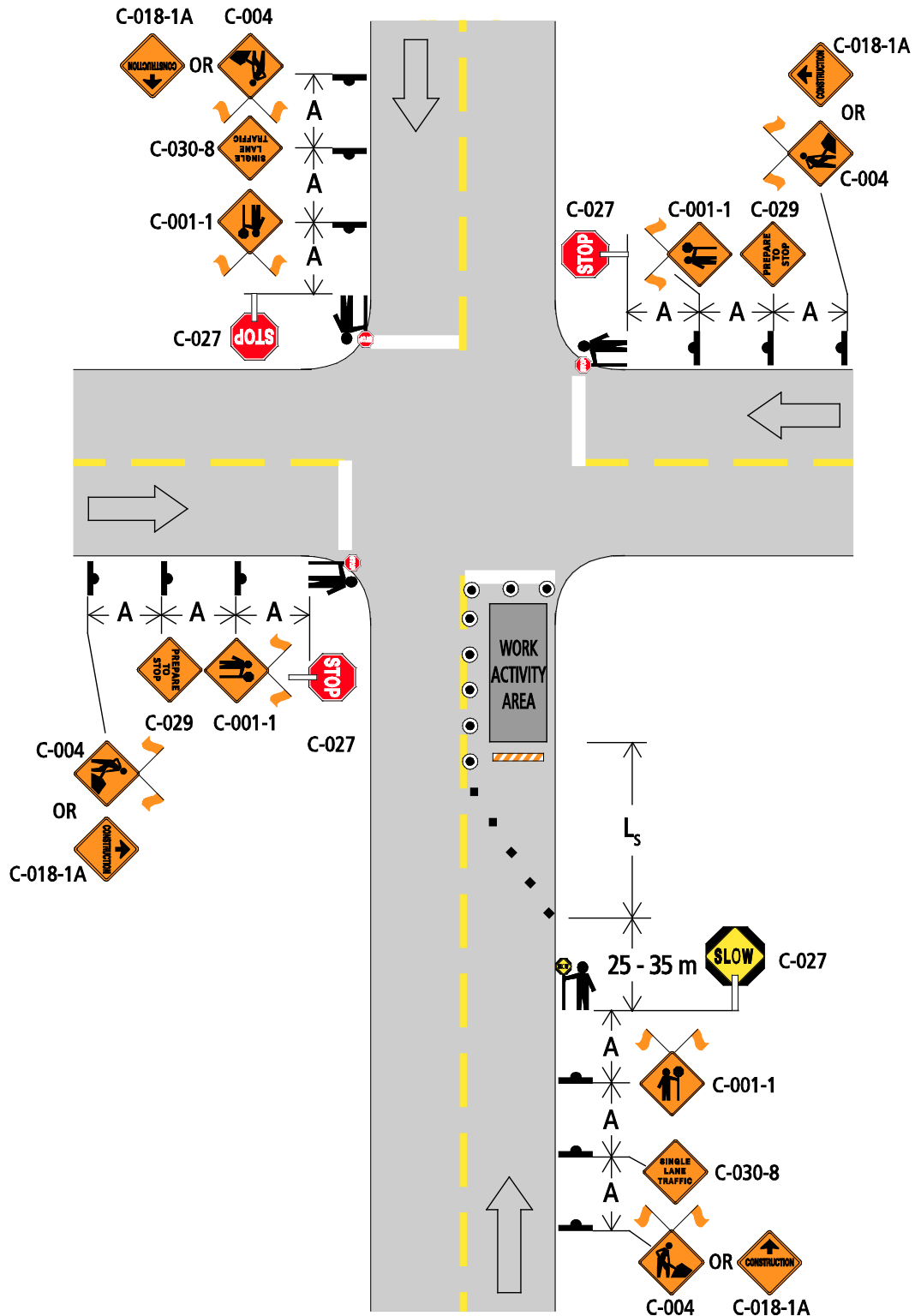
Guidance:

- None at this time.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- If the cross street volume is low, TCPs may not be required in the cross direction but Traffic Control Person Ahead C-001-1 signs are still required to identify the presence of other TCPs controlling traffic.

Figure 11.2: Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCPs (Near Side) – Short and Long Duration



11.3 Intersection Lane Closure – Two-Lane, Two-Way Roadway with Detour (Near Side) – Short and Long Duration

Purpose:

This layout shows the typical setup for a lane closure on a two-lane, two-way roadway when the closure occurs on the approach to (near side of) an intersection. It may be used where a detour can be established to allow drivers to bypass the closed area. Detour signage is continued at decision points through the detour route to guide motorists along the detour and back to the main roadway.

This layout is to be used only if a detour route is available.

If no alternative route is available, TCPs are required as shown in [Section 11.2: Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCPs \(Near Side\)](#).

Standard:

- Either a Road Closed Ahead C-030-6A sign or a dynamic message sign (DMS) shall be the first sign used on the approach to the closed portion of roadway.
- A Detour Ahead Left/Right C-006-L/R marker shall be used in advance of the detour route to guide traffic in the appropriate direction.
- A Turn Control R-015-L/R sign shall be used on the cross street to restrict traffic from turning into the work area.
- Barricades on the closed lane shall display to approaching traffic a Road Closed R-012 sign and a Detour C-005-L/R sign.

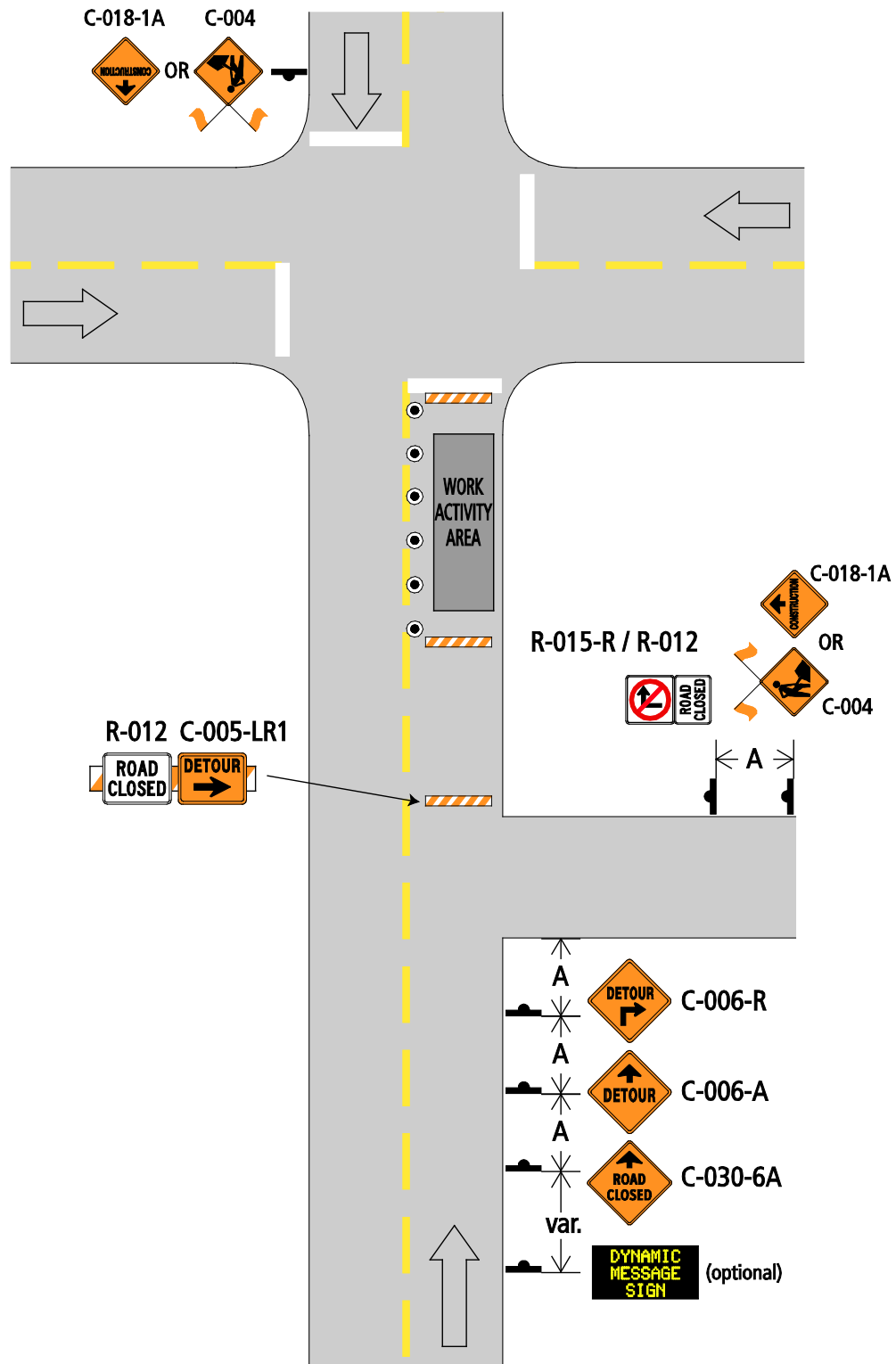
Guidance:

- Advance planning is recommended for situations involving business access and egress.
- The detour route chosen should have the least impact on the travelling public and local residents. This may necessitate establishing the detour on a road further in advance of the work area.

Options:

- Flashing arrow boards (FABs) may be used in addition to barricades. They should be set to caution mode to mark the closed portion of the roadway, and to arrow mode at the detour.

Figure 11.3: Intersection Lane Closure – Two-Lane, Two-Way Roadway with Detour (Near Side) – Short and Long Duration



11.4 Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCP's (Far Side) – Short and Long Duration

Purpose:

This layout shows the typical setup for a lane closure using Traffic Control Persons on a two-lane, two-way roadway when the closure occurs downstream (far side) of an intersection. It may be used where the intersection is signalized or stop-controlled.

One TCP is typically needed for each leg of the intersection because traffic control is complex at intersections, especially for turning traffic.

Standard:

- Single Lane Traffic C-030-8 signs are required in both directions along the roadway where the work is being conducted.
- A Prepare to Stop C-029 sign shall be placed on the cross street in advance of the intersection.
- A flashing arrow board (FAB) in caution mode shall be placed inside the approaching taper in advance of the work area.
- Tubular markers are required for channelizing traffic and for tapers.
- When TCPs are directing traffic, the construction speed limit shall not be greater than 70 km/h.

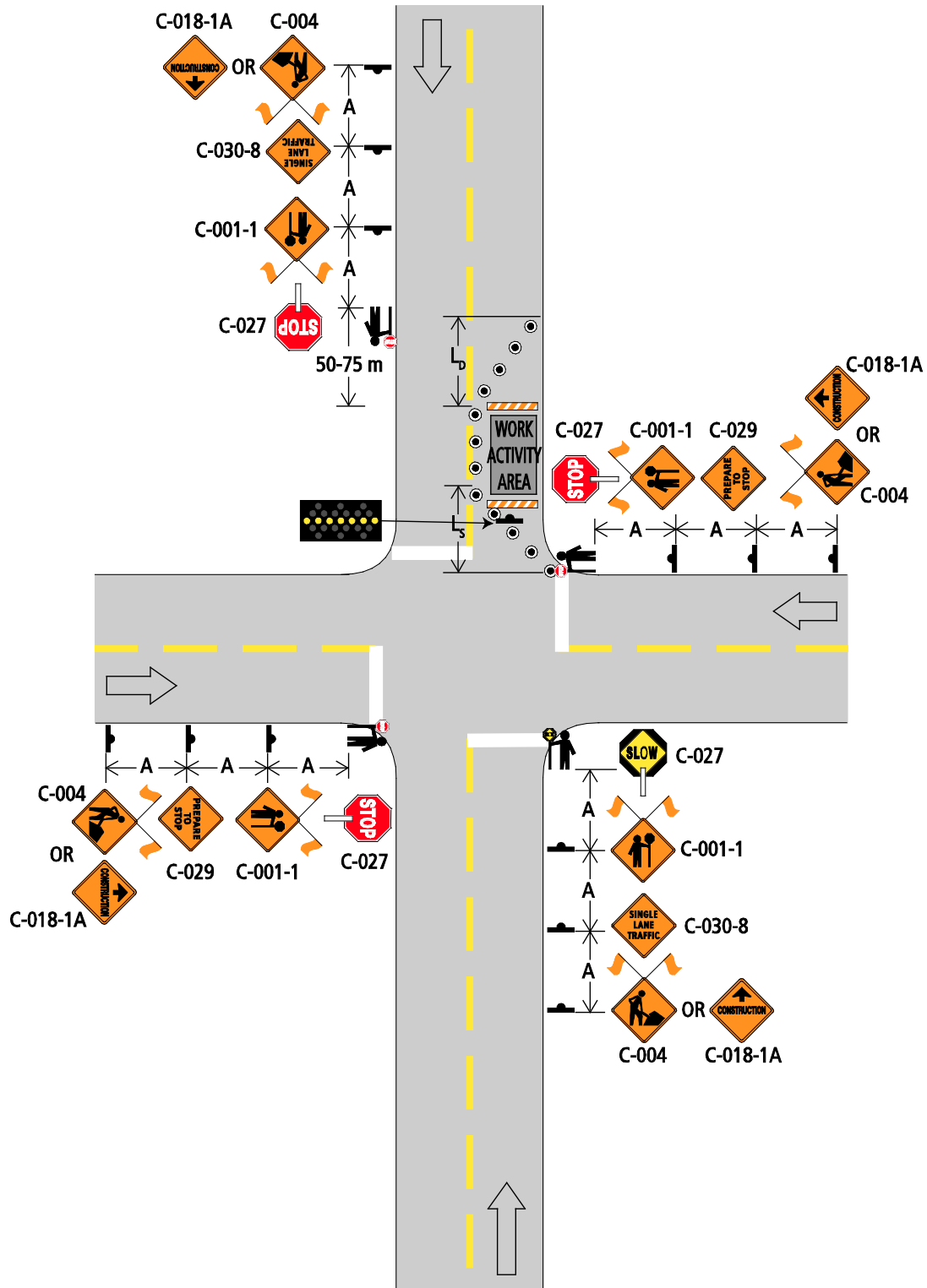
Guidance:

- None at this time.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- If the speed of the roadway on which the work is being undertaken is ≤ 60 km/h, the flashing arrow board (FAB) may be replaced by a barricade with a flashing light.
- If the cross-street volume is low, TCPs may not be required in the cross direction but Traffic Control Person Ahead C-001-1 signs are still required to identify the presence of other TCPs directing traffic.

Figure 11.4: Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCPs (Far Side) – Short and Long Duration



11.5 Intersection Lane Closure – Two-Lane, Two-Way Roadway with Detour (Far Side) – Short and Long Duration

Purpose:

This layout shows the typical setup for a lane closure on a two-lane, two-way roadway when the closure occurs downstream (far side) of an intersection. It may be used where a detour can be established to allow drivers to bypass the closed area. Detour signage is continued at decision points through the detour route to guide motorists along the detour and back to the main roadway.

This layout is to be used only if a detour route is available.

If no alternative route is available, TCPs are required as shown in [Section 11.4: Intersection Lane Closure – Two-Lane, Two-Way Roadway with TCPs \(Far Side\)](#).

Standard:

- Either a Road Closed Ahead C-030-6A sign or a dynamic message sign (DMS) shall be the first sign used on the approach to the closed portion of roadway.
- A Detour Ahead Left/Right C-006-L/R sign shall be used in advance of the detour route to guide traffic in the appropriate direction.
- A Turn Control R-015-L/R sign shall be used on the cross street to restrict traffic from turning into the work area.
- Tubular markers are required for channelizing traffic and for tapers.
- A flashing arrow board (FAB) in caution mode shall be used in advance of the work area.

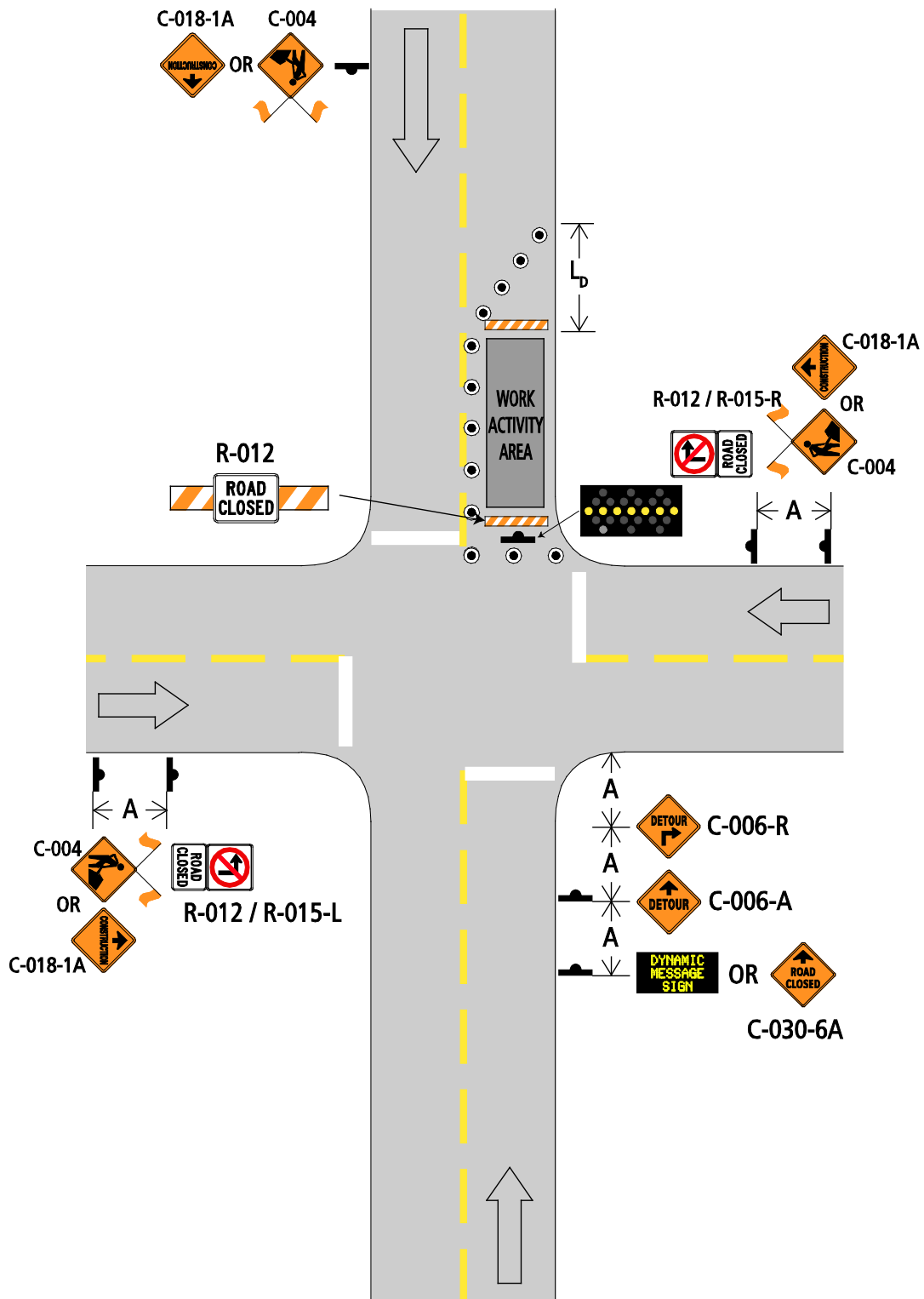
Guidance:

- Advance planning is recommended for situations involving business access and egress.
- The detour route chosen should have the least impact on the travelling public and local residents. This may necessitate establishing the detour on a road further in advance of the work area.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- If the speed of the roadway on which the work is being undertaken is ≤ 60 km/h, the flashing arrow board (FAB) on the approach side of the work activity area may be replaced by a barricade with a Road Closed R-012 sign.

Figure 11.5: Intersection Lane Closure – Two-Lane, Two-Way Roadway with Detour (Far Side) – Short and Long Duration



11.6 Right Lane Closure (Near Side) – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure on a multilane roadway when the closure occurs on the approach to (near side of) an intersection. It may be used where the intersection is signalized or stop-controlled.

Since at least one lane is available approaching the intersection in the affected direction, traffic is diverted into an adjacent lane through a lane drop.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- A flashing arrow board (FAB) in arrow mode shall be placed inside the approaching taper in advance of the work area.

Guidance:

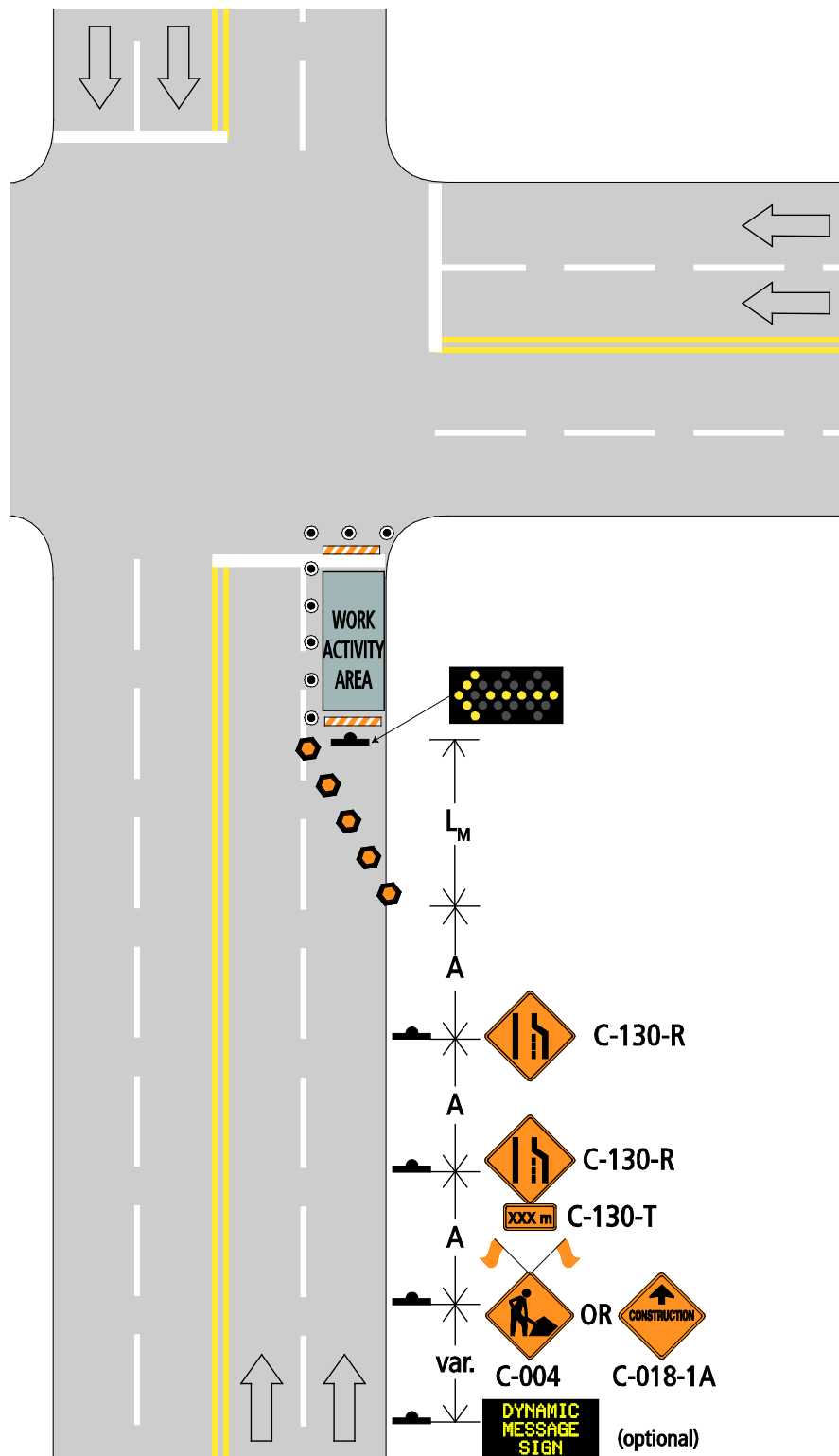
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- A dynamic message sign (DMS) may be used in advance of the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign.
- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
 - Cones may be used for protecting the work area.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 11.6: Right Lane Closure (Near Side) – Multilane Intersection – Short and Long Duration



11.7 Left Lane Closure (Far Side) – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure on a multilane roadway when the closure occurs downstream (far side) of an intersection. It may be used where the intersection is signalized or stop-controlled.

Since at least one lane is available approaching the intersection in the affected direction, traffic is diverted into an adjacent lane through a lane drop. Although the work is taking place downstream of the intersection, the lane drop should be established in advance of the intersection.

Standard:

- The left lane shall be closed on the near side of the intersection and traffic moved to the right lane.
- A Left Lane Closed Ahead C-130-L sign with a C-130-T distance tab is required in advance of a second Left Lane Closed Ahead C-130-L sign.
- A flashing arrow board (FAB) in arrow mode shall be placed inside the taper in advance of the work area on the near side of the intersection.
- A Lane Closure Arrow C-053 sign and barricade shall be positioned immediately in advance of the work area on the far side of the intersection.

Guidance:

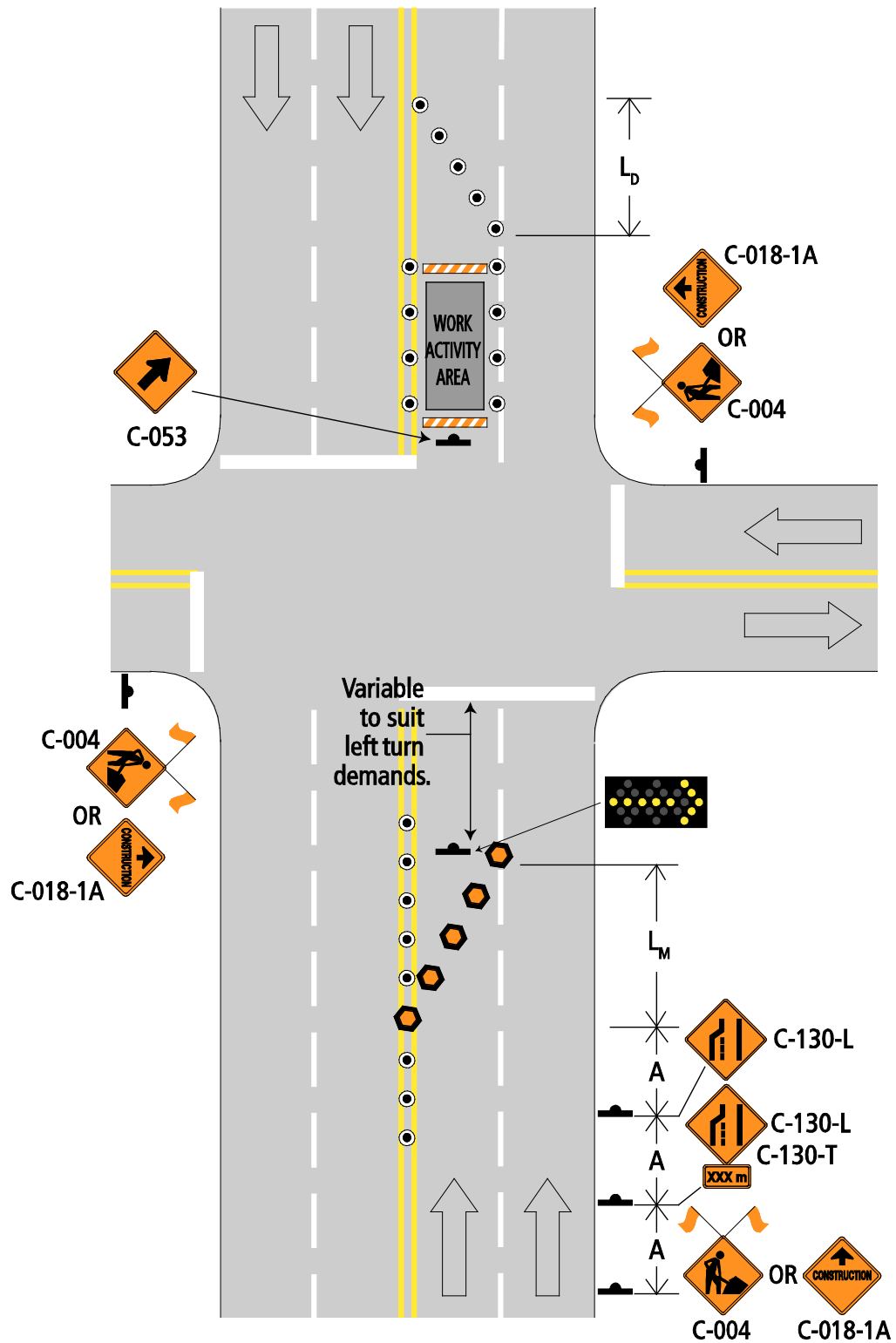
- A left lane that has significant left-turning movements may remain open as a turn lane for left turns only. Sufficient space should be considered for vehicle storage in this lane, and additional traffic control should be considered.
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- If the speed limit is ≤ 60 km/h:
 - The upstream Left Lane Closed Ahead C-130-L sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 11.7: Left Lane Closure (Far Side) – Multilane Intersection – Short and Long Duration



11.8 Right Lane Closure (Far Side) – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure on a multilane roadway when the closure occurs downstream (far side) of an intersection. It may be used where the intersection is signalized or stop-controlled.

Since at least one lane is available approaching the intersection in the affected direction, traffic is diverted into an adjacent lane through a lane drop. Although the work is taking place downstream of the intersection, the lane drop should be established in advance of the intersection.

Standard:

- The right lane shall be closed on the near side of the intersection and traffic moved to the left lane.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- A flashing arrow board (FAB) in arrow mode shall be placed inside the taper in advance of the work area on the near side of the intersection.
- A Lane Closure Arrow C-053 sign and barricade shall be used immediately in advance of the work area on the far side.

Guidance:

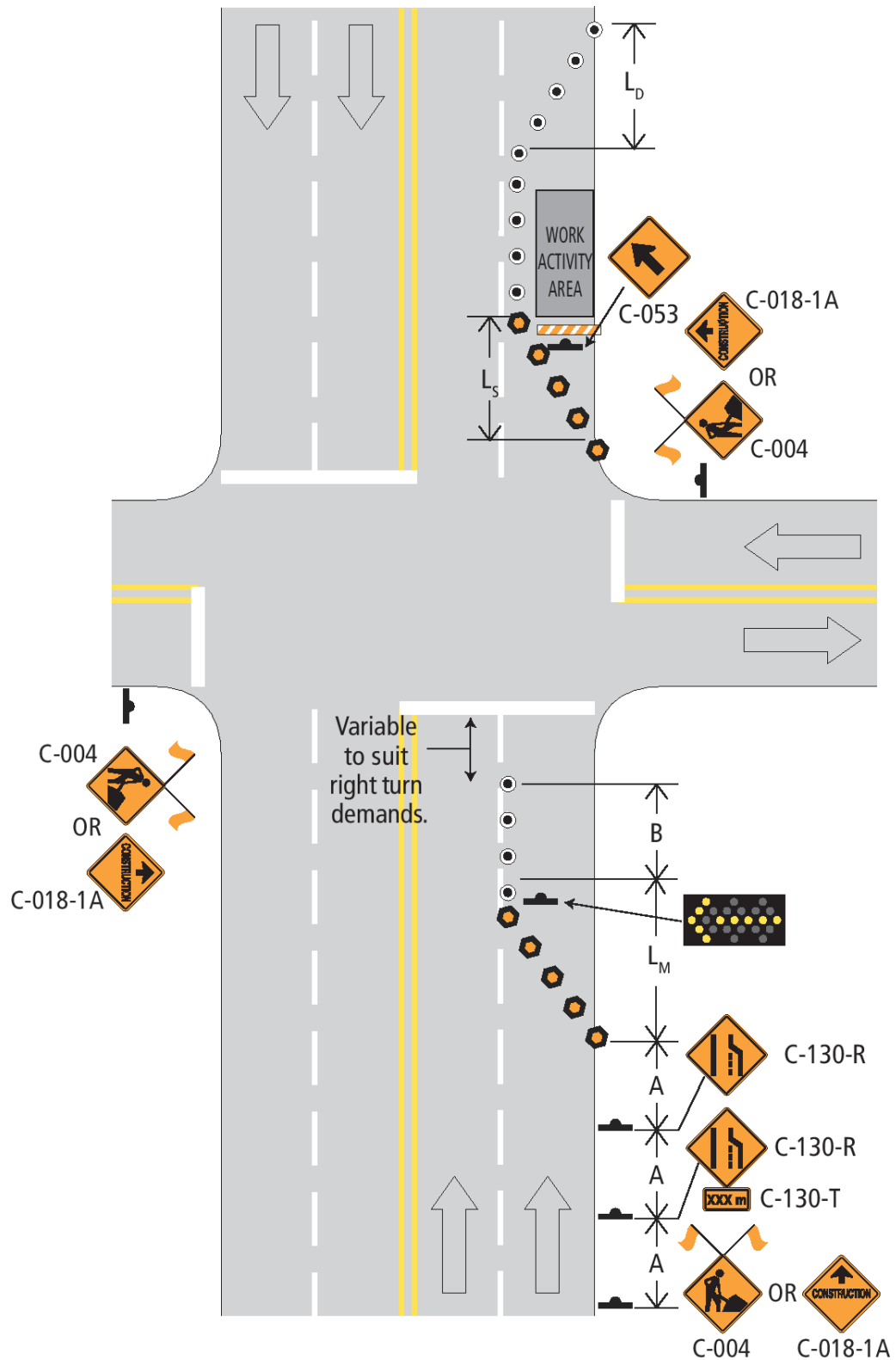
- A right lane that has significant right-turning movements may remain open as a turn lane for right turns only. Sufficient space should be considered for vehicle storage in this lane, and additional traffic control should be considered.
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed Ahead C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 11.8: Right Lane Closure (Far Side) – Multilane Intersection – Short and Long Duration



11.9 Left/Right Lane Closure within Intersection – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure on a multilane roadway where the closure extends into—and possibly through—an intersection that affects both major road and cross-direction traffic. It may be used where the intersection is signalized or stop-controlled.

Traffic from the closed lane on the major road is diverted into an adjacent lane using a lane drop. Traffic on the cross street should be informed of the partial or complete closure, and re-routed using a detour route if possible.

Because of the lane closure within the intersection, it is necessary to restrict turning movements at the intersection for certain directions of travel (i.e., prohibit left and/or right turns by using Turn Control R-015-L/R signs).

Standard:

- On the **major road**:
 - The left/right lane shall be closed on the near side of the intersection, and traffic moved to the left/right lane.
 - A Left/Right Lane Closed Ahead C-130-L/R sign with a C-130-T distance tab is required in advance of a second Left/Right Lane Closed Ahead C-130-L/R sign.
 - A Road Closed R-012 sign and a Turn Control R-015-L/R sign shall be placed in advance of the work area and repeated closer to the intersection.
 - In the opposing direction on the major road, a Road Closed R-012 sign and a Turn Control R-015-L/R sign shall be used.
 - A flashing arrow board (FAB) in arrow mode shall be placed inside the taper in advance of the work area on the near side of the intersection.
- In the **cross-street direction**:
 - From both directions, a Road Closed Ahead C-030-6A sign or a dynamic message sign (DMS) shall be the first sign used on the approach to the closed portion of roadway.
 - Turning shall be restricted in the cross direction with a No Through Traffic R-017-2 sign and a Road Closed R-012 sign.
 - The closed lane shall be blocked by a barricade with a Road Closed R-012 sign and a Detour C-005-LR1 marker.
 - The barricade on the intersection side shall display a Road Closed R-012 sign.
- If a **detour route** is available, additional signage is required:
 - A Detour Ahead C-006-A marker shall be used in advance of the detour.
 - A Detour Ahead Left/Right C-006-LR marker shall be positioned just in advance of the detour route to guide traffic in the appropriate direction.

Guidance:

- Detour signing should be provided on both cross-street approaches wherever possible, and will vary with the detour routes available.

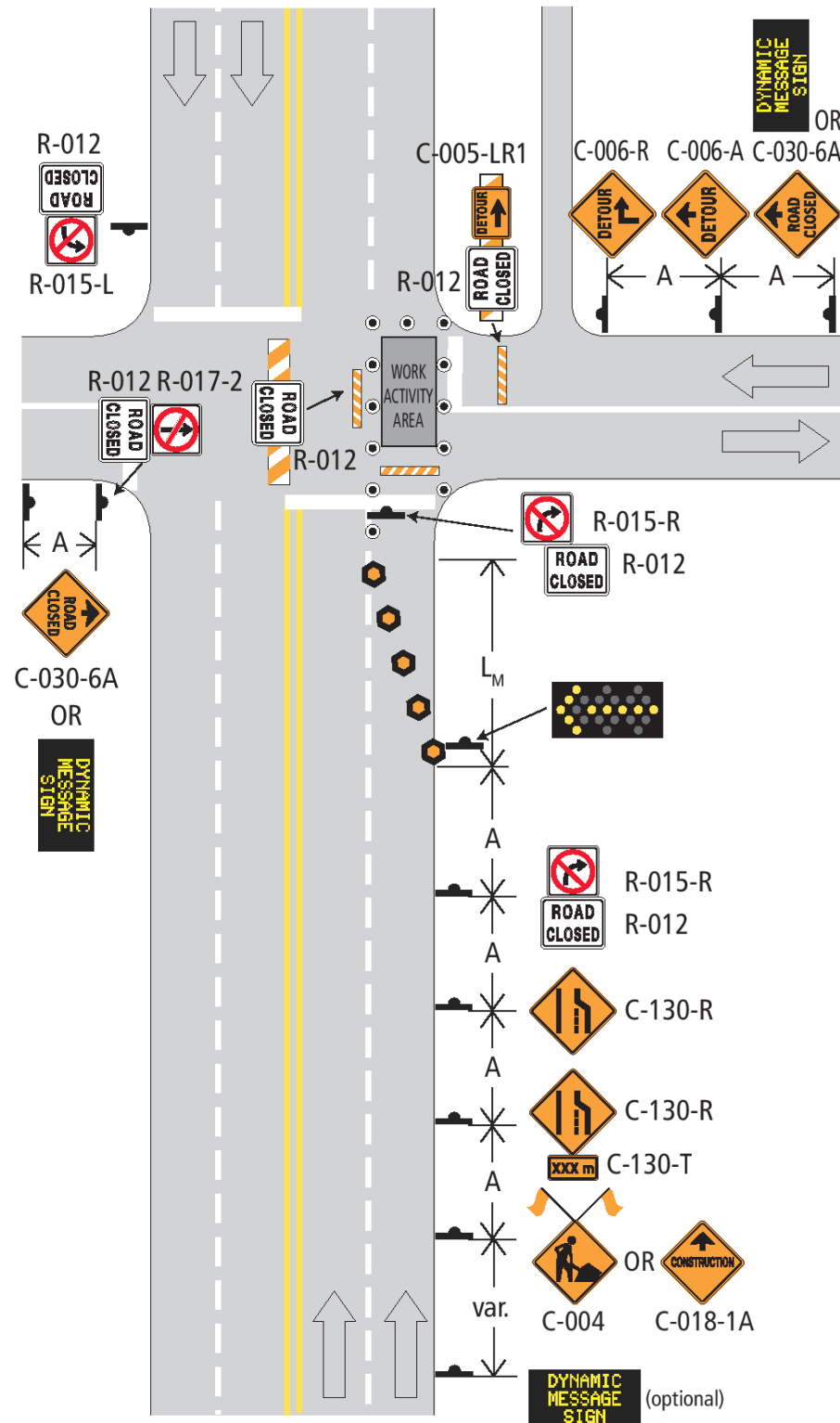
Options:

- If the speed limit is ≤ 60 km/h:
 - The upstream Left/Right Lane Closed Ahead C-130-L/R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

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Figure 11.9: Left/Right Lane Closure within Intersection – Multilane Intersection – Short and Long Duration



11.10 Right Lane Closure with Right-Turn Lane (Near Side) – Channelized Right Turn Open – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a single lane closure on a multilane roadway when the closure occurs on the approach to (near side of) an intersection.

It is typically be used at a signalized intersection where there is a channelized right-turn lane.

Traffic in the right lane is directed into the right-turn lane. Drivers in the right lane are informed in advance that traffic in the right lane must turn right.

Standard:

- A Right Lane Must Turn Right R-082-R2 sign with a C-130-T distance tab is required in advance of a second Right Lane Must Turn Right R-082-R2 sign.
- The flashing arrow board (FAB) shall be set to caution mode.

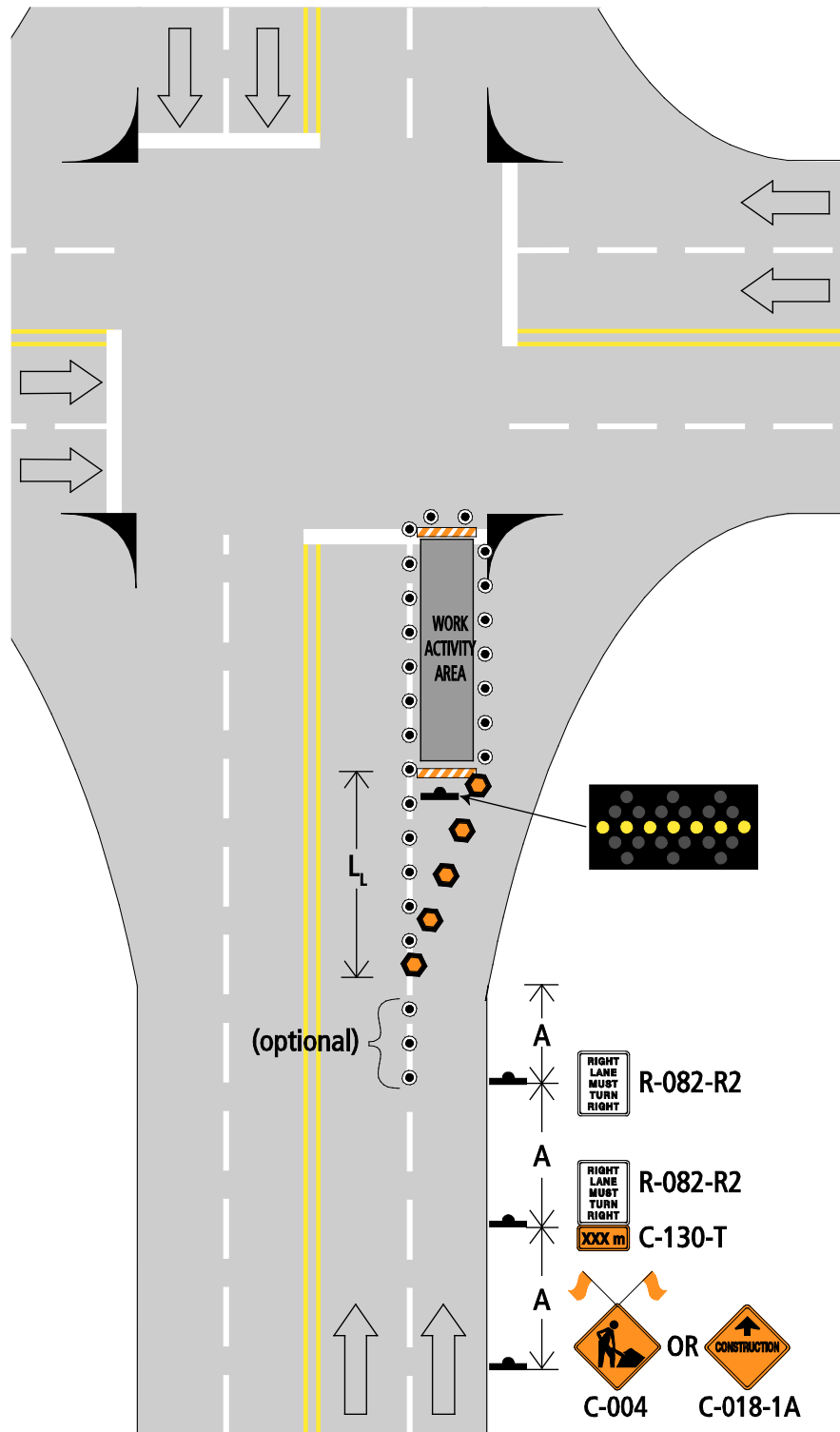
Guidance:

- To direct right-turn vehicular traffic into the right-turn lane, tubular markers or drums should be placed in a line parallel to the pavement edge to create a taper.
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- To separate traffic earlier in advance of the work area, additional channelizing devices may be placed along the dashed lane line to separate the left and right lanes.

Figure 11.10: Right Lane Closure with Right-Turn Lane (Near Side) – Channelized Right Turn Open – Multilane Intersection – Short and Long Duration



11.11 Two Lanes Closed (Near Side) – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a double lane closure on a multilane roadway when the closure occurs on the approach to (near side of) an intersection.

Both through lanes are closed, and through traffic is diverted into the left-turn lane to accommodate its movement through the intersection.

Standard:

- Traffic shall be merged into a single lane before approaching the left-turn and right-turn lanes.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- A double-sided taper shall be indicated with drums, and a Double Hazard C-154-D marker shall be positioned in advance of the work area to direct traffic to the left and right lanes.
- Flashing arrow boards (FABs) shall be positioned as follows:
 - FAB #1 in arrow mode: in the right lane drop taper in advance of the work area
 - FAB #2 in caution mode: inside the work area taper in advance of the work

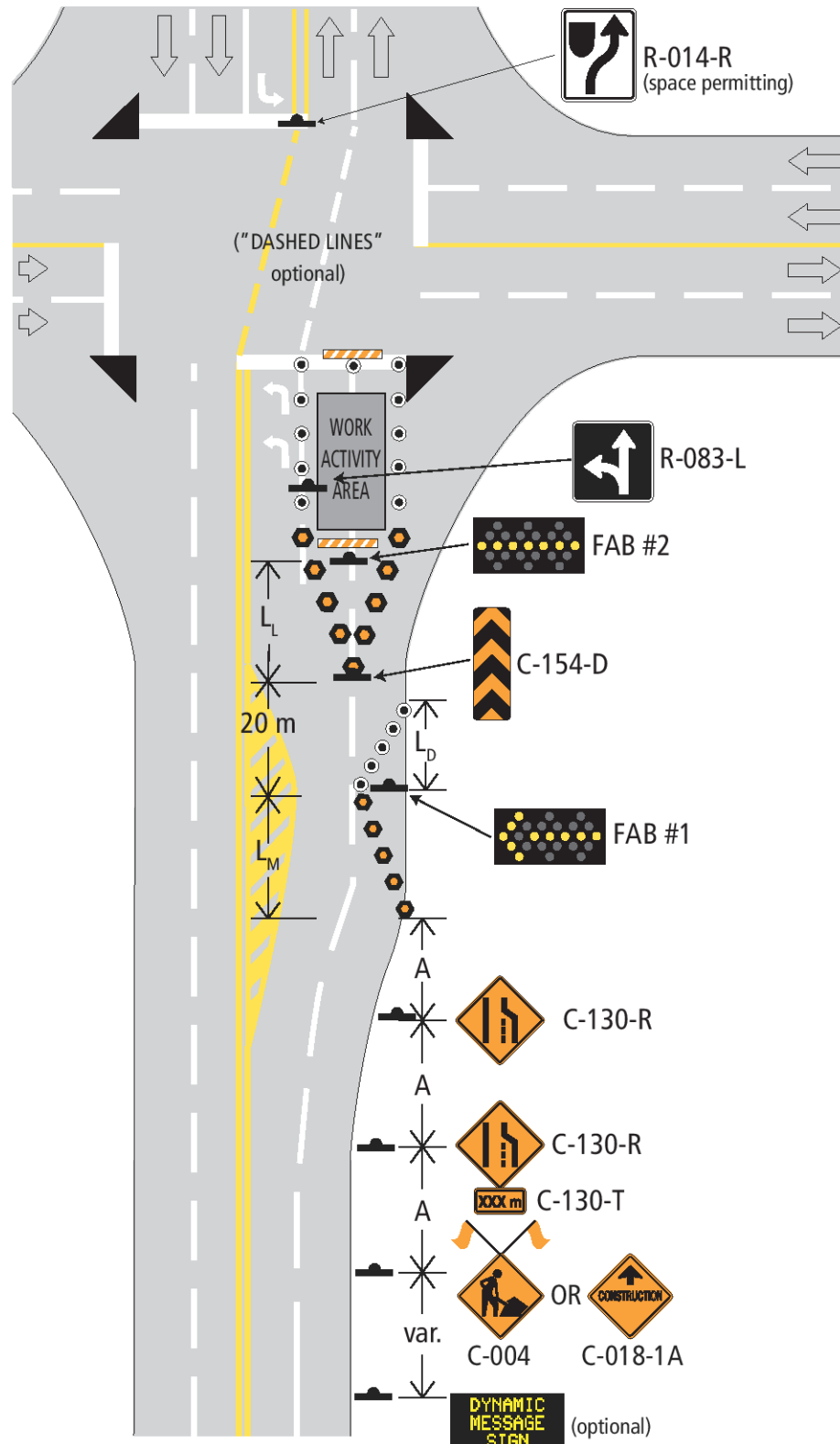
Guidance:

- It is intended that traffic moving through the intersection use the left-turn lane. Signal timings may have to be adjusted in all directions at signalized intersections.
- A lane use sign, such as the Lane Use R-083-L sign, should be positioned before the intersection to provide clarity for drivers.
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- Temporary dashed pavement marking may be added across the intersection to guide traffic through the intersection into the downstream lane.
- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed Ahead C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
 - A Lane Closure Arrow C-053 sign may replace FAB #1

Figure 11.11: Two Lanes Closed (Near Side) – Multilane Intersection – Short and Long Duration



11.12 Two-Lane Closure – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a double lane closure on a multilane roadway where the closure occurs both upstream (near side) and downstream (far side) of a signalized or stop-controlled intersection, but not through the intersection itself.

Traffic from the closed lanes is re-routed across the centreline into the opposing travel lane through a median crossover, and the number of lanes available for opposing traffic is reduced using lane drops. The placement and maintenance of channelizing devices is critical.

Standard:

- Flashing arrow boards (FABs #1, #2, #3, and #4) in arrow mode are required in advance of the work area on the major road, and shall be positioned inside the approaching taper for each closed lane or lane shift.
- Two-Way Traffic Ahead C-132 signs shall be used in advance of locations where two-way traffic begins.
- Two-Way Traffic R-010 signs shall be used along tangents where two-way traffic has been established.
- A Keep Right R-014-R sign shall be placed on the far side of the intersection to direct drivers to keep right.

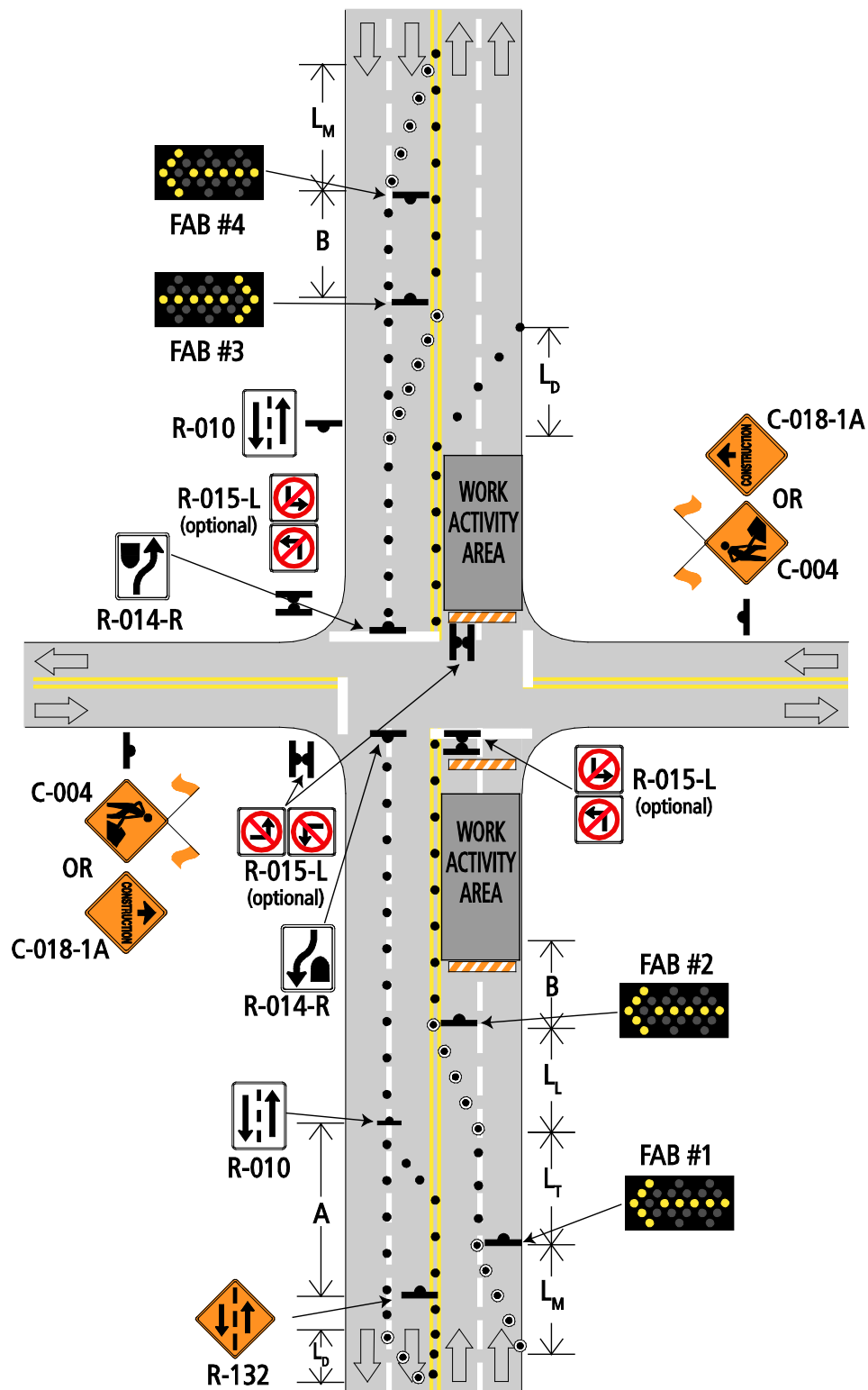
Guidance:

- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- Temporary dashed pavement marking may be added across the intersection to guide traffic through the intersection into the downstream lane.
- If the speed limit is ≤ 60 km/h:
 - A Lane Closure Arrow C-053 sign may replace FAB #2 and FAB #3

Figure 11.12: Two-Lane Closure – Multilane Intersection – Short and Long Duration



11.13 Multiple Lane Closure (Far Side) with Dedicated Left-Turn Lane – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup for a double lane closure on a multilane roadway when the closure occurs downstream (far side) of an intersection.

Traffic from the closed lanes is merged into the left-turn lane on the upstream (near) side and travels through the intersection into the opposing left-turn lane.

The number of lanes available for opposing traffic is reduced, so the placement and maintenance of channelizing devices is critical.

Standard:

- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- A double-sided taper shall be indicated with drums, and a Double Hazard C-154-D marker shall be positioned in advance of the work to direct traffic to the left and right lanes.
- Flashing arrow boards (FABs) shall be positioned as follows:
 - FAB #1 in arrow mode: in the right lane drop taper in advance of the work area
 - FAB #2 in caution mode: inside the work area taper in advance of the work
- A Lane Closure Arrow C-053 sign shall be used in advance of the work area.

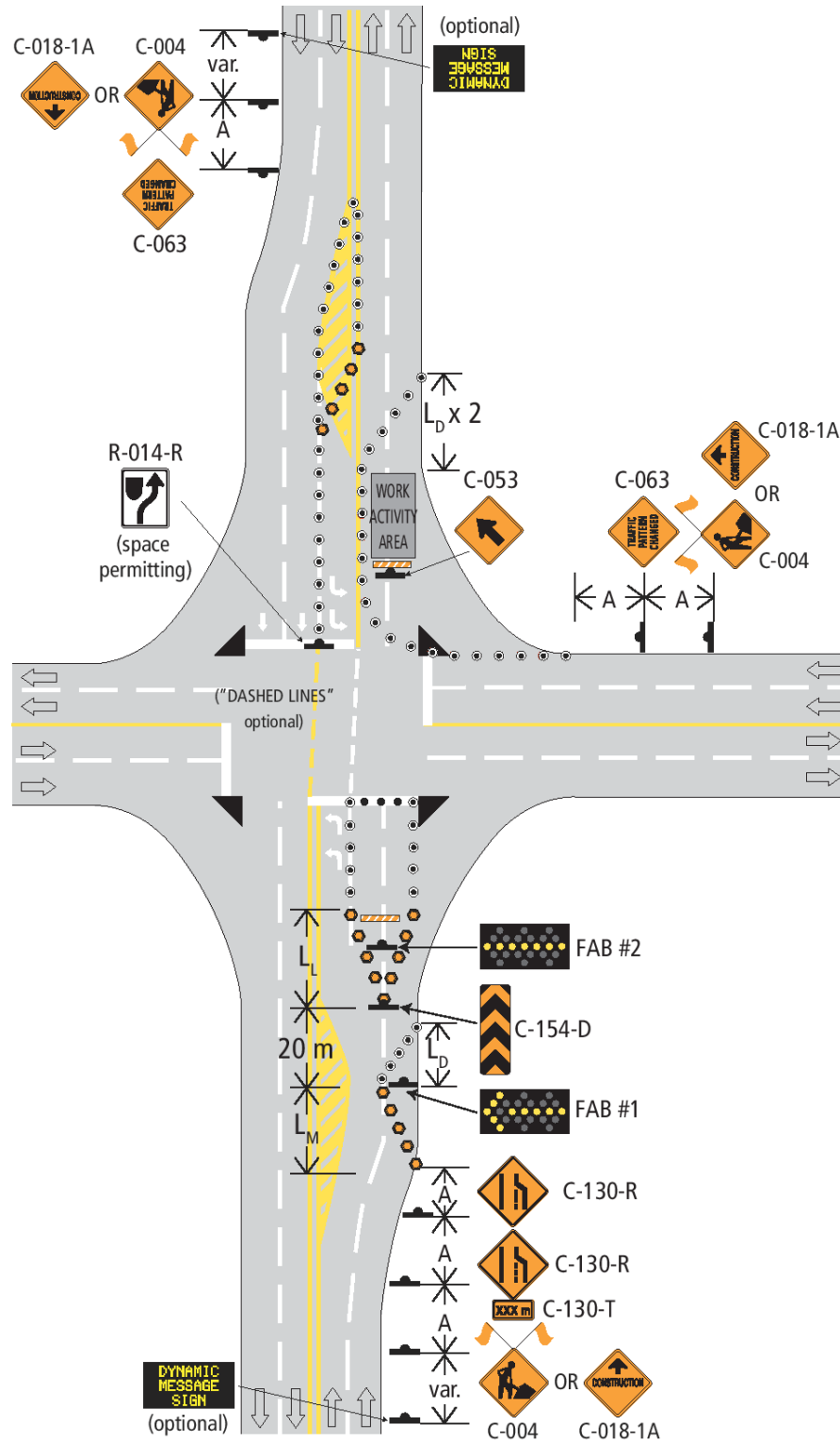
Guidance:

- Traffic moving through the intersection is intended to use the left-turn lane. Signal timings may have to be adjusted in all directions at signalized intersections.
- Median-mounted signs matching the shoulder-mounted signs should be used where space allows.

Options:

- A dynamic message sign may be used in advance of the work.
- Temporary dashed pavement marking may be added across the intersection to guide traffic through the intersection into the downstream lane.
- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed Ahead C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
 - A Lane Closure Arrow C-053 sign may replace FAB #1.

Figure 11.13: Multiple Lane Closure (Far Side) with Dedicated Left-Turn Lane – Multilane Intersection – Short and Long Duration



11.14 Midblock Sidewalk Detour – Multilane Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for a sidewalk detour that uses the outside lane of a multilane roadway or the parking lane of a two-lane, two-way roadway.

Standard:

- The pedestrian detour shall be clearly delineated so that the route is apparent to both pedestrians and motorists.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- The lane closure taper shall be delineated with drums.
- Flashing arrow boards (FABs) in arrow mode shall be used inside the approaching taper in advance of the work area and before the pedestrian route, and for speeds ≥ 70 km/h.

Guidance:

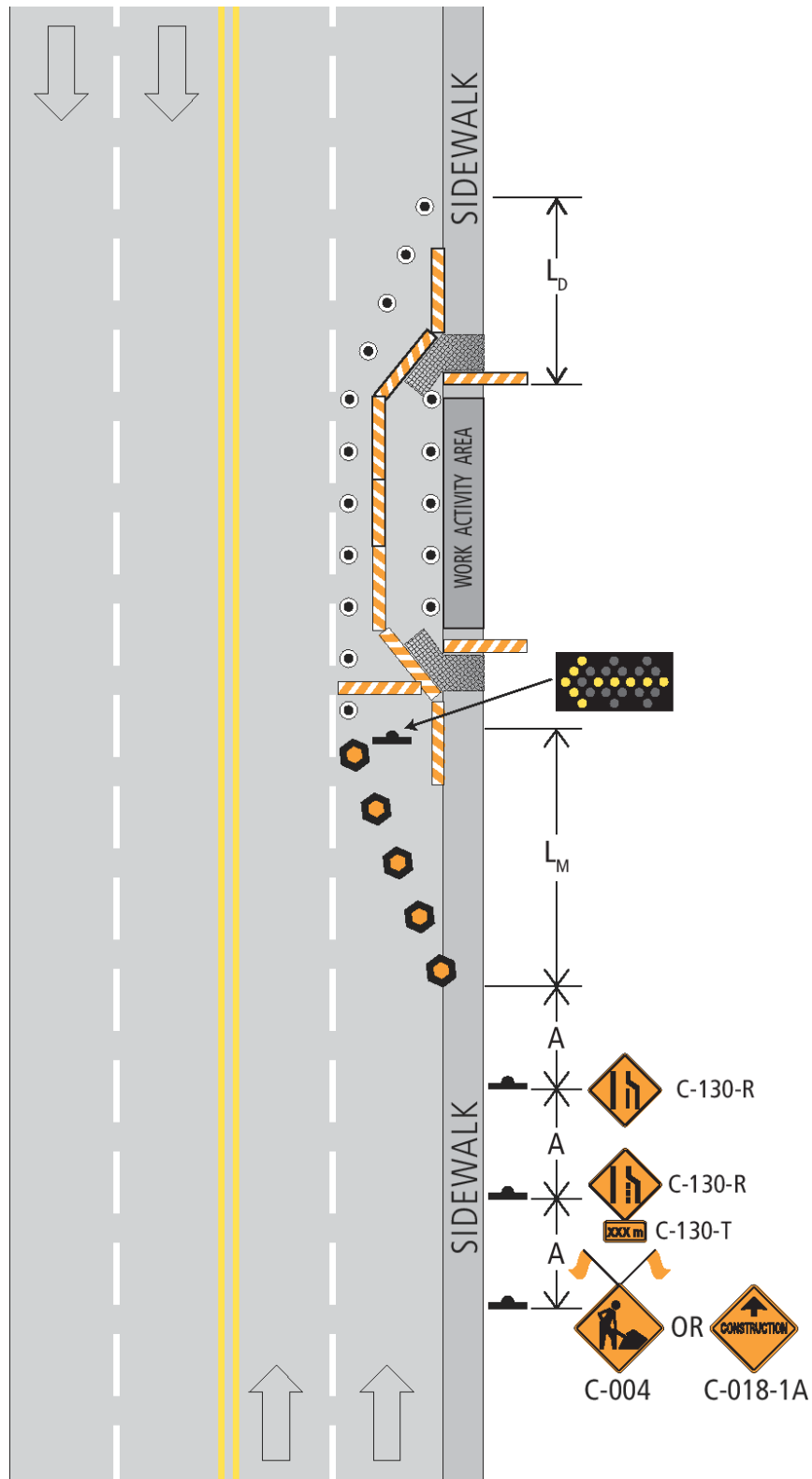
- Clear delineation of the pedestrian route can be achieved in various ways, such as using closely-spaced tubular markers, barricades, fencing, or temporary barriers.
- Temporary pedestrian access routes should be 1.5 metres wide or wider, with a minimum width of 1.2 metres where constraints exist.
- A hard, temporary walking surface should cover rough, soft, or uneven ground.
- At abrupt elevation changes (e.g., between sidewalk and road levels), a temporary curb ramp should be provided, with anti-slip treatment and a slope of 12:1 (8%) or less.
- When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities should include accessibility features that are consistent with those in the existing pedestrian facility.

Options:

- Instead of a ramp, a boardwalk with a railing may be installed at sidewalk level around the closure for high-volume pedestrian areas or projects that last for several days or more.
- Depending on the type of work and the condition of the site, barricades may have to be supplemented with fencing or other devices to physically prevent pedestrians from straying into the work area (see [Section 4.10.1: Work Zone Fencing](#)).
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 11.14: Midblock Sidewalk Detour – Multilane Roadway – Short and Long Duration



11.15 Midblock Sidewalk Closure – Short and Long Duration

Purpose:

This layout shows the typical setup for a sidewalk detour that is not able to use the outside lane of a multilane roadway or the parking lane of a two-lane, two-way roadway.

This layout is used where a sidewalk is closed and pedestrians are detoured to another pedestrian facility. It affects only the path that pedestrians must follow, and has no impact on traffic.

Standard:

- The sidewalk shall be closed using a barricade and a Sidewalk Closed C-202 sign on both sides of the work.
- A second barricade with a Sidewalk Closed – Cross Here C-203-L/R sign shall be placed in advance of the closure to advise pedestrians of a suitable alternative crossing.
- The pedestrian detour shall be clearly delineated so that the route is apparent to pedestrians.

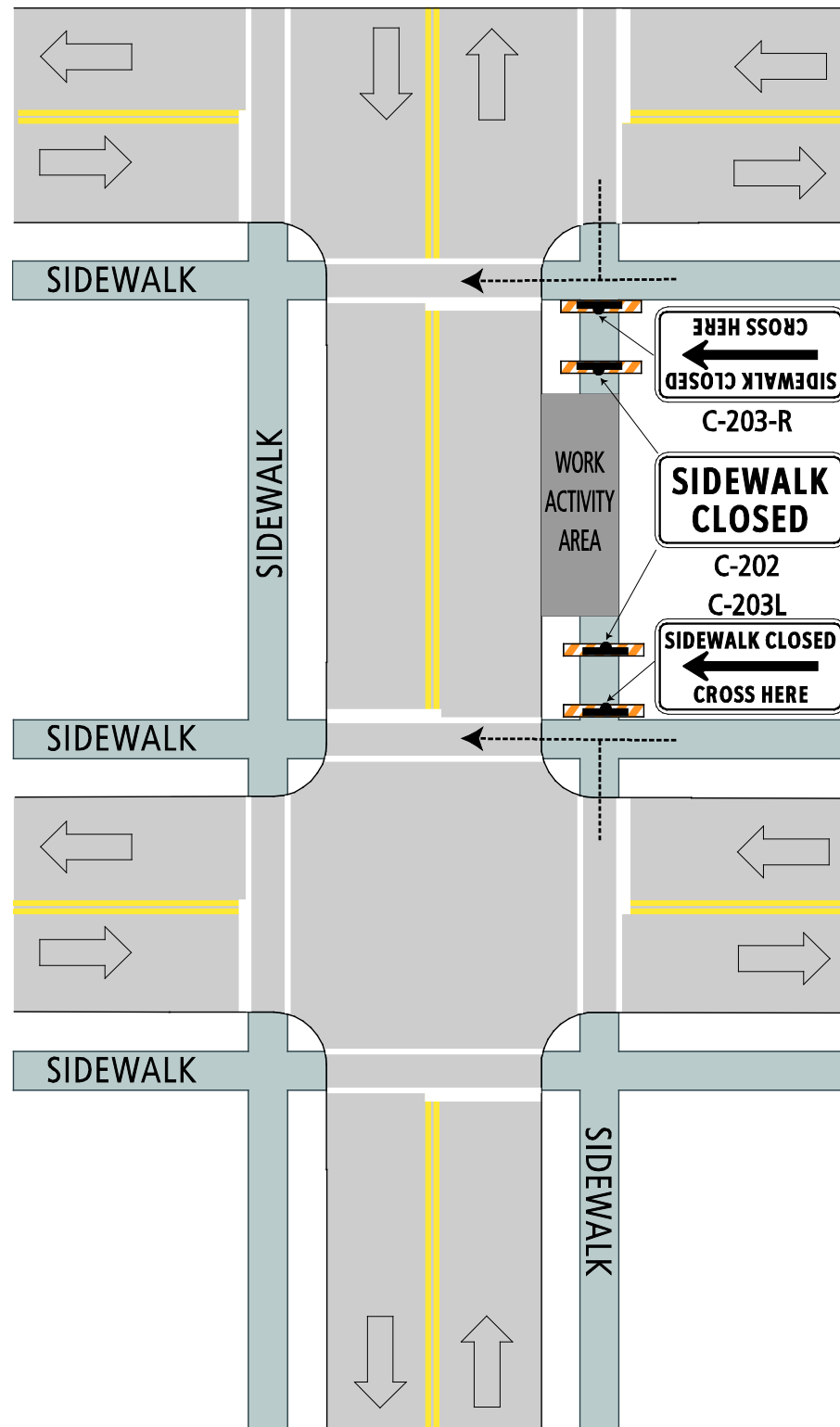
Guidance:

- Pedestrians should be notified of the closure both in advance of the closure and at the closure itself.
- Pedestrians should be advised of the location of an available crosswalk that they can use to cross the road and access a sidewalk on the other side.
- When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities should include accessibility features that are consistent with those in the existing pedestrian facility.
- The roadway may require delineation if the sidewalk work encroaches onto it.

Options:

- Depending on the type of work and the condition of the site, the barricades may have to be supplemented with fencing or other devices to physically prevent pedestrians from straying into the work area (see [Section 4.10.1: Work Zone Fencing](#)).

Figure 11.15: Midblock Sidewalk Closure – Short and Long Duration



11.16 Sidewalk Detour – Multilane Intersection – Short and Long Duration

Purpose:

This layout shows the typical setup at an intersection and on a corner for a sidewalk detour onto a multilane roadway or a two-lane, two-way roadway that has a parking lane. Where possible, the crosswalks should be kept open.

Standard:

- The pedestrian detour shall be clearly delineated so that it is apparent to both pedestrians and motorists.
- A right lane closure is required for any area where the sidewalk detours into the travel lane:
 - A Right Lane Closed Ahead C-130-R sign and a second C-130-R sign with a C-130-T distance tab are required on the leg of the intersection where traffic is being merged to one lane.
 - In the cross direction, a Right Lane Closed C-030-4A sign is required in advance of the intersection, followed by a Right Lane Must Turn Right R-082-R2 sign to advise that traffic in the outside lane cannot go through the intersection and must turn right.
- The lane closure taper shall be delineated with drums.
- Flashing arrow boards (FABs) in arrow mode shall be used inside the approaching taper in advance of the work area and before the pedestrian route, and for speeds ≥ 70 km/h.

Guidance:

- Pedestrian signals controlling closed crosswalks should be covered or deactivated.
- Clear delineation of the pedestrian route can be achieved in various ways, such as using closely-spaced tubular markers, barricades, fencing, or temporary barriers.
- Temporary pedestrian access routes should be 1.5 metres wide or wider, with a minimum width of 1.2 metres where constraints exist.
- A hard, temporary walking surface should cover rough, soft, or uneven ground.
- At abrupt elevation changes (e.g., between sidewalk and road levels), a temporary curb ramp should be provided, with anti-slip treatment and a slope of 12:1 (8%) or less.
- When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities should include accessibility features that are consistent with those in the existing pedestrian facility.

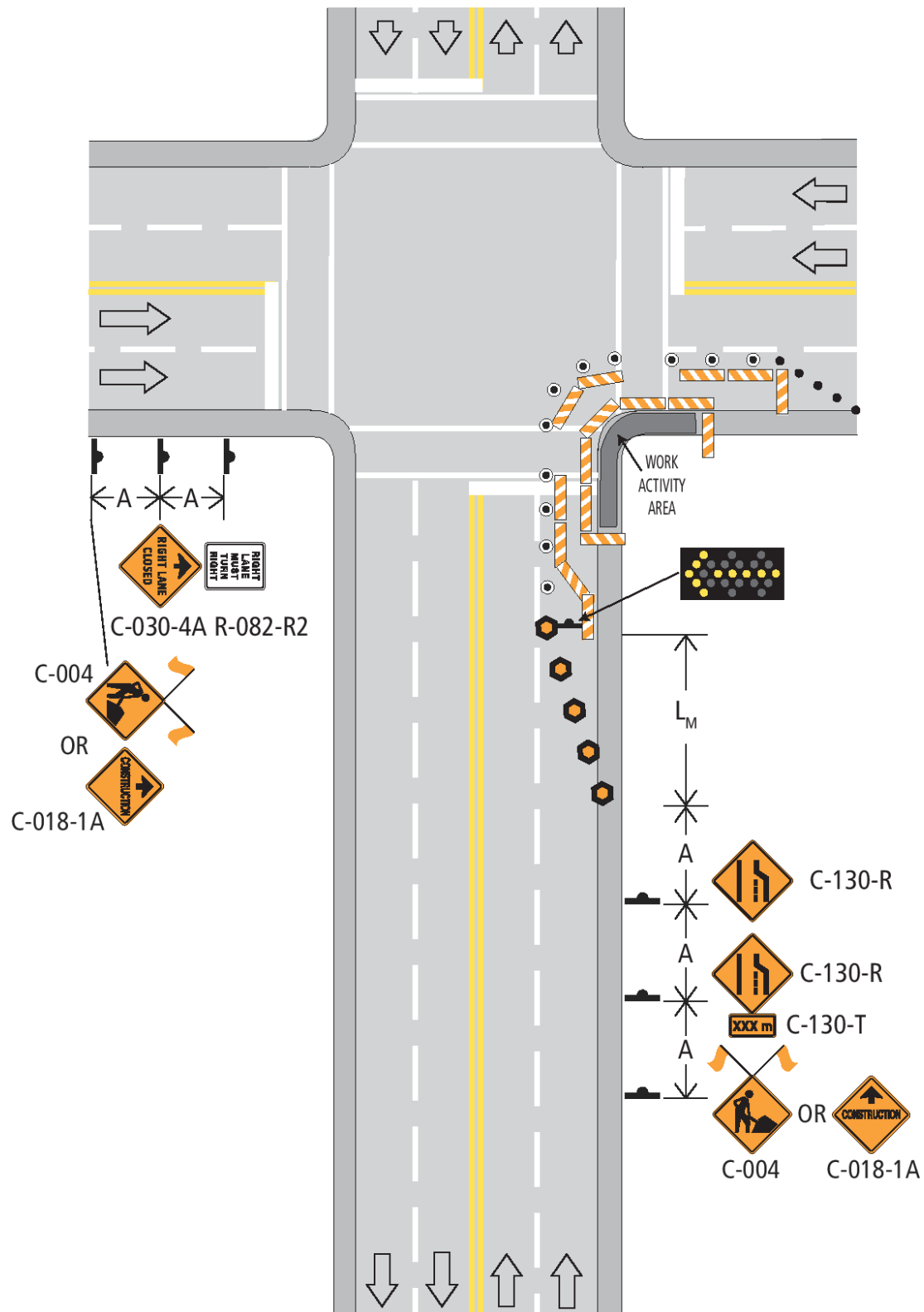
Options:

- A full lane closure may be considered for the right lane of the cross street if high volumes of traffic are attempting to proceed straight through the intersection or if there is confusion about the Right Turn Only signage.
- Instead of a ramp, a boardwalk with a railing may be installed at sidewalk level around the closure for high-volume pedestrian areas or projects that last for several days or more.
- Depending on the type of work and the condition of the site, barricades may have to be supplemented with fencing or other devices to physically prevent pedestrians from straying into the work area (see Section 4.10.1: Work Zone Fencing).
- If the speed limit is ≤ 60 km/h:
 - The upstream Right Lane Closed Ahead C-130-R sign may be omitted and the Crew Working Ahead C-004 sign or Construction Ahead C-018-1A sign moved downstream by Table B Distance A.
 - Tubular markers may be used for leading tapers instead of drums.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

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Figure 11.16: Sidewalk Detour – Multilane Intersection – Short and Long Duration



11.17 Intersection Sidewalk and Crosswalk Closure – Short and Long Duration

Purpose:

This layout shows the typical setup where crosswalks at an intersection are affected by sidewalk or roadside work on one of the intersection corners.

In this situation, the affected crosswalk cannot be used, and a detour in advance of the closure is required to direct pedestrians to another pedestrian facility.

Standard:

- The pedestrian detour shall be clearly delineated so that the route is apparent to both pedestrians and motorists.
- Barricades shall be used to close both the sidewalk approach and the crosswalk approach to prevent access to the work area.
- Barricades immediately adjacent to the work shall display Sidewalk Closed C-202 signs.
- Additional barricades with Sidewalk Closed – Cross Here C-203-L/R signs shall be placed in advance of the closure to advise pedestrians of a suitable alternative crossing.

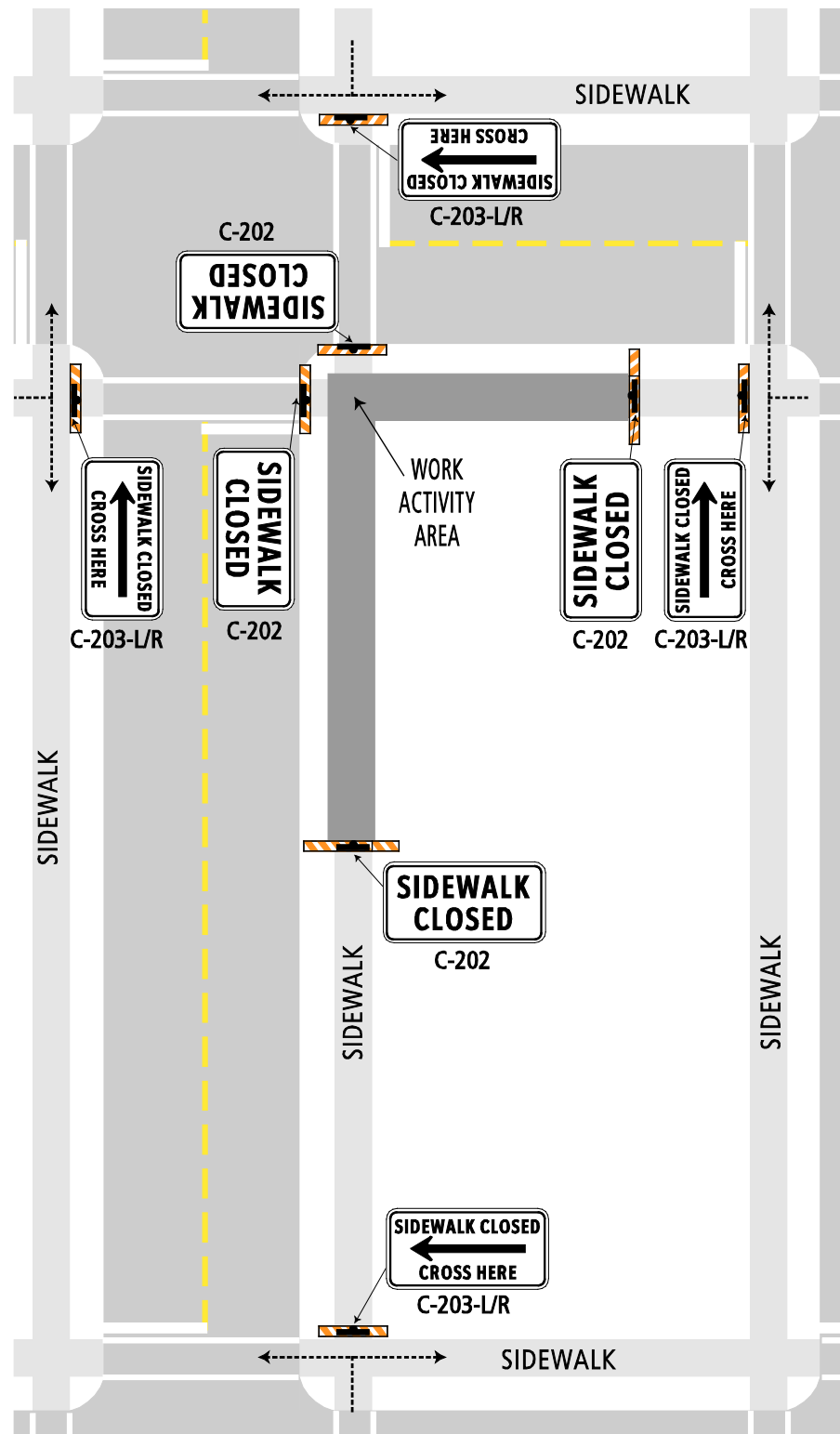
Guidance:

- Pedestrian signals controlling closed crosswalks should be covered or deactivated.
- Pedestrians should be notified of the closure both in advance of the closure and at the closure itself.
- Pedestrians should be advised of the location of an available crosswalk that they can use to cross the road and access a sidewalk on the other side.
- When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities should include accessibility features that are consistent with those in the existing pedestrian facility.
- The roadway may require delineation if the sidewalk work encroaches onto it.

Options:

- A temporary crosswalk may be implemented if there is no nearby pedestrian crossing opportunity.
- If a temporary midblock crosswalk is implemented, curb parking should be prohibited within 30 metres in advance of the midblock crosswalk.

Figure 11.17: Intersection Sidewalk and Crosswalk Closure – Short and Long Duration



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PART B – TRAFFIC CONTROL

Section 12: Traffic Control Layouts – Roundabouts¹

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¹ See [Section 11: Traffic Control Layouts](#) – Intersections for information on traffic control layouts for other intersections.

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PART B – TRAFFIC CONTROL

Section 12: Traffic Control Layouts – Roundabouts

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS									
Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS									
Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

12.1 General Information - Roundabouts¹

1. The one-way flow and roadway geometry of roundabouts combine to make them significantly different from most other intersections negotiated by drivers.
2. Temporary traffic control during maintenance and construction activities at roundabouts should provide clear guidance to drivers, some of whom may be unfamiliar with roundabout operations.
3. Some basic features of roundabouts that are mentioned throughout this section are shown below in [Figure 12.1: Generic Two-Lane Roundabout](#).

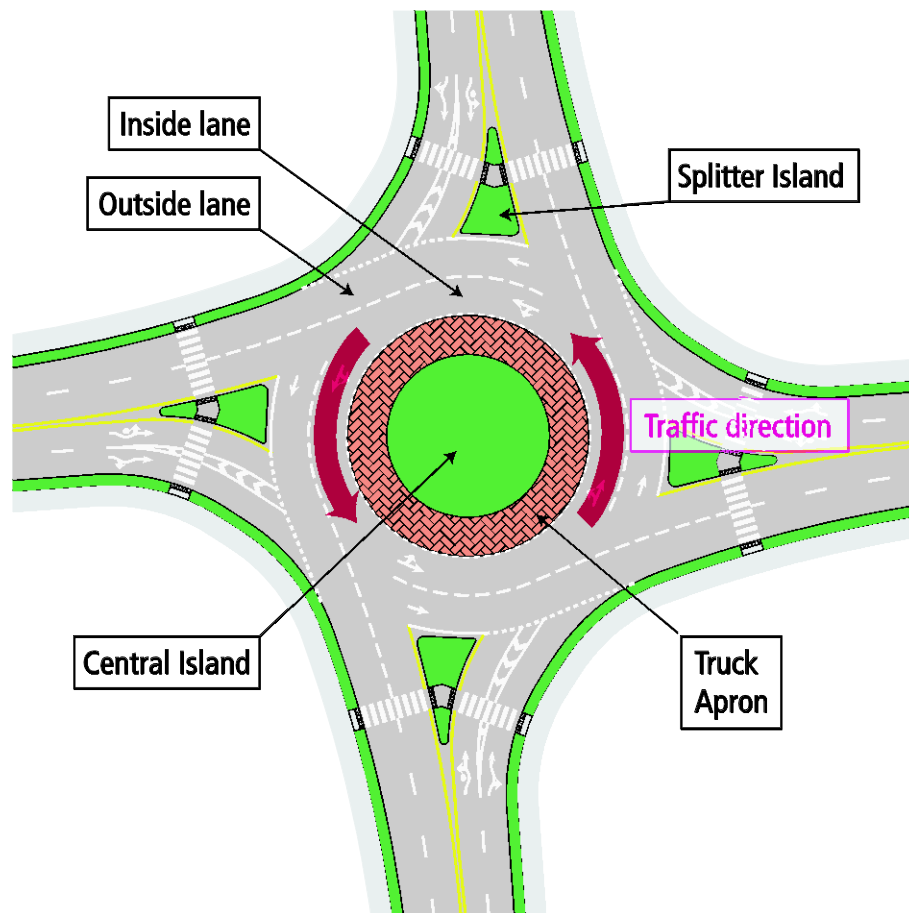


Figure 12.1: Generic Two-Lane Roundabout

¹ See [Section 11: Traffic Control Layouts – Intersections](#) for information on traffic control layouts for other intersection types.

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign shall be used.
- For long-duration work, a Construction Ahead C-018-1A sign shall be used.
- A Prepare to Stop C-029 and Traffic Control Person Ahead C-001-1 signs shall be used in advance of TCPs.
- Existing directional signs that are contrary to the new flow of traffic shall be covered.

Guidance:

- Using tubular markers rather than drums allows for better sight lines between TCPs and vehicle queues, and provides more room for large vehicles to navigate through the roundabout.

Options:

- The Flagger Ahead C-001-2 sign may be used for additional advance warning where TCPs are stopping traffic
- A portable dynamic message sign (DMS) may be used to provide advance messaging for drivers.
- In low speed (≤ 60 km/h) urban areas (within municipal boundaries), customization of traffic control layouts, including closer device spacing and shorter taper lengths, may be necessary to maintain access and mobility. In these cases, document why adjustments are being made.

12.2 Lane Closure in Roundabout – Single Lane – Short and Long Duration

Purpose:

This layout shows the typical setup where an area within the roundabout or the approach to the roundabout is obstructed, preventing traffic from entering the roundabout in its normal path. It is typically used for short-duration work, but it may also be used for long-duration work.

As is the case for traffic control at a signalized or stop-controlled intersection, a Traffic Control Person is required for each approach leg entering the roundabout because traffic is being directed in the opposite direction through the roundabout.

Standard:

- The TCPs shall have communication with one another.
- Overhead lighting shall illuminate each TCP location at night.
- The TCP on each approach leg shall hold traffic so that only one direction proceeds at a time.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.
- Channelizing devices shall be used to isolate the work activity area and guide traffic through the roundabout.
- Barricades are required at each end of the work activity area for long-duration work.

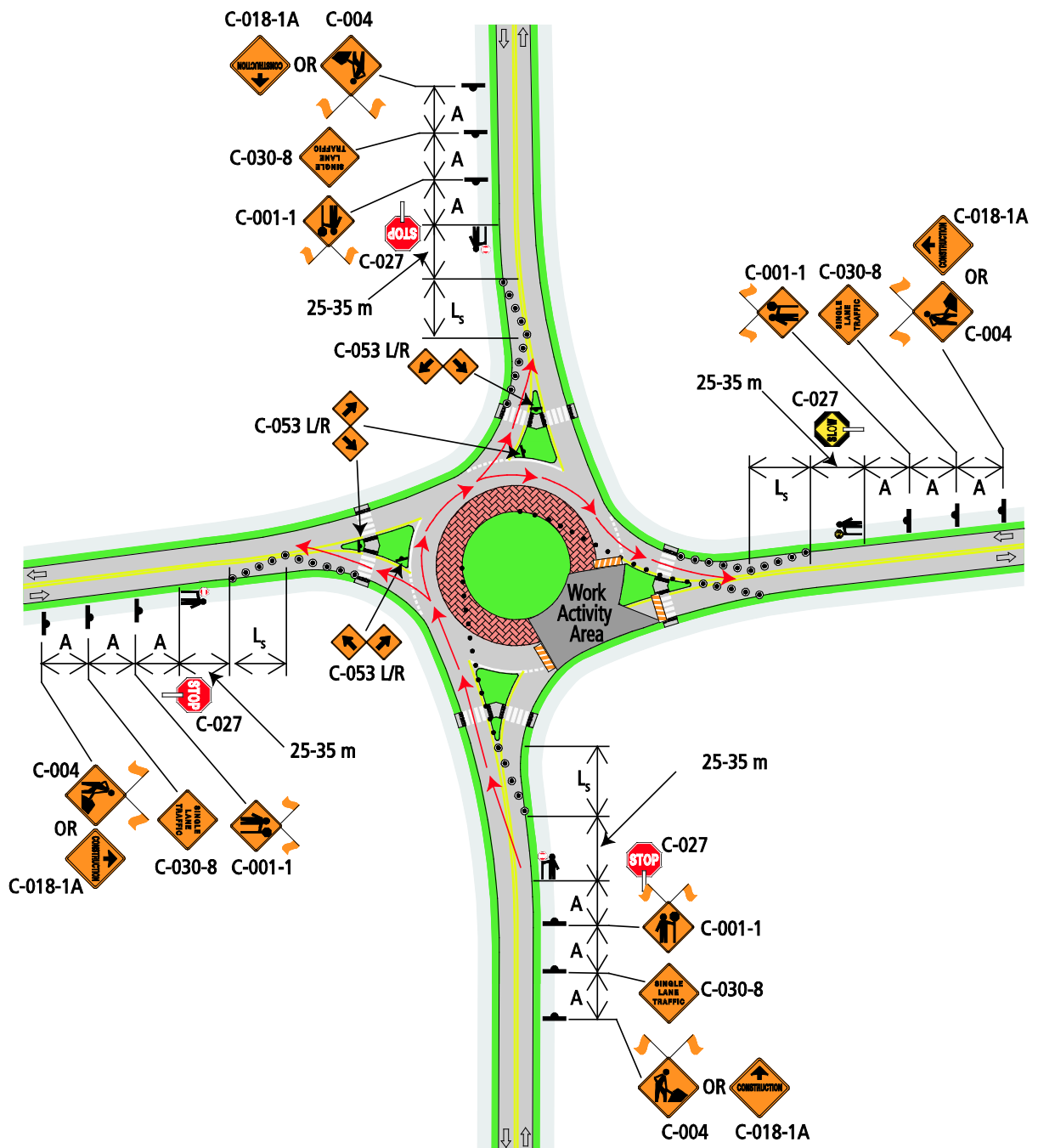
Guidance:

- Where traffic must travel counter to its normal flow because of a full closure within the roundabout, additional signing to direct drivers may be needed on splitter islands and/or within the roundabout central island (e.g., detour signs with arrows).

Options:

- Additional signing in the central island may be necessary to assist traffic movement through roundabout.
- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- The truck apron may be used as part of a temporary lane to divert traffic around a lane closure within the roundabout.
- An additional TCP stationed within the central island may assist in directing drivers.
- If all the work is contained within the central island and does not affect the travel lanes, one sign per approach may be sufficient (i.e., a Crew Working Ahead C-004 sign for short-duration work or a Construction Ahead C-018-1A sign for long-duration work).

Figure 12.2: Lane Closure in Roundabout – Single Lane – Short and Long Duration



12.3 Work Outside Roundabout – Short and Long Duration

Purpose:

This layout shows the typical setup where a lane is closed on an approach to—or a departure from—a roundabout but traffic is still able to enter and proceed through the roundabout in its normal path.

As is the case for a single lane alternating setup, one Traffic Control Person is typically required on each side of the work. Advance warning signage is required on each leg entering the roundabout.

Since the closure does not affect the roundabout itself, traffic flows counter-clockwise as usual through the roundabout.

If traffic cannot use the regular entrance into the roundabout, use the layout described in [*Section 12.2: Lane Closure in Roundabout – Single Lane*](#).

Standard:

- A Lane Closure Arrow C-053 sign shall be placed on the central island to direct traffic back into the right lane.
- Channelizing devices shall be used to isolate the work area and guide traffic into the roundabout.
- Barricades are required at each end of the work activity area for long-duration work.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

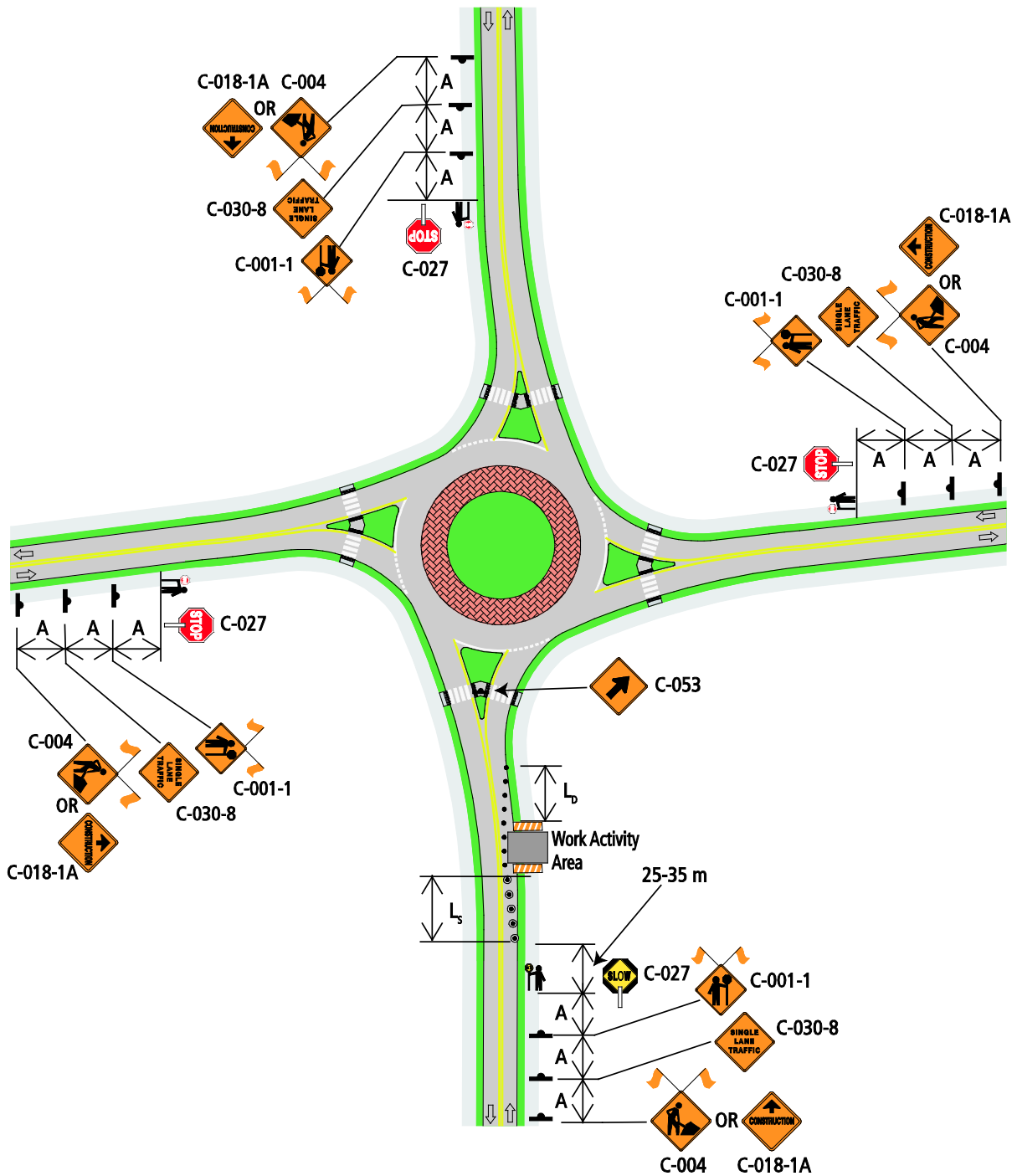
Guidance:

- Depending on the distance between TCPs, radios may be used to improve communication.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- In simpler situations, or where traffic volumes are low, the movement of traffic around the closure may be controlled by as few as two TCPs on the affected leg.

Figure 12.3: Work Outside Roundabout – Short and Long Duration



12.4 Inner Lane Closure – Multilane Roundabout – Short and Long Duration

Purpose:

This layout shows the typical setup for an inner lane closure within a multilane roundabout.

Traffic Control Persons may not be required because traffic should be able to self-regulate, using the roundabout as if it were a single-lane roundabout.

Standard:

- A Left Lane Closed C-030-3A sign is required in advance of the roundabout, followed by the corresponding Left Lane Closed Ahead C-130-L sign.
- A flashing arrow board (FAB) shall be used inside each taper.
- A Lane Closure Arrow C-053 sign is required on the outside edge of the inner lane.
- Channelizing devices shall be used to isolate the work area and separate the inner and outer lanes.

Guidance:

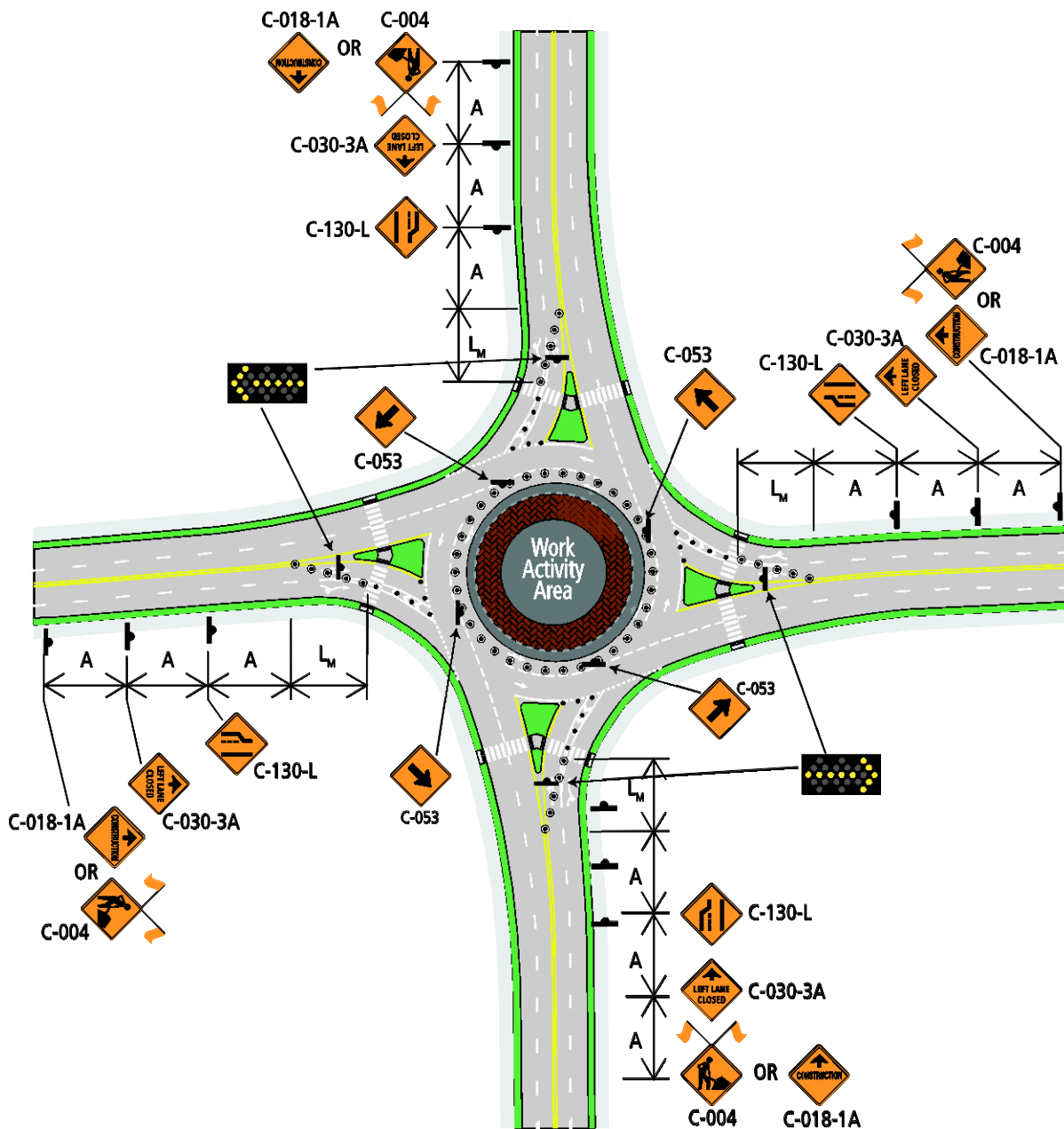
- Existing signs regarding lane use may have to be covered because the roundabout will be operating as a single-lane roundabout.
- Device positioning may have to be adjusted to accommodate long and combination vehicles, which require more room to navigate through roundabouts.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 12.4: Inner Lane Closure – Multilane Roundabout – Short and Long Duration



12.5 Outer Lane Closure – Multilane Roundabout – Short and Long Duration

Purpose:

This layout shows the typical setup for an outer lane closure within a multilane roundabout.

It is used to isolate the work area and guide traffic through the roundabout in the inner lane while also leaving space for traffic to enter and exit the inner lane.

Traffic Control Persons may not be required because traffic should be able to self-regulate, using the roundabout as if it were a single-lane roundabout.

Standard:

- A Right Lane Closed C-030-4A sign is required in advance of the roundabout, followed by the corresponding Right Lane Closed Ahead C-130-R sign.
- A flashing arrow board (FAB) shall be used inside each taper.
- A Lane Closure Arrow C-053 sign shall be positioned just inside the work area to warn traffic navigating the roundabout that the outer lane is closed.
- Barricades are required on approaches to the work activity area for long-duration work.

Guidance:

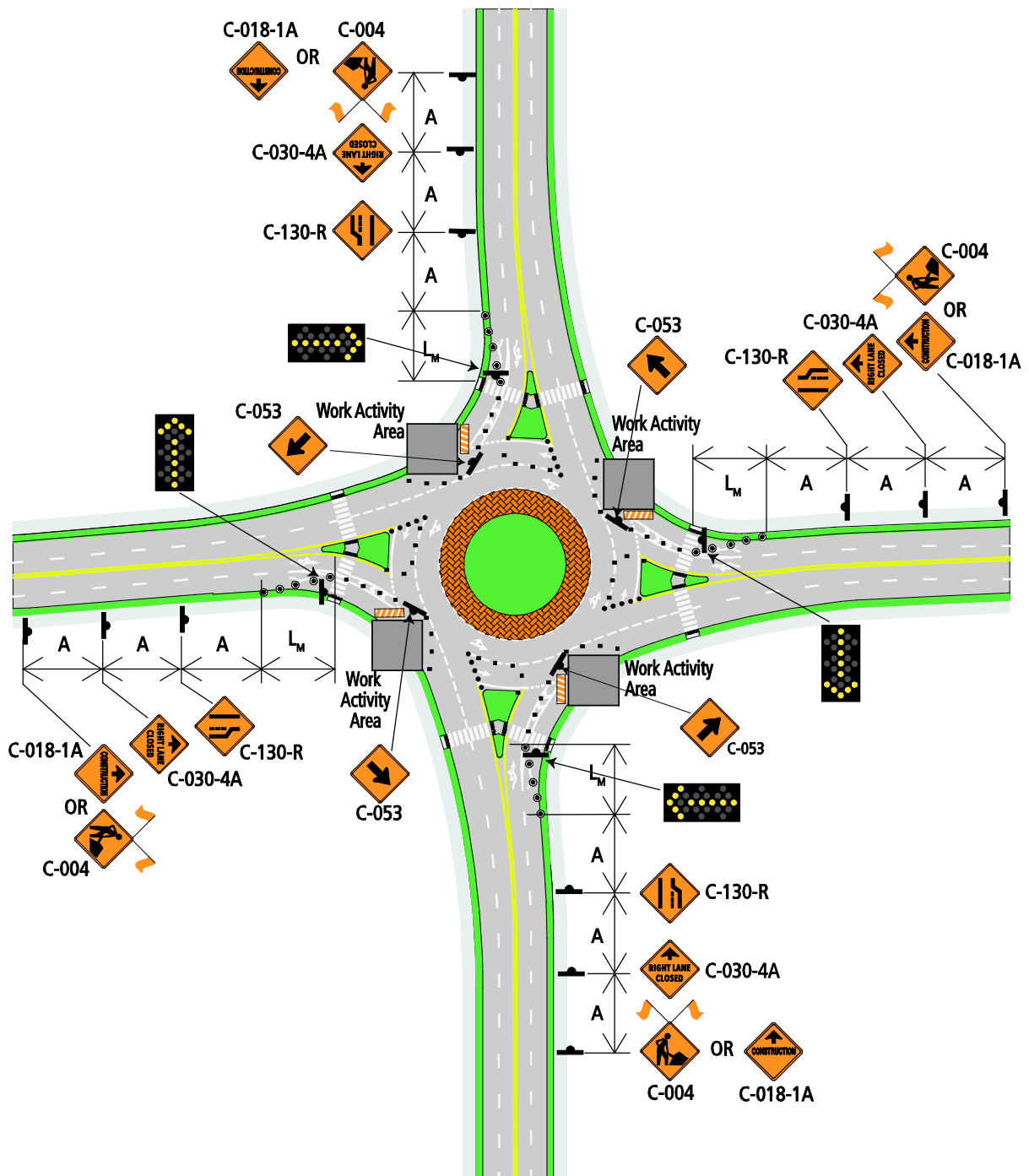
- Device positioning may have to be adjusted to accommodate long and combination vehicles, which require more room to navigate through roundabouts.
- It may be difficult for large vehicles to turn right to exit the roundabout. Additional guidance can be provided by using the Roundabout Right Turn Truck Signs C-121-1 series, which directs drivers to circumnavigate the roundabout so that they re-approach the exit straight-on.
- It may be necessary to detour large trucks from the area during construction.

Options:

- Where approach speeds are ≤ 60 km/h, cones may be used instead of tubular markers.
- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 12.5: Outer Lane Closure – Multilane Roundabout – Short and Long Duration



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PART B – TRAFFIC CONTROL

Section 13: Traffic Control Layouts – Milling, Paving, Seal Coating Contents

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PART B – TRAFFIC CONTROL

Section 13: Traffic Control Layouts – Milling, Paving, Seal Coating

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

13.1 General Information - Milling, Paving, and Seal Coating

Milling, paving, and seal coating are specific types of work that occur on a variety of roadways. The appropriate traffic control layout in this Manual should be chosen for the environment in which the work will occur.

Condition-specific signs should provide drivers with information about the specific site conditions, which may include, but are not limited to:

- low shoulders
- fresh oil
- dust
- uneven pavement lifts
- loose gravel
- bumps
- no pavement markings
- grooved pavement

The signage for low shoulders and uneven pavement lifts requires particular attention because these conditions are not easily detected in darkness or poor weather.

In addition, these principles should be incorporated into traffic control layouts:

1. Warning signs should be repeated as necessary for long sections of affected roadway.
2. Specific signage for motorcyclists and cyclists—for example, the Rough Surface C-019 series and the Bike Hazard C-183 series—should be used in advance of changes to the pavement surface that can affect stability for these road uses, such as gravelled or milled surfaces.
3. The positioning of Construction Speed Zones should be changed as necessary to keep them as short as possible and to avoid requiring drivers to proceed at unreasonably low speeds. Construction Speed Zones should be removed or relocated from areas where the work has been completed so that the speed reductions are specifically appropriate for the active work areas or the areas where hazards exist because of incomplete work.
4. More than one Construction Speed Zone may be used throughout the length of the project, with long zones requiring Maximum Speed R-004 signs and Construction Speed Zone C-080-T tabs to be repeated as necessary. The ends of Construction Speed Zones are to be marked with Maximum Speed R-004 signs that show normal speed limits.
5. For typical pilot car operations, see [Section 4.11.9: Pilot Cars for Work Zones](#) and [Section 7.16: Pilot Cars](#). The signs described in Section 7.16 can also be incorporated into other applications and layouts.
6. Signs should be moved to keep up with moving paving and seal coating operations.

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- A No Passing R-022 sign shall be used in areas where passing is prohibited.
- A Passing Permitted R-023 sign shall be used in areas where passing is permitted within the project area.

Guidance:

- None at this time.

Options:

- Where cyclists are regularly observed using the shoulder, a Share the Road W-132-1 sign may be used with an appropriate cycling hazard tab (see [Section 18: Traffic Control Layouts – Bicycle Lanes](#) for additional information).

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13.2 Benkleman Beam and Falling Weight Deflectometer Testing

The **Benkleman Beam** is a pavement-testing device that measures the deflection of flexible asphalt in order to determine the strength of the road. The worker doing the testing is required to leave the work vehicle to perform the test.

Benkleman Beam testing may take place in travelled lanes. In these cases, a spotter may be beneficial to provide additional situational awareness to the worker regarding vehicle arrivals.

The **Falling Weight Deflectometer** is a pavement-testing device mounted on a small trailer that is towed by a van. Tests are usually made at intervals of between 20 and 100 metres, with the test unit typically stopping for a maximum of 45 seconds per test. The worker doing the testing does not have to leave the work vehicle to perform the test.

Both of these operations are normally classified as mobile work (see [Section 10: Traffic Control Layouts – Mobile Work](#)).

- For testing on two-lane, two-way roadways with light traffic volumes and good visibility, see [Section 10.3: Intermittently-Moving Work – Two-Lane, Two-Way Roadway](#).
- For testing on multilane roadways, see [Section 10.5: Intermittently-Moving Work – Multilane Undivided or Divided Roadway](#).
- If traffic volumes are high or conditions prevent traffic from self-regulating, see [Section 7.8: Lane Closure with TCPs – Single Lane Alternating](#).
- A buffer vehicle should be used on high-speed, high-volume roadways.
- When Truck Stopped on Road Next 2 km C-038 signs are used for testing operations, the maximum distance between the two opposing C-038 signs should not exceed 2 kilometres except for Falling Weight Deflectometer operations on rural highways, for which it should not exceed 8 kilometres.

13.3 Advance Warning for Paving Work

Purpose:

This layout shows the typical setup for the advance warning area for paving projects.

Paving projects can cover long distances, with work occurring in only one small section at a time, so it is important to identify the project area and the work activity areas separately. Advance warning signage should identify the extent of the project limits and advise road users of upcoming work activity areas.

Standard:

- A dynamic messaging sign (DMS) is required to provide road users with relevant project information.
- A No Passing R-022 sign shall be used in areas where passing is prohibited.
- A Passing Permitted R-023 sign shall be used in areas where passing is permitted within the project area.
- A Paving Ahead Next XX km C-008-1 sign with the appropriate C-008-OL distance overlay shall be used in advance of the Limits of Construction (LoC) to advise drivers of the length of the paving work.

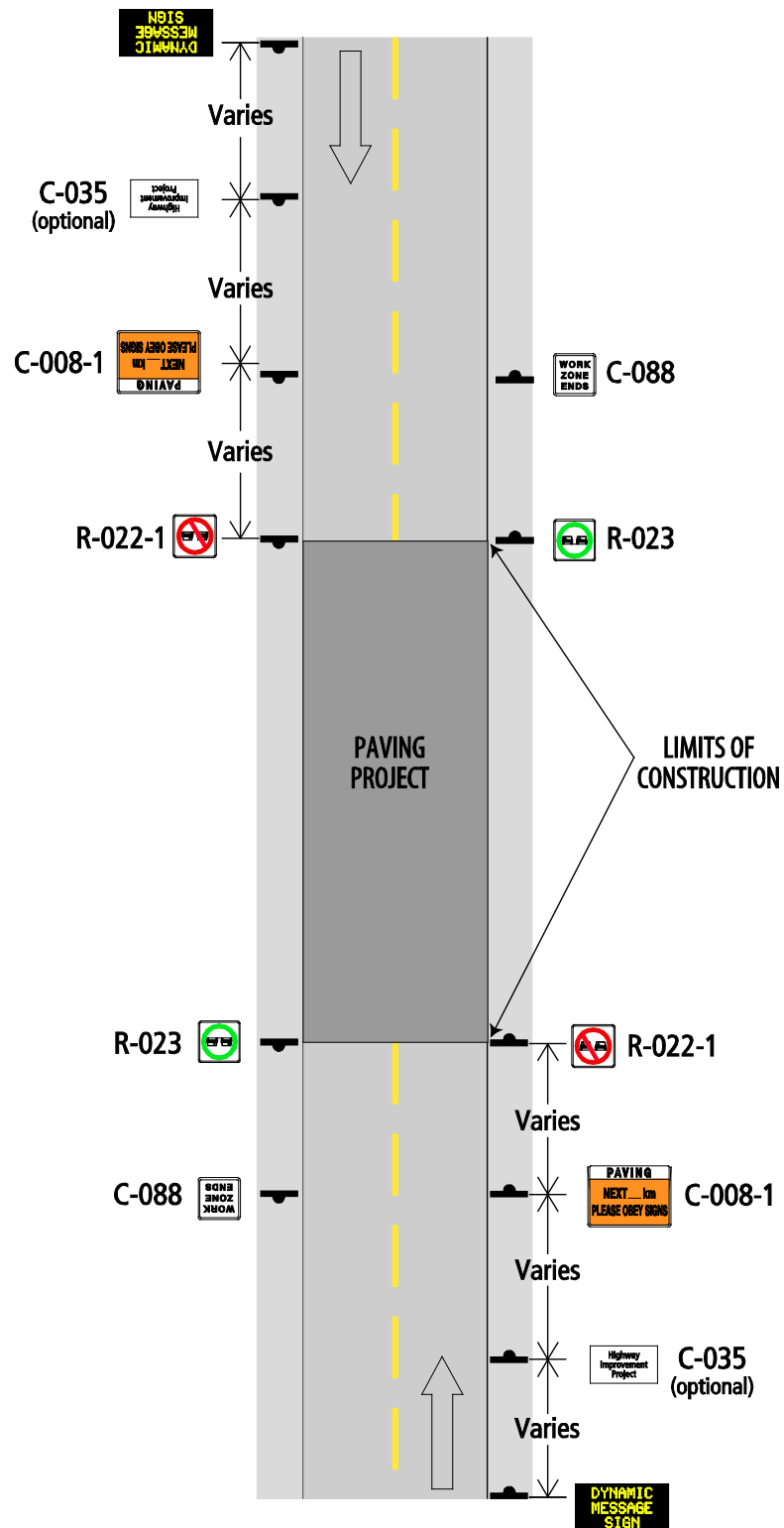
Guidance:

- The dynamic messaging sign (DMS) may be positioned before or after the Construction Project C-035 sign.
- As shown in the diagram, the distance between the Paving Ahead Next XX km C-008-1 sign and the LoC varies as the work activity area moves through the project area.
- When the work is occurring close to the LoC, all other signs preceding the work activity area should be in place first. This may push the C-008-1 sign back from the edge of the LoC during this period.
- See [Section 13.4: Paving – Work in Progress](#) for advance warning signage requirements for a work activity area that is located close to the LoC.
- Paving Ahead Next XX km C-008-1 signs with the appropriate C-008-OL distance overlays should be repeated at various distance intervals in advance of the active work area.

Options:

- Additional signs may be required throughout the advance warning area and repeated as necessary (see [Appendix B: Standard Construction Signs](#)). These may include, but are not limited to:
 - Soft Shoulder C-012
 - Fresh Oil C-014
 - Single Lane Traffic C-030-8
 - Pavement Ends C-149

Figure 13.3: Advance Warning for Paving Work



13.4 Paving – Work in Progress

Purpose:

This layout shows the work activity area within the longer project area (Limits of Construction). It is important to focus on the work activity area and the current conditions to ensure that the most applicable signage and devices are used and that the selected layout accurately reflects the work.

Standard:

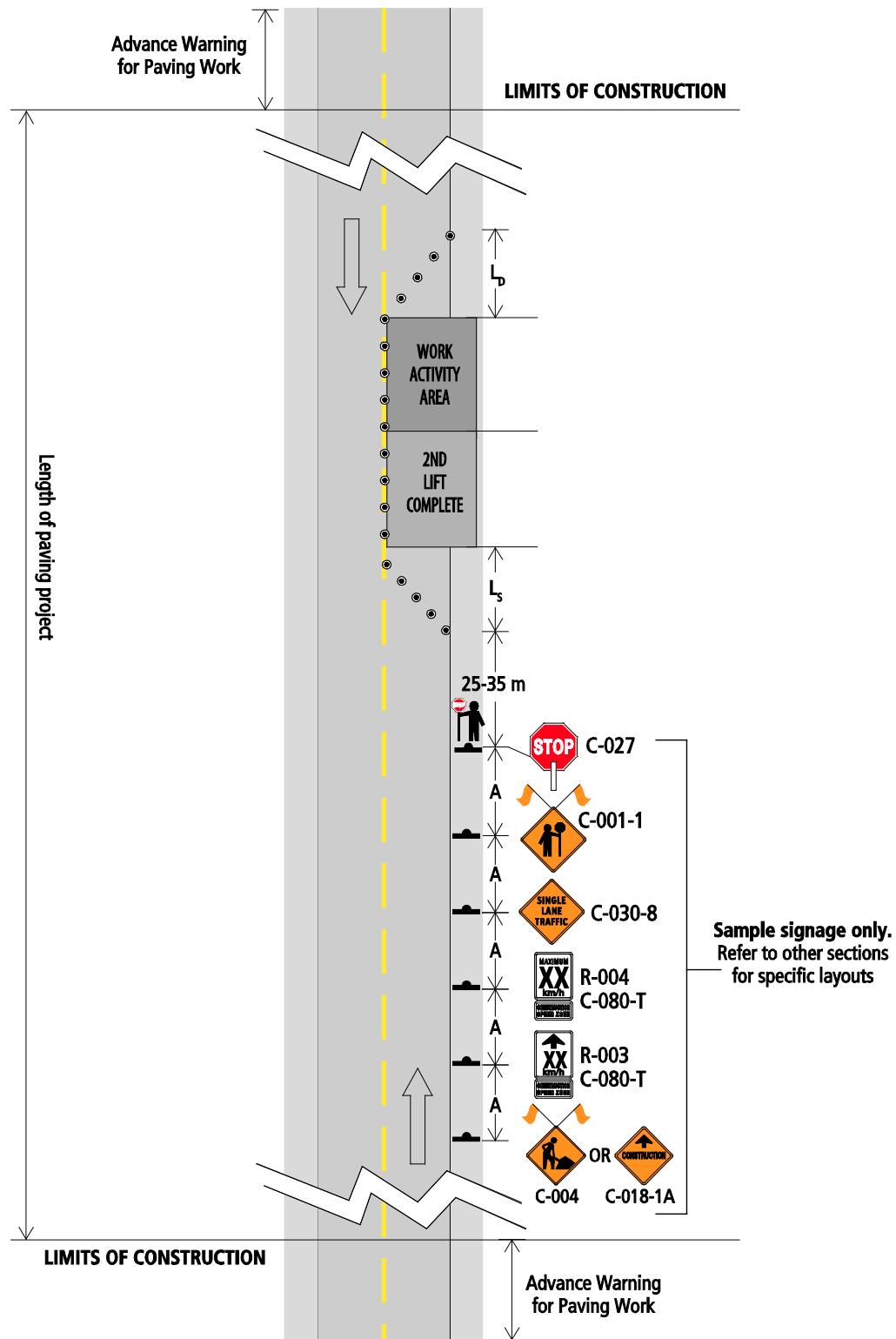
The most appropriate layout should be applied to the work activity area, based on the highway type and traffic control required. The layout options include, but are not limited to, those listed below.

Type of Work Area	Traffic Control Layouts
Two-Lane, Two-Way Single Lane Alternating	Section 7.8 <i>Lane Closure with TCPs – Single Lane Alternating</i>
Pilot Car Operation	Section 7.16 <i>Pilot Cars</i> Section 13.6 <i>Seal Coating in Progress</i>
Multilane Roadway Lane Closure	Section 8.6 <i>Right Lane Closed</i> Section 8.7 <i>Left Lane Closed</i> Section 8.8 <i>Centre Lane Closure (< 60 km/h)</i> Section 9.7 <i>Left Lane Closed</i> Section 9.9 <i>Centre Lane Closure (≥ 70 km/h)</i> Section 9.10 <i>Double Lane Closure</i>
Lane Shift	Section 8.10 <i>Centreline Crossover</i> Section 8.14 <i>Passing/Climbing Lanes – Lane Shift</i> Section 9.11 <i>Median Crossover</i>
Intersection	Section 11.9 <i>Left/Right Lane Closure within Intersection – Multilane Intersection</i> Section 11.10 <i>Right Lane Closure with Right-Turn Lane (Near Side) – Channelized Right Turn Open – Multilane Intersection</i> Section 11.11 <i>Two Lanes Closed (Near Side) – Multilane Intersection</i> Section 11.12 <i>Two-Lane Closure – Multilane Intersection</i>

Guidance and Options:

- The Guidance and Options for the selected layout apply.

Figure 13.4: Paving – Work in Progress



13.5 Paving – Work Not in Progress

Purpose:

This layout shows a typical setup for a paving project that is under way—but for which workers are not currently present (e.g., at night or on a weekend)—and that has site conditions of which drivers should be advised through appropriate signage (e.g., No Centreline, Bump, Low or Soft Shoulder, No Passing, etc.) These signs may also be used when paving is in progress.

Standard:

Signs commonly required on inactive or dormant paving projects include, but are not limited to:

- Construction Ahead C-018-1A sign with Construction Speed Zone C-080-T tab for long-duration work.
- Paving Next XX km C-008-1 signs in advance of and throughout the work activity area at 5-kilometre intervals.
- Low Shoulder on Left/Right C-013-LR sign where shoulder is lower than road surface.
- Uneven Pavement on Left/Right C-010-LR sign where there is uneven pavement on either side of the travel lane (excluding shoulders).
- Bump or Rough Roadway Ahead C-017 sign where sharp road surface changes are sufficiently abrupt.
- Uneven Pavement Ends C-016 sign at the end of an uneven section of pavement.

Other signs that help to identify certain conditions or activities on dormant sites include:

- | | |
|---------------------------------|---------|
| • Soft Shoulder | C-012 |
| • Loose Gravel | C-015 |
| • Pavement Ends | C-149 |
| • Use Headlights – Extreme Dust | C-185-3 |

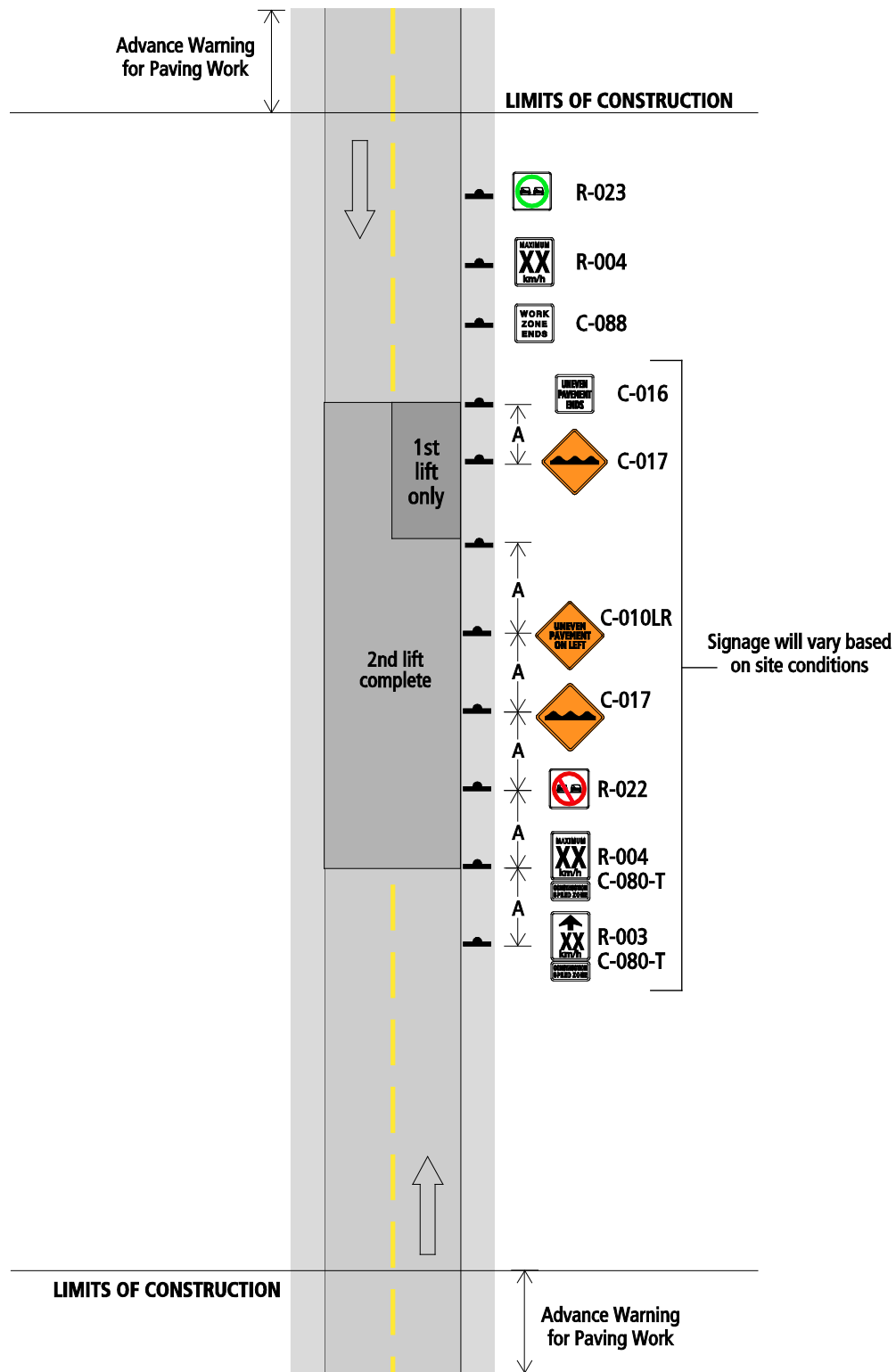
Guidance:

- When the roadway and shoulders are clear of machinery and obstructions, and the condition of the unfinished roadway is such that traffic can proceed safely without the assistance of TCPs or a pilot car:
 - All non-applicable signs should be removed or covered.
 - The Paving Ahead Next XX km C-008-1 sign with the appropriate C-008-OL distance overlay should be repeated every 5 kilometers, showing a decreasing distance to the end of the project.

Options:

- Additional signage may be required throughout the work area and the project area, and repeated as necessary (see [Appendix B: Standard Construction Signs](#)).

Figure 13.5: Paving – Work Not in Progress



13.6 Seal Coating in Progress

Purpose:

This layout shows the typical setup for an active seal coating project on a two-lane, two-way roadway. Seal coating projects can involve a long work activity area so a pilot car operation is often used with a single lane alternating setup to guide traffic through the work zone.

Standard:

- A Seal Coating – Loose Gravel Next XX km C-008-2 shall be positioned in advance of the work activity area.
- If TCPs are used, a Traffic Control Person Ahead C-001-1 sign is required.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.
- Overhead lighting shall illuminate each TCP location at night.
- A Follow Pilot Car C-049 shall be positioned on the shoulder.
- The double-sided Pilot Car (frontward-facing) and Pilot Car Do Not Pass (rearward-facing) C-048-1-DS sign or the Pilot Car C-048-2 overhead sign are required on the pilot car so that its signage is visible from both directions.
- A Work Zone Ends C-088 sign, followed by a Maximum Speed R-004 sign, shall be positioned the end of the work activity area.
- The Seal Coating – Loose Gravel Next X km C-008-2 sign should be repeated every 5 kilometers, showing a decreasing distance to the end of the project.

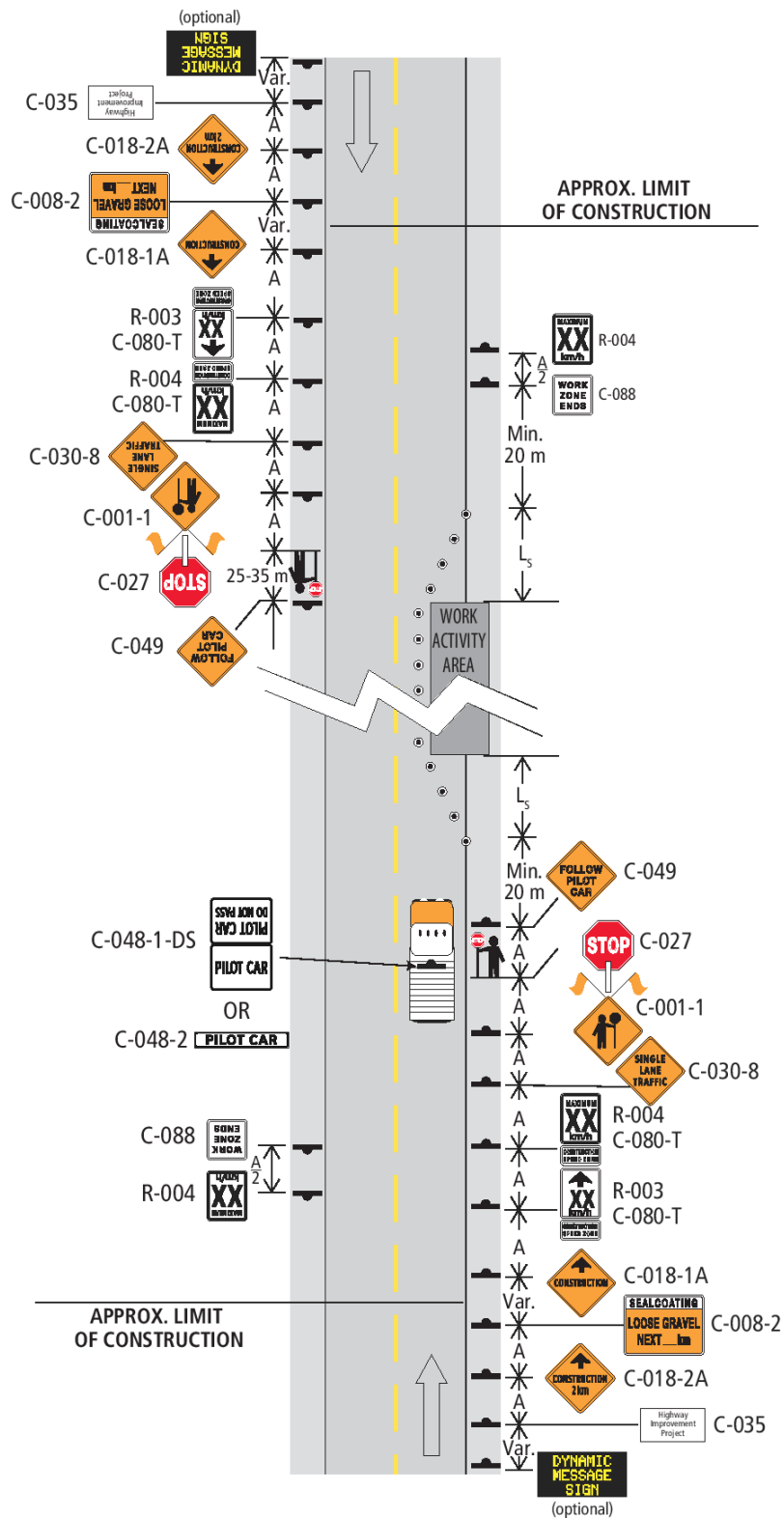
Guidance:

- The pilot car operator and TCPs should be in radio contact.

Options:

- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- Additional signage may be required throughout the advance warning area and repeated as necessary (see [Appendix B: Standard Construction Signs](#)), including but not limited to:
 - Soft Shoulder C-012
 - Fresh Oil C-014
 - Loose Gravel C-015
 - Single Lane Traffic C-030-8
 - Follow Pilot Car C-049
 - Sweeper Working C-076
 - Pavement Ends C-149
 - Truck Crossing/Entering Highway C-172-R
 - Use Headlights – Extreme Dust C-185-3

Figure 13.6: Seal Coating in Progress



13.7 Installing and Removing Reflectors

Purpose:

This layout shows two potential setups—depending on the shoulder width—for the installation of temporary and permanent reflectors on a hard surface and the removal of reflectors from such a surface:

- [*Figure 13.7 A – Insufficient Shoulder Width*](#)
- [*Figure 13.7 B – Sufficient Shoulder Width*](#)

These setups are appropriate for intermittently-moving, short-duration work during daylight hours on a low-speed, low-volume, two-lane, two-way roadway.

Night work and roadways with higher speeds and volumes require more complex setups. Refer to these sections for appropriate traffic control layouts:

- [*Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways*](#)
- [*Section 8: Traffic Control Layouts – Multilane Undivided Roadways*](#)
- [*Section 9: Traffic Control Layouts – Multilane Divided Roadways*](#)
- [*Section 10: Traffic Control Layouts – Mobile Work*](#)

Standard:

For areas with **insufficient shoulder width**:

- A shadow vehicle shall be used to protect workers and provide advance warning to approaching motorists.
- The work and shadow vehicles shall both display a rear-mounted Slow Moving Vehicle C-036 sign, a flashing arrow board (FAB) in bar mode, and 360-degree flashing lights and 4-way flashers.
- Traffic shall be regulated with a single lane alternating setup, either by using a Yield to Oncoming Traffic R-056-1 sign on the back of the shadow vehicle or by using Traffic Control Persons.
- A Slow Vehicle Next XX km C-044 sign or a Truck Stopped on Road Next 2 km C-038 sign shall be used in advance of the work and identified with flags. It shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the sign.
- If 5 or more vehicles are queued or if potential passing hazards are of concern, the work and shadow vehicles shall move off the road to allow traffic to pass.
- If passing traffic is an ongoing concern, other traffic control methods and layouts shall be used.
- The Slow Vehicle Next X km C-044 sign shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the sign.

For areas with **sufficient shoulder width**:

- The work and shadow vehicles shall both display a rear-mounted Slow Moving Vehicle C-036 sign, a flashing arrow board (FAB) in bar mode, and 360-degree flashing lights and 4-way flashers.
- Traffic may be permitted to pass on the shoulder if a 3.5-metre distance can be maintained between the work/shadow vehicle and the edge of the paved shoulder.
- If traffic is permitted to pass on the shoulder side, a Pass This Side C-042-R (right arrow) sign shall be displayed on the rear of the shadow vehicle.
- A Slow Vehicle Next XX km C-044 sign shall be used in advance of the work and identified with flags. This sign shall be moved as the work progresses so that the work vehicle remains within the distance indicated on the signs.

Guidance:

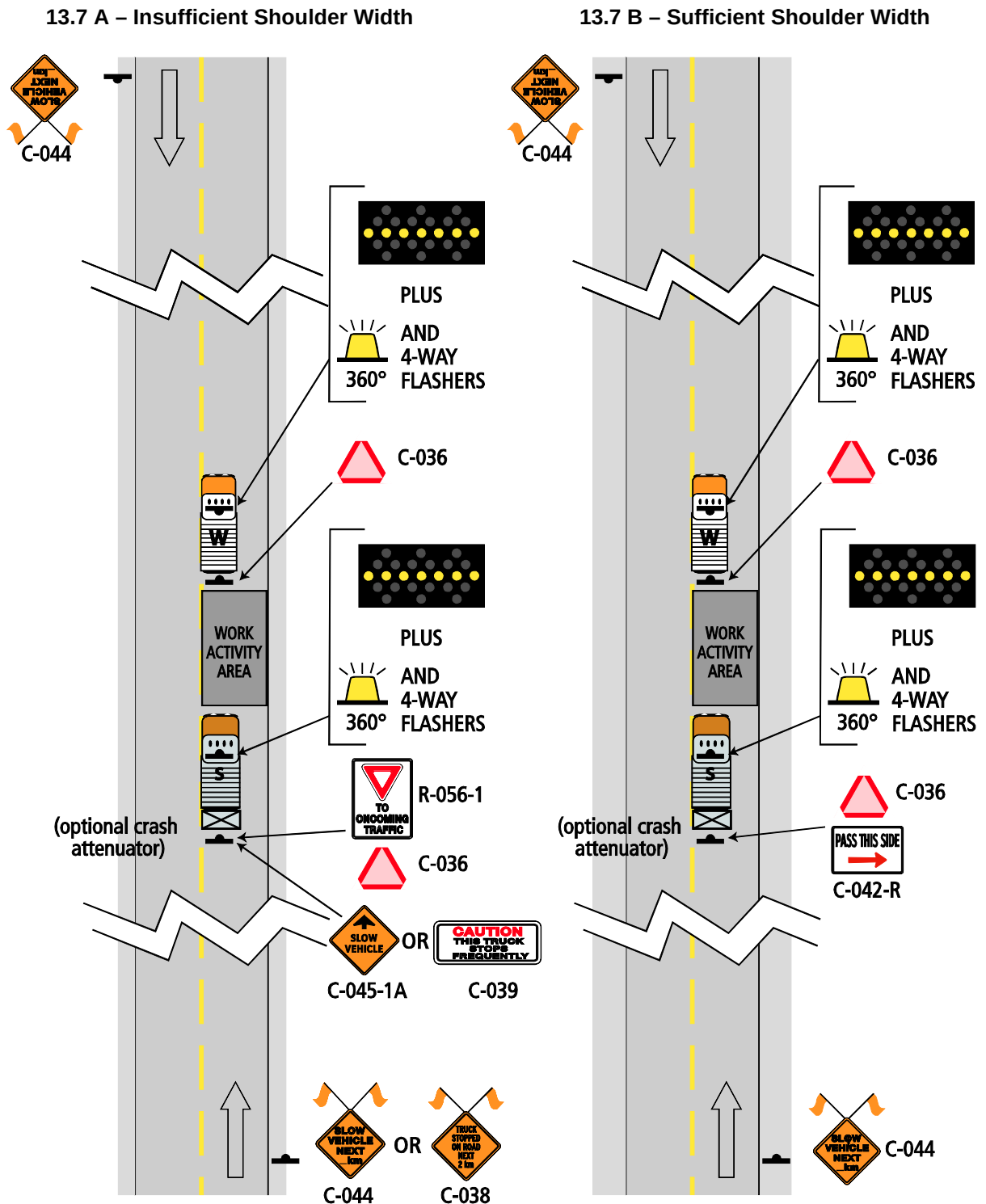
- The distance shown on Slow Vehicle Next X km C-044 signs should not exceed 8 kilometres.
- All temporary signs should be removed or covered when work is not in progress.
- Work vehicles may travel at posted speeds when work is not in progress.

Options:

- The Road Authority may require that the shadow vehicle have a rear-mounted Slow Vehicle(s) Ahead C-045 sign or other appropriate sign.
- A dynamic message sign (DMS) displaying the appropriate directional text and arrow may be used instead of the Pass This Side C-042-R sign.

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Figure 13.7: Installing and Removing Reflectors



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PART B – TRAFFIC CONTROL

Section 14: Traffic Control Layouts – Pavement Marking

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PART B – TRAFFIC CONTROL

Section 14: Traffic Control Layouts – Pavement Marking

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Shadow Vehicle #2		Flashing Arrow Board (FAB) in caution mode
	Buffer Vehicle		Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

14.1 General Information - Pavement Marking

1. For the purposes of this Manual, pavement marking is considered to be either conventional or quick-dry pavement marking:
 - **Conventional Pavement Marking:** When the drying time is 5 minutes or more after the passing of the paint truck and shadow vehicle, and where vehicles could track paint onto the roadway upon contact with it, it is necessary to implement advance warning signage and protection of the painted area until the paint is set. This involves using signs, cones, barricades, closures, and/or other traffic control devices.
 - **Quick-Dry Pavement Marking:** Quick-dry painting is a continuously-moving operation and differs from conventional longitudinal line painting by using dynamic message signs (DMS) on shadow vehicles to inform drivers that painting is in progress along the roadway. When the drying time is 90 seconds or less after the passing of the paint truck and shadow vehicle, the paint is set to a point where vehicles will not track paint onto the roadway upon contact with it.
2. Note that these two terms refer to the set time of the paint, not to two different applications. Paint that sets more slowly can typically be protected until it dries, while paint that sets more quickly may not require the same protection. For traffic control purposes, the determining factor is whether or not the paint will be tracked onto the roadway if vehicles come into contact with the freshly painted line.
3. The set time of the paint is determined by the composition of the paint and the condition and temperature of the surface and the air. Some paints that dry quickly under ideal conditions may no longer be “quick-dry” paints when used in less than ideal conditions. If the paint’s set time is prolonged for any reason, it can be treated as “conventional” paint that requires advance warning signage and protection of the freshly painted surface.

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- All static signs and dynamic message signs (DMS) shall be visible to drivers when painting is in progress.
- All work vehicles require **two** 360-degree flashing lights when painting the centreline or working at night.
- Constant communication is required between all Vehicle Operators.
- Stationary construction signs and cones are not required for quick-dry marking.
- **Escort Vehicle Requirements:**
 - 360-degree flashing light and 4-way flashers
 - caution pattern or arrow on sequential arrow board
 - dynamic message sign (DMS)
 - Slow Moving Vehicle C-036 sign
 - Caution – Paint Spray Truck Ahead C-043 sign
 - Pass This Side C-042-L sign
- **Paint Truck Requirements:**
 - 360-degree flashing light and 4-way flashers
 - caution pattern or arrow on sequential arrow board
 - Wet Paint C-037-1 sign
 - Slow Moving Vehicle C-036 sign
 - Wet Paint – Keep Off C-037-2 sign
- **Shadow Vehicle #1 Requirements:**
 - 360-degree flashing light and 4-way flashers
 - caution pattern or arrow on sequential arrow board
 - dynamic message sign (DMS)
 - Slow Moving Vehicle C-036 sign
 - Wet Paint – Keep Off C-037-2 sign
 - truck-mounted crash attenuator for speeds ≥ 70 km/h
- **Shadow Vehicle #2 Requirements:**
 - 360-degree flashing light and 4-way flashers
 - caution pattern or arrow on sequential arrow board
 - dynamic message sign (DMS)
 - Slow Moving Vehicle C-036 sign

Guidance:

- None at this time.

Options:

- A crash attenuator may be added to Shadow Vehicle #2.

14.2 Quick-Dry Long-Line Marking – Two-Lane, Two-Way Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for quick-dry long-line marking on a two-lane, two-way roadway.

Standard:

Two-Lane, Two-Way Roadway – Passing NOT Permitted:

Escort Operations:

- The Escort Vehicle is positioned 200 to 500 meters in front of the Paint Truck, depending on traffic volumes and sight conditions.
- The DMS display shall be visible to oncoming traffic. It may be:
 - caution pattern
 - Line Painting ... Ahead
 - Line Painting ... Slow Down
- The Escort Vehicle Operator shall have a STOP/SLOW TCP C-027 paddle for emergencies.

Shadow Vehicle #1 Operations:

- Shadow Vehicle #1 follows the Paint Truck at a distance of 200 to 400 metres, depending on sight distances and paint drying times.
- The DMS shall display one these messages:
 - Line Painting ... No Passing
 - Wet Paint ... No Passing

Shadow Vehicle #2 Operations:

- Shadow Vehicle #2 follows the paint operation at a distance of approximately 1 kilometre, depending on sight distances, travelling on the shoulder where possible.
- The DMS messaging is specified by the foreman, and may be:
 - caution pattern
 - Line Painting ... Ahead
 - Line Painting ... 1 km Ahead
 - Line Painting ... Next 1 km
 - Wet Paint ... Next 1 km

Two-Lane, Two-Way Roadway – Controlled Passing Opportunities:

Escort Vehicle Operations:

- The Escort Vehicle should be stopped as close as possible to the centreline—but not straddling it—and have good visibility to oncoming traffic.
- When controlled passing is not occurring, the Escort Vehicle Operator shall display these messages on the DMS:
 - Line Painting ... Ahead
 - Line Painting ... Slow Down
- Upon notification, the Escort Vehicle Operator shall evaluate sight distances and traffic conditions before initiating controlled passing.
- If conditions are satisfactory for controlled passing, the Escort Vehicle Operator shall display STOP on the DMS.
- The Escort Vehicle Operator shall ensure that all vehicles have complied with the STOP message before allowing the pass operation to be passed.
- The Escort Vehicle Operator shall continue to hold stopped traffic until the last vehicle in the passing procession (as described by Shadow Vehicle #1 Operator) has cleared the work zone.
- The Escort Vehicle Operator shall notify the Shadow Vehicle #1 Operator that passing is complete.

Shadow Vehicle #1 Operations:

- When passing is required, the Shadow Vehicle #1 Operator shall communicate a passing request to the Escort Vehicle Operator and wait for notification that oncoming traffic is stopped.
- When it is safe to pass, the DMS display shall be changed to:
 - Line Painting ... Pass on Left
 - Wet Paint ... Pass on Left
- The Shadow Vehicle #1 Operator shall provide a description of the last vehicle in the passing procession to the Escort Vehicle Operator.
- Once the last vehicle has passed, the DMS display shall be changed to:
 - Line Painting ... No Passing
 - Wet Paint ... No Passing

Shadow Vehicle #2 Operations:

- On a two-lane roadway, Shadow Vehicle #2 assumes the buffer position.
- On a highway with a 3-metre shoulder, Shadow Vehicle #2 shall be driven along the right shoulder—not straddling the edge line—and follow the Paint Truck at a distance of approximately 1 kilometre.
- If the shoulder is too narrow, Shadow Vehicle #2 shall travel leap-frog fashion from approach to approach, parking parallel to the highway when stopping, keeping the signs and DMS visible to approaching traffic, and maintaining the approximate 1 kilometre distance behind the Paint Truck.
- The DMS messaging is specified by the foreman, and may be:
 - caution pattern
 - Line Painting ... Ahead/Next 1 km
 - Wet Painting ... 1 km Ahead/ Next 1 km

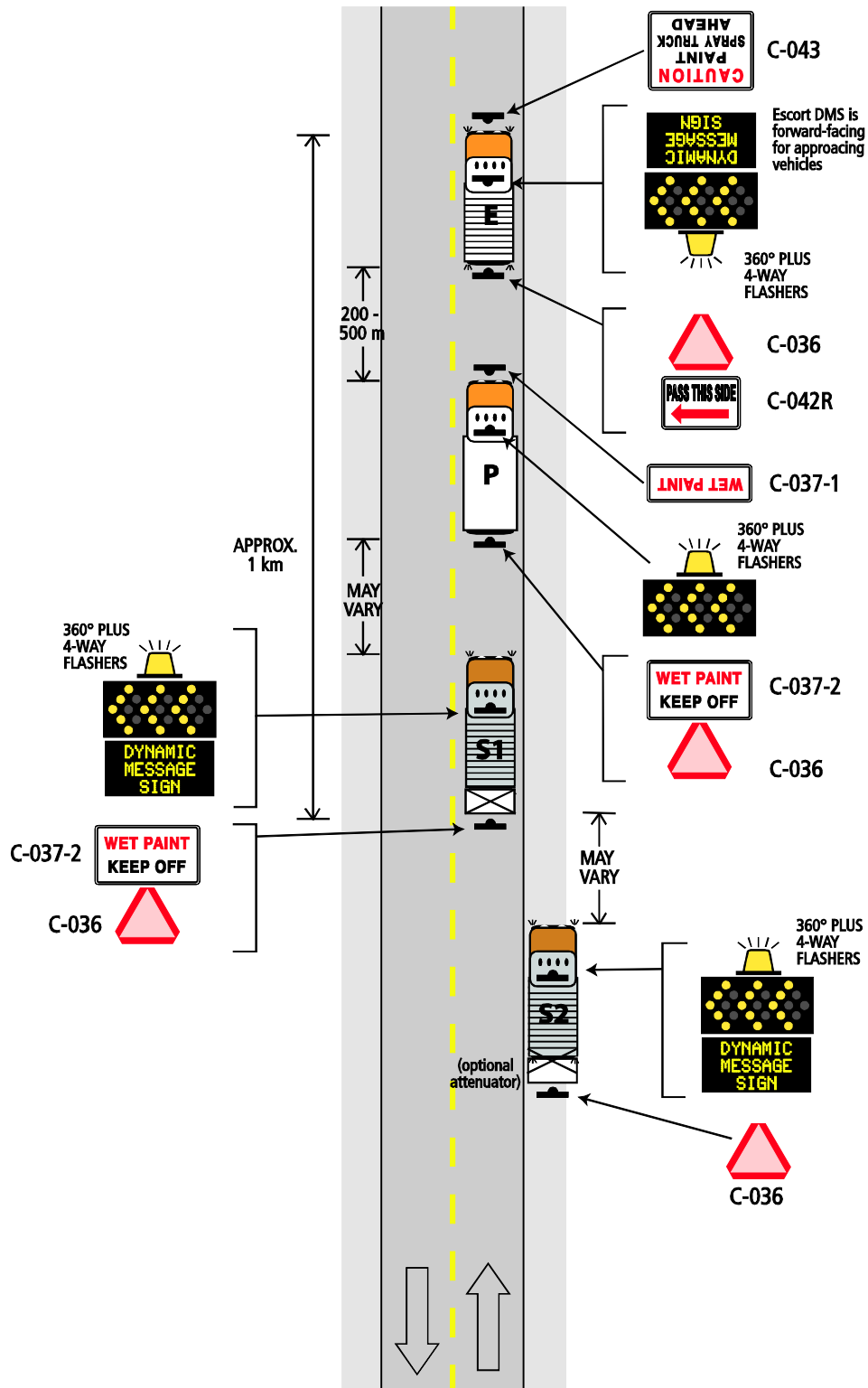
Guidance:

- The separation distance between the Paint Truck and Shadow Vehicle #1 should be determined by the set time (track-free time) of the pavement-marking paint.
- Sight distances and traffic volumes should be taken into consideration when choosing areas for controlled passing.
- Controlled passing of the painting operation requires effective communication and coordinated traffic control between the Escort Vehicle and Shadow Vehicle #1 Operators.
- Ideally, traffic will pass Shadow Vehicle #1 and the Paint Truck at the same time.
- When traffic volumes are excessive and the passing procession is large, the Paint Truck may have to stop the painting operation until the procession has passed completely. This will also help to reduce the required length of the passing zone.
- When a wide load or emergency vehicle is approaching the painting operation, all Vehicle Operators should be alerted so that they may take appropriate action.

Options:

- None at this time.

**Figure 14.2: Quick-Dry Long-Line Marking – Two-Lane, Two-Way Roadway
– Short and Long Duration**



14.3 Quick-Dry Long-Line Marking – Right Lane – Multilane Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for quick-dry long-line marking on the right lane of a divided or undivided multilane roadway.

Standard:**Shadow Vehicle #1 Operations:**

- Shadow Vehicle #1 shall travel in the same lane as the Paint Truck, following at a distance of 50 to 200 metres, depending on sight distance and traffic volumes. (It may have to be closer to the Paint Truck to prevent vehicles from entering the gap between the two vehicles, with consideration given to the amount of set time required for the paint.)
- The DMS messaging may be:
 - left chevron
 - Wet Paint ... Keep Left
 - Line Painting ... Keep Left

Shadow Vehicle #2 Operations:

- Shadow Vehicle #2 shall travel on the right shoulder—not straddling the edge line—and follow the Paint Truck at a distance of approximately 1 kilometre.
- The DMS messaging is specified by the foreman, and may be:
 - left chevron
 - Line Painting ... Keep Left
 - Line Painting ... Merge Left

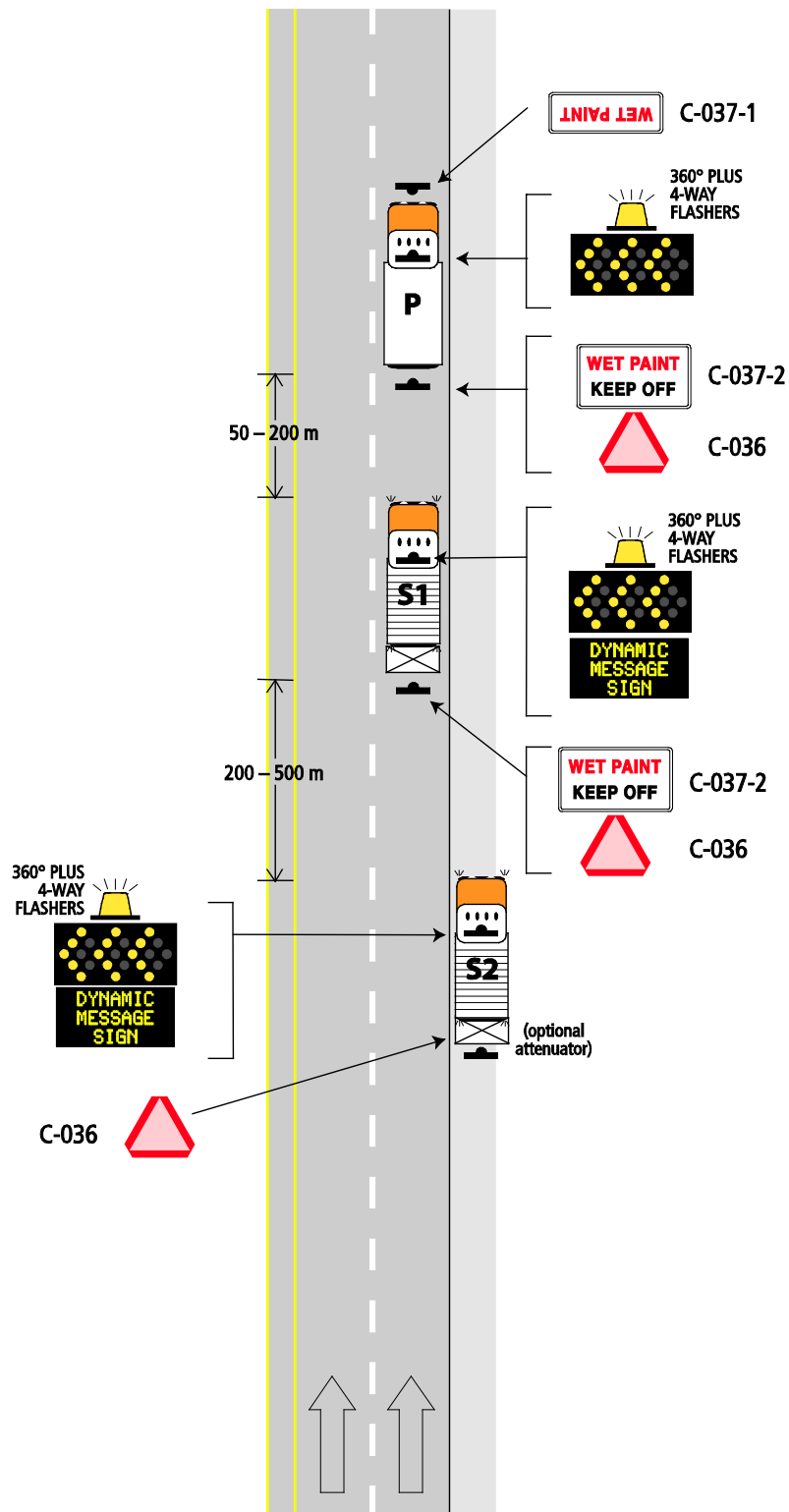
Guidance:

- The distance between the Paint Truck and Shadow Vehicle #1 should be determined by the set time (track-free time) of the pavement-marking paint.

Options:

- When traffic volumes are high, a third shadow vehicle may be positioned between the Paint Truck and Shadow Vehicle #1. It should follow the Paint Truck at a distance of 50 to 200 metres, followed by Shadow Vehicle #1 at a distance of 200 to 300 metres. The DMS messaging on the third shadow vehicle may be:
 - Wet Paint ... Keep Left
 - Line Painting ... Keep Left
- The third shadow vehicle may be the Escort Vehicle with the DMS repositioned to be rear-facing so that the message is visible to rear-approaching traffic.

Figure 14.3: Quick-Dry Long-Line Marking – Right Lane – Multilane Roadway – Short and Long Duration



14.4 Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway (Median ≥ 1 m) – Short and Long Duration

Purpose:

This layout shows the typical setup for quick-dry long-line marking on the left lane of a multilane roadway when the centre median is ≥ 1 metre wide.

Standard:

Shadow Vehicle #1 Operations:

- Shadow Vehicle #1 shall travel in the same lane as the Paint Truck, following at a distance of 50 to 200 metres, depending on sight distance and traffic volumes. (It may have to be closer to the Paint Truck to prevent vehicles from entering the gap between the two vehicles, with consideration given to the amount of set time required for the paint.)
- The DMS messaging may be:
 - right chevron
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right

Shadow Vehicle #2 Operations:

- Shadow Vehicle #2 shall travel as far left as practicable, following the Paint Truck at a distance of approximately 1 kilometre.
- The DMS messaging is specified by the foreman, and may be:
 - right chevron
 - Line Painting ... Keep Right
 - Line Painting ... Merge Right

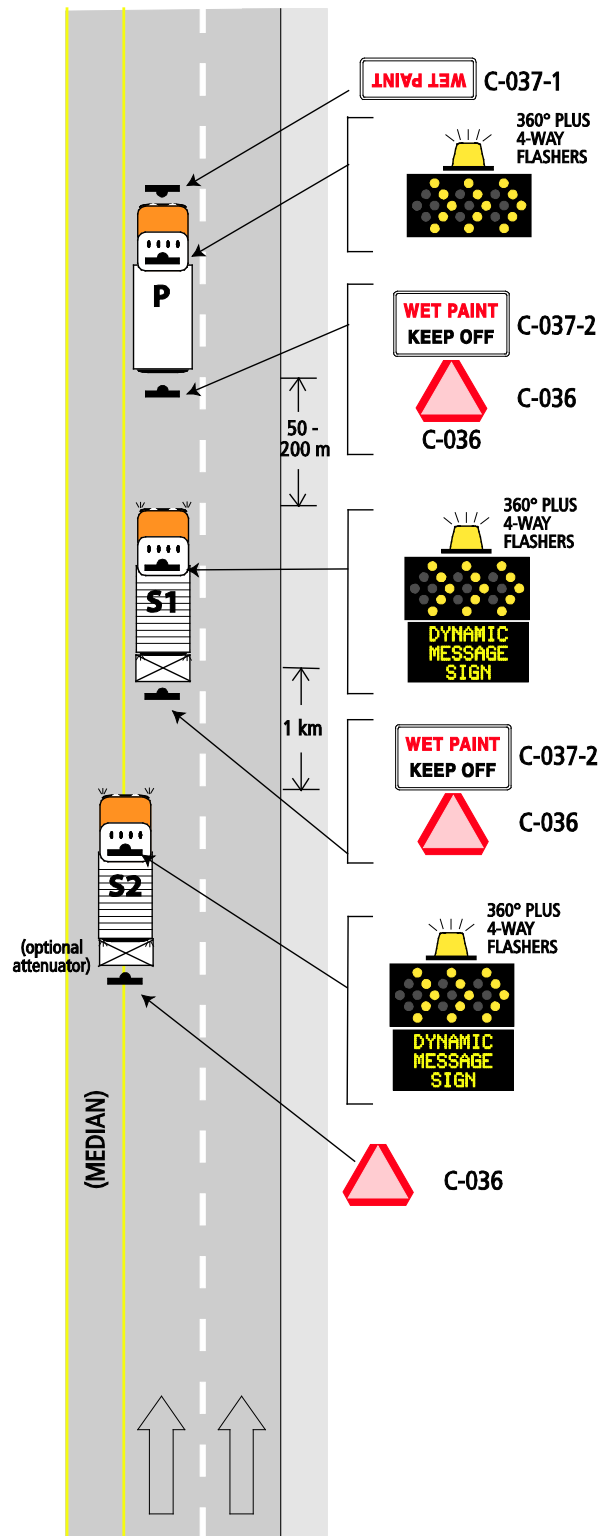
Guidance:

- The distance between the Paint Truck and Shadow Vehicle #1 should be determined by the set time (track-free time) of the pavement-marking paint.

Options:

- When traffic volumes are high, a third shadow vehicle may be positioned between the Paint Truck and Shadow Vehicle #1. It should follow the Paint Truck at a distance of 50 to 200 metres, followed by Shadow Vehicle #1 at a distance of 200 to 300 metres. The DMS on the third shadow vehicle may display one of these messages:
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right
- The third shadow vehicle may be the Escort Vehicle with the DMS repositioned to be rear facing so that the message is visible to rear-approaching traffic.

**Figure 14.4 Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway (Median ≥ 1 m)
– Short and Long Duration**



14.5 Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway (Median < 1 m, Right Shoulder ≥ 2 m) – Short and Long Duration

Purpose:

This layout shows the typical setup for quick-dry long-line marking on the left lane of a multilane roadway when the centre median width < 1 metre wide and the right shoulder is ≥ 2 metres wide.

Standard:**Shadow Vehicle #1 Operations:**

- Shadow Vehicle #1 shall travel in the same lane as the Paint Truck, following at a distance of 50 to 200 metres, depending on sight distance and traffic volumes. (It may have to be closer to the Paint Truck to prevent vehicles from entering the gap between the two vehicles, with consideration given to the amount of set time required for the paint.)
- The DMS messaging may be:
 - right chevron
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right

Shadow Vehicle #2 Operations:

- Shadow Vehicle #2 shall travel as far right as practicable on the right shoulder, following the Paint Truck at a distance not exceeding 1 kilometre.
- The DMS messaging is specified by the foreman, and may be:
 - Caution mode
 - Line Painting ... Ahead
 - Keep Right

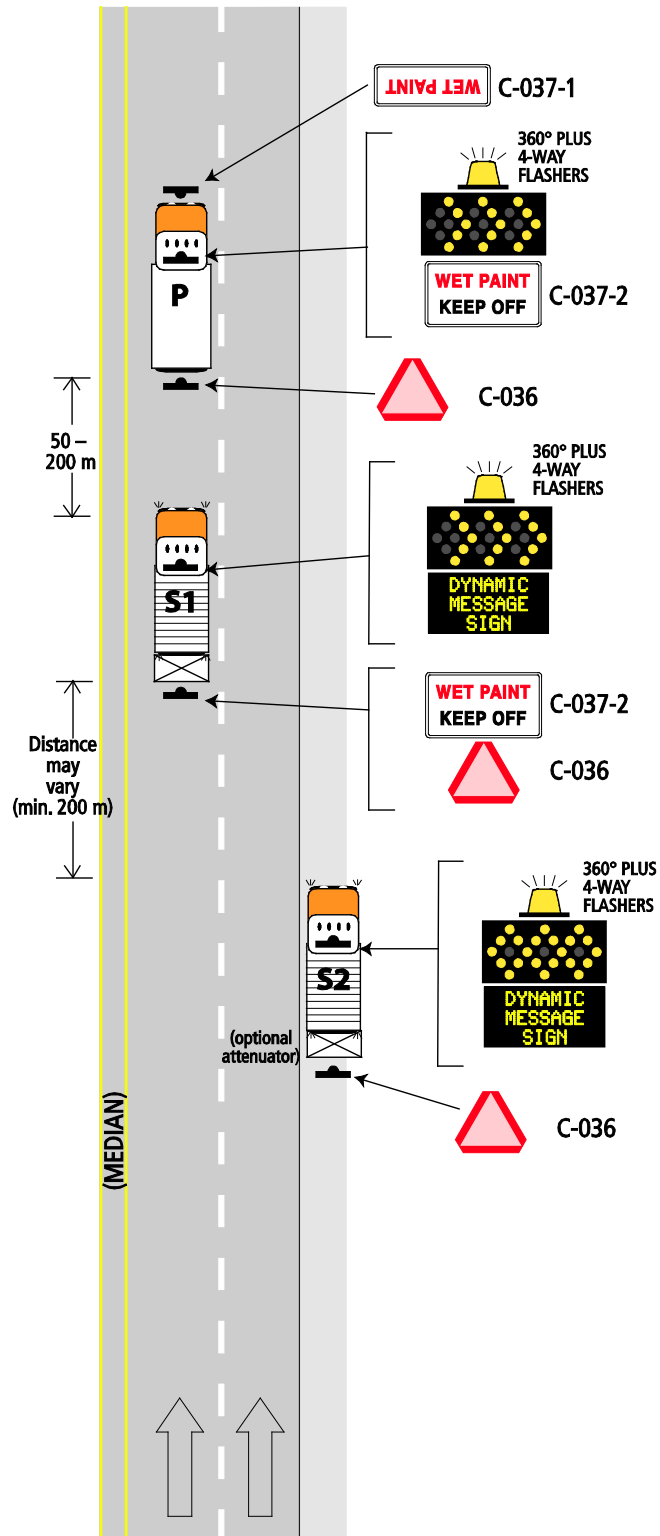
Guidance:

- The distance between the Paint Truck and Shadow Vehicle #1 should be determined by the set time (track-free time) of the pavement-marking paint.

Options:

- When traffic volumes are high, a third shadow vehicle may be positioned between the Paint Truck and Shadow Vehicle #1. It should follow the Paint Truck at a distance of 50 to 200 metres, followed by Shadow Vehicle #1 at a distance of 200 to 300 metres. The DMS on the third shadow vehicle may display one of these messages:
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right
- The third shadow vehicle may be the Escort Vehicle with the DMS repositioned to be rear-facing so that the message is visible to rear-approaching traffic.

**Figure 14.5: Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway
(Median < 1 m, Right Shoulder ≥ 2 m) – Short and Long Duration**



14.6 Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway (Median < 1 m, Right Shoulder < 2 m) – Short and Long Duration

Purpose:

This layout shows the typical setup for quick-dry long-line marking on the left lane of a multilane roadway when the centre median is < 1 metre wide and the right shoulder is < 2 metres wide.

Standard:**Shadow Vehicle #1 Operations:**

- Shadow Vehicle #1 shall travel in the same lane as the Paint Truck, following at a distance of 50 to 200 metres, depending on sight distance and traffic volumes. (It may have to be closer to the Paint Truck to prevent vehicles from entering the gap between the two vehicles, with consideration given to the amount of set time required for the paint.)
- The DMS messaging may be:
 - Right chevron
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right

Shadow Vehicle #2 Operations:

- Shadow Vehicle #2 shall be outside the travel lane, either in the median or on the shoulder, at a distance not exceeding 1 kilometre.
- The DMS messaging is specified by the foreman, and may be:
 - Right chevron
 - Line Painting ... Ahead
 - Keep Right

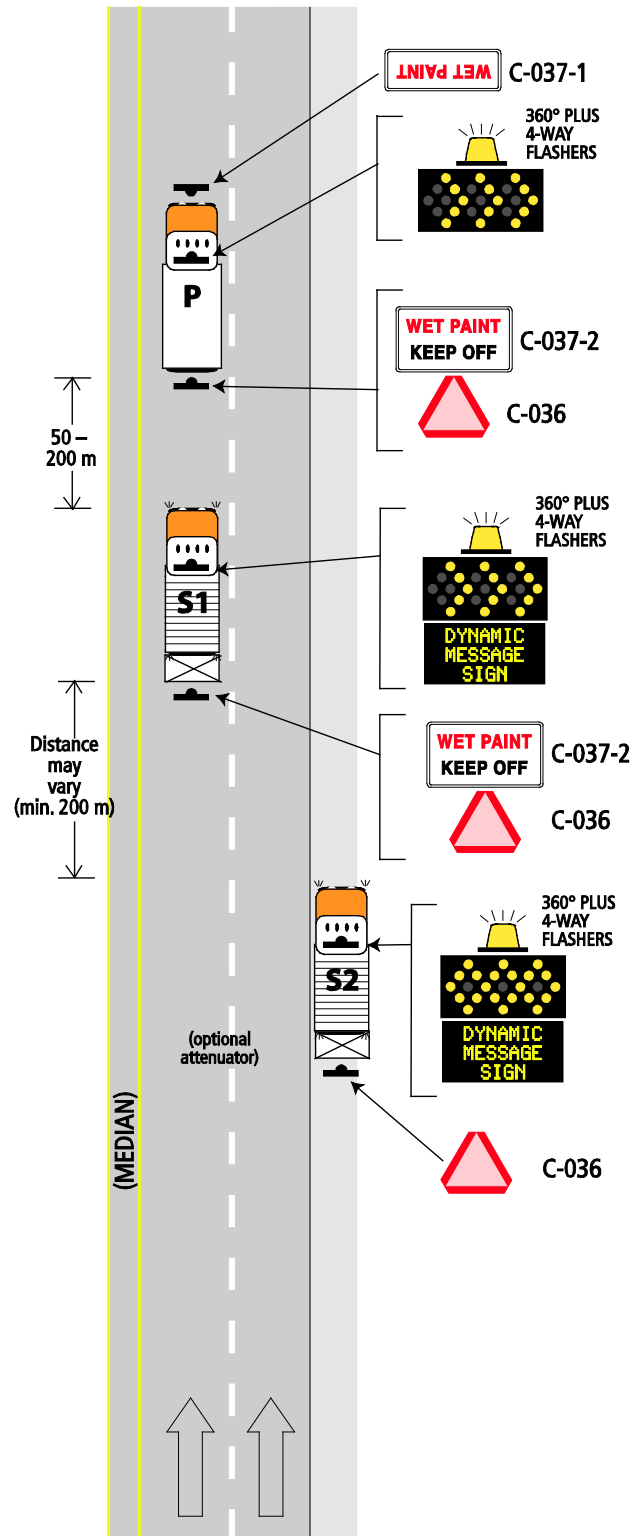
Guidance:

- The distance between the Paint Truck and Shadow Vehicle #1 should be determined by the set time (track-free time) of the pavement-marking paint.

Options:

- When traffic volumes are high, a third shadow vehicle may be positioned between the Paint Truck and Shadow Vehicle #1. It should follow the Paint Truck at a distance of 50 to 200 metres, followed by Shadow Vehicle #1 at a distance of 200 to 300 metres. The DMS on the third shadow vehicle may display one of these messages:
 - Wet Paint ... Keep Right
 - Line Painting ... Keep Right
- The third shadow vehicle may be the Escort Vehicle with the DMS repositioned to be rear-facing so that the message is visible to rear-approaching traffic.

**Figure 14.6: Quick-Dry Long-Line Marking – Left Lane – Multilane Roadway
(Median < 1 m, Right Shoulder < 2 m) – Short and Long Duration**



14.7 Conventional Long-Line Centreline and White Line Marking – Two-Lane, Two-Way Roadway – Short and Long Duration

Purpose:

This layout shows typical setups for two kinds of conventional long-line pavement marking along a two-lane, two-way roadway:

- [*Figure 14.7 A – Centreline Marking*](#)
- [*Figure 14.7 B – White Line Marking \(Shoulder or Edge\)*](#)

Standard:

- Road Marking in Progress C-041-xx signs shall be displayed at each end of the work activity area. The distance between the two signs shall not exceed 10 kilometres.
- The Slow Vehicles Ahead C-045-2A sign shall be positioned after the Road Marking in Progress C-041-xx sign.
- A Caution – Paint Spray Truck Ahead C-043 sign shall be mounted on the front of the Escort Vehicle.
- Both the Paint Truck and the Escort Vehicle shall have:
 - a Pass This Side C-042-LR sign
 - a 360-degree flashing light and 4-way flashers
 - a dynamic message sign (DMS) set to alternate between flashing arrow mode and a displayed message
- Constant communication is required between all Vehicle Operators.
- For centreline marking, cones shall be placed on the centreline.
- For shoulder line marking, cones shall be placed on the white line.

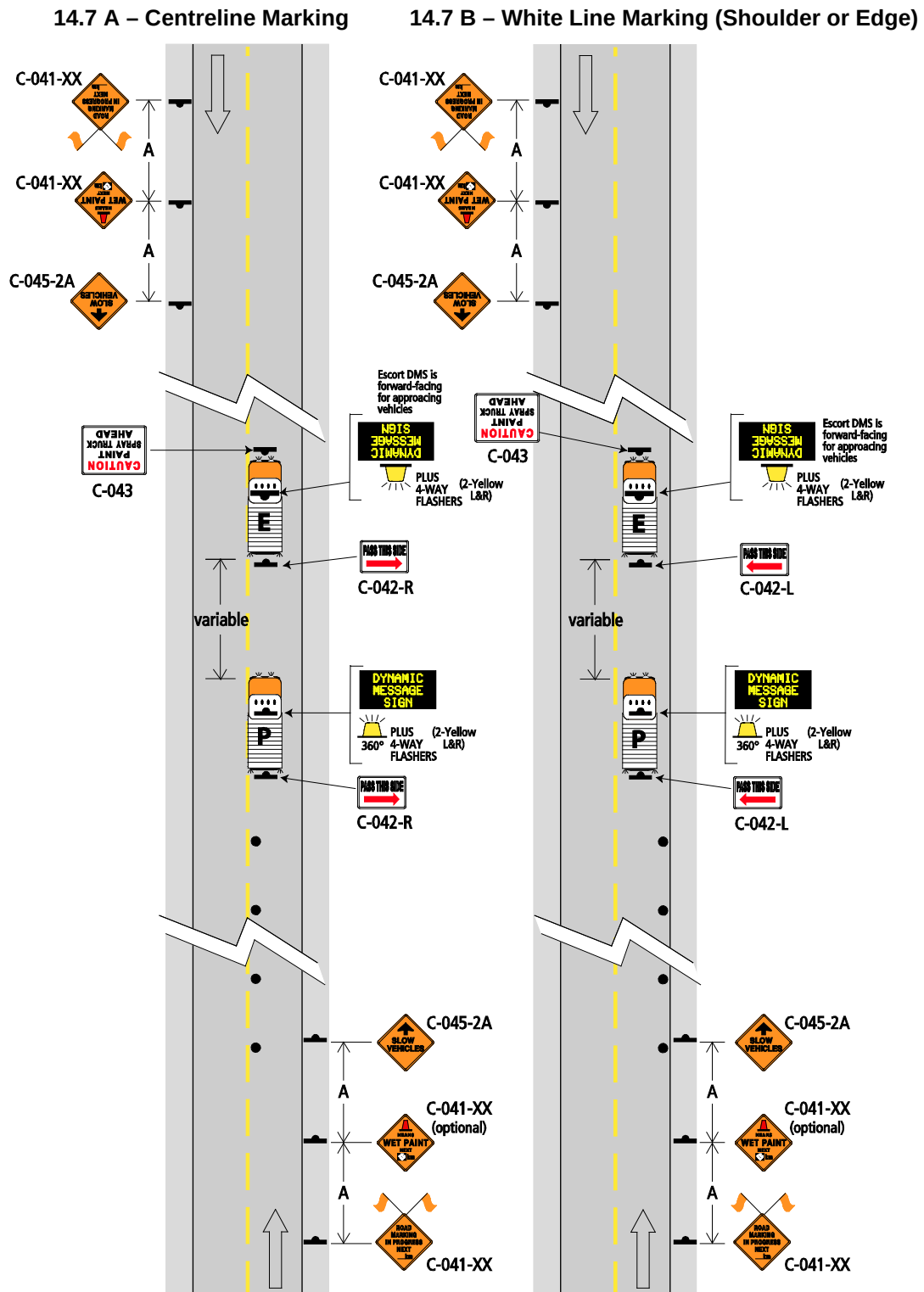
Guidance:

- If it is not practicable for drivers following the Paint Truck and Escort Vehicle to pass the operation, the Paint Truck and Escort Vehicle should pull over periodically to allow these vehicles to go around them.
- The distance between the Escort Vehicle and the Paint Truck will vary, depending on sight lines. They should be as close to each other as possible, but it may be necessary to increase the space on curved roads to provide more advance warning for approaching traffic.

Options:

- The Wet Paint side of an additional Road Marking in Progress C-041-xx sign may be used within the work area.
- Crash attenuators may be added to the Paint Truck and/or the Escort Vehicle.
- If shadow vehicles are used to supplement the operation, they shall have dynamic message signs (DMS).

Figure 14.7: Conventional Long-Line Centreline and White Line Marking – Two-Lane, Two-Way Roadway – Short and Long Duration



14.8 Conventional Long-Line Marking – Multilane Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for conventional long-line pavement marking on a multilane roadway.

The diagram shows line painting occurring in different lanes and in different directions—and the associated signing required for each setup—in order to illustrate that the painting operation may occupy either lane. The diagram does not imply a requirement to paint in both directions simultaneously.

Standard:

- Road Marking in Progress C-041-xx signs shall be displayed at each end of the work activity area. The distance between the two signs shall not exceed 10 kilometres.
- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- A Left/Right Lane Closed Ahead C-130-L/R sign with a C-130-T distance tab is required in advance of a second Left/Right Lane Closed Ahead C-130-L/R sign.
- Both the Paint Truck and the Shadow Vehicle require two 360-degree flashing lights when painting the centreline or working at night.
- Cones are required along all painted lines—on the centreline for centreline marking and on the white line for shoulder line marking.
- Dynamic message signs (DMS) shall be used on the Paint Truck and the Shadow Vehicle, with the arrow direction indicating the direction of travel and the side on which vehicles are to pass the operation.
- The taper shall be delineated to prevent vehicles from driving in the working lane or pulling in behind the Paint Truck.
- A flashing arrow board (FAB) is required if the speed limit is $\geq 70\text{km/h}$.
- Constant communication is required between all Vehicle Operators.

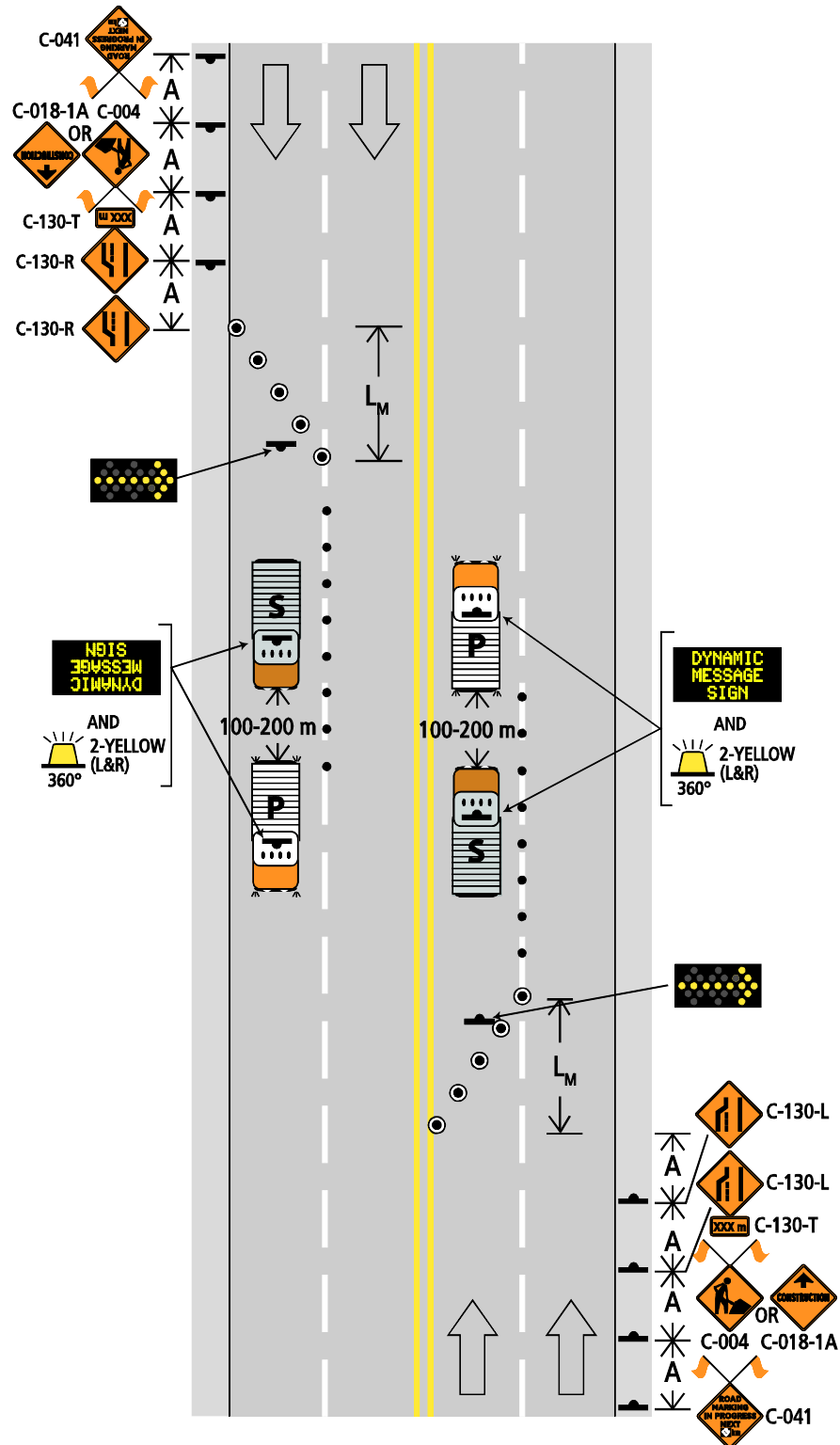
Guidance:

- Typical spacing between the Paint Truck and the Shadow Vehicle is 100 to 200 metres.

Options:

- If the speed limit is $\leq 60\text{ km/h}$, a Lane Closure Arrow C-053 sign may replace the flashing arrow board (FAB) in the lane taper.
- The dynamic message signs (DMS) on top of the Paint Truck and Shadow Vehicle may be replaced with flashing arrow boards (FABs).

Figure 14.8: Conventional Long-Line Marking – Multilane Roadway – Short and Long Duration



14.9 Left-Turn Arrow Marking – Short and Long Duration

Purpose:

This layout shows the typical setup for marking left-turn arrows at an intersection.

If the intersection requiring work is not depicted in the diagram, see the layouts in [Section 11: Traffic Control Layouts – Intersections](#).

Standard:

- Road Marking in Progress C-041-xx signs shall be displayed at each end of the work activity area. The distance between the two signs shall not exceed 10 kilometres.
- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- When the speed limit is ≥ 70 km/h, a vehicle with a flashing arrow board (FAB) or a 360-degree flashing light and 4-way flashers shall be stationed within the upstream island.

Guidance:

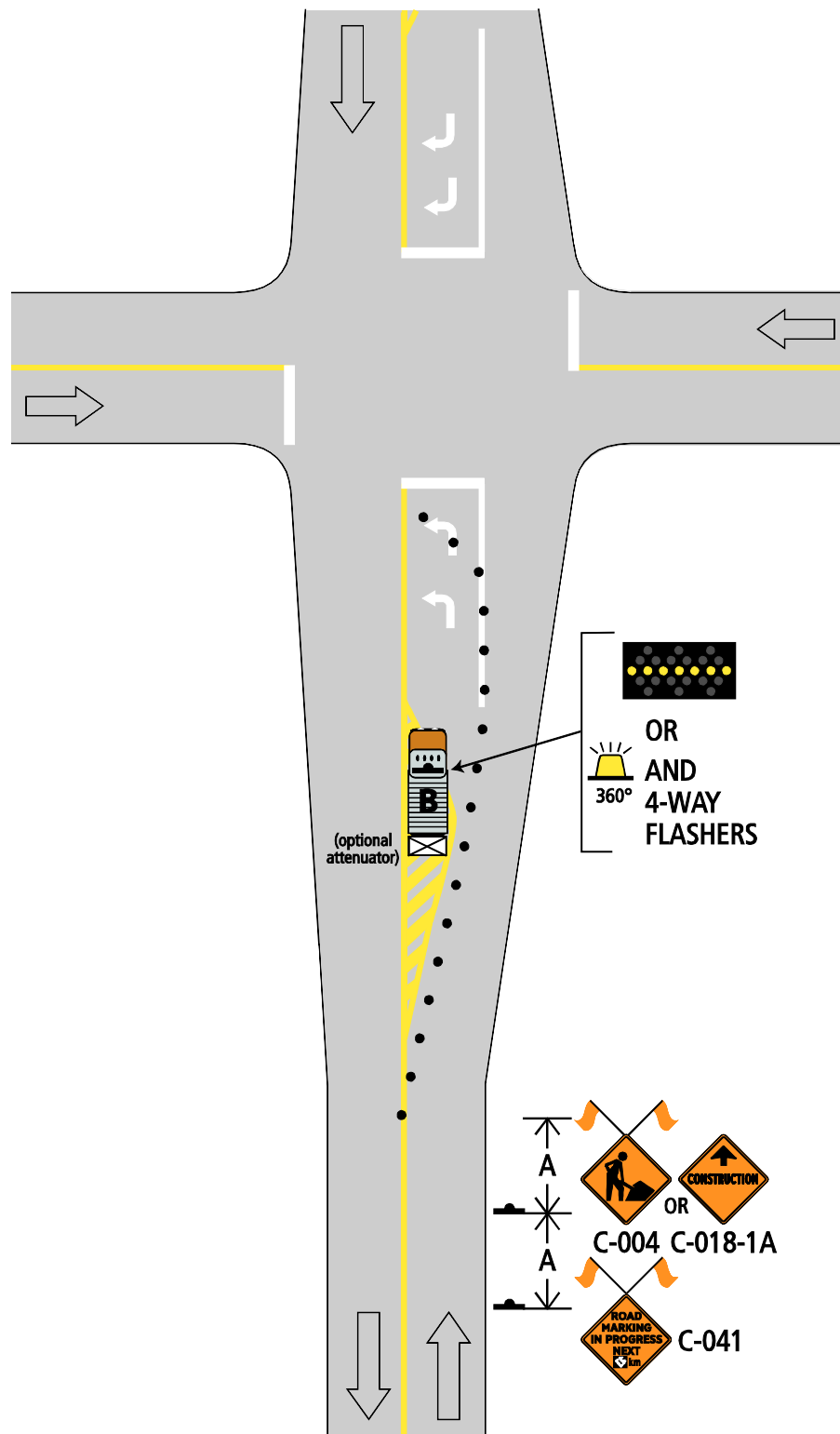
- A work vehicle can be parked on the left-turn loop to activate the left-turn phase of the traffic signal and help to keep vehicles moving in the now-shared through/left-turn lane. If it is parked there for an extended time, the controller may stop activating the left-turn phase so this should be monitored and adjustments made to the setup or traffic control as appropriate.
- If the work allows, keeping a portion of the left-turn slot open near the intersection may provide room for vehicles to make left turns.

Options:

- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	360° flashing light and 4-way flashers.	Barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 14.9: Left-Turn Arrow Marking – Short and Long Duration



14.10 Stop Line and Crosswalk Marking – Left Lanes – Multilane Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for marking stop lines and crosswalks in left lanes at an intersection.

For multilane intersections, this is usually done in stages, with the inner lane marking done separately from the outer lane marking to minimize disruption to traffic.

If the intersection requiring work is not depicted in the diagram, see the layouts in [Section 11: Traffic Control Layouts – Intersections](#).

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- A Left Lane Closed Ahead C-130-L sign with a C-130-T distance tab is required in advance of a second Left Lane Closed Ahead C-130-L sign.
- Flashing arrow boards (FABs) shall be used inside all lane closure tapers.
- If the speed limit is ≥ 70 km/h, a buffer space shall be used.

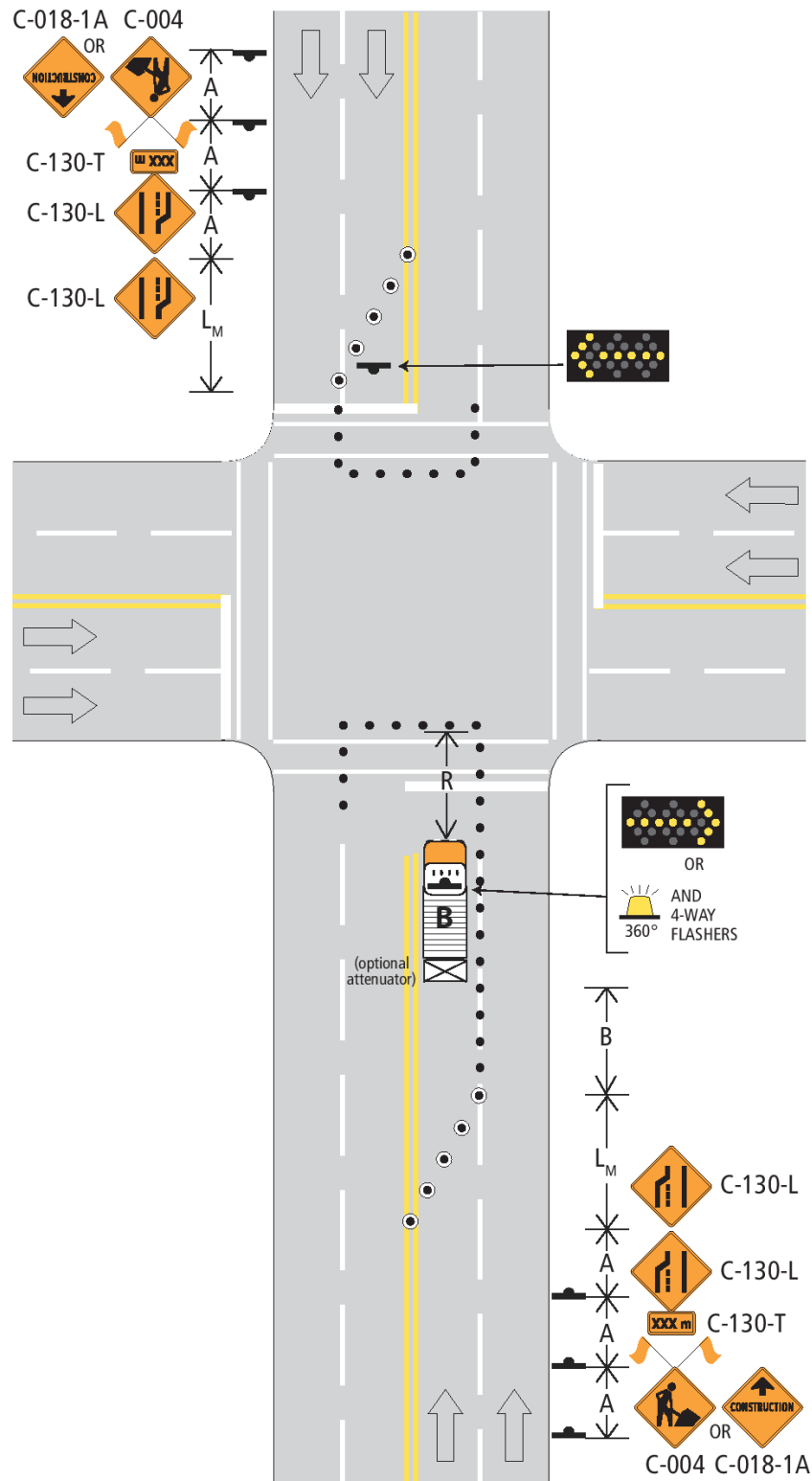
Guidance:

- To maintain traffic flow, it may be necessary to restrict turning movements at the intersection (i.e., prohibit left and/or right turns using Turn Control R-015-L/R signs).
- A buffer vehicle with a 360-degree light and 4-way flashers should be used when workers are on the roadway.
- Depending on the route and traffic volumes, it may be preferable to implement a single lane closure (as opposed to the two closures shown in the diagram).
- When a buffer space is provided, it may be less than the length specified in [Table B – Device Spacing Lengths](#) if space is limited and the adaptation is approved by the Road Authority.

Options:

- A Road Marking in Progress C-041-xx sign may be used in advance of the work.
- For low-volume, low-speed (≤ 60 km/h) roadways:
 - A Lane Closure Arrow C-053 sign may replace the flashing arrow board (FAB).
 - The advance lane drop sign and tab may be removed, and the Crew Working Ahead C-004 sign moved upstream by Table B Distance A.

**Figure 14.10: Stop Line and Crosswalk Marking – Left Lanes – Multilane Roadway
– Short and Long Duration**



14.11 Stop Line and Crosswalk Marking – Right Lanes – Multilane Roadway – Short and Long Duration

Purpose:

This layout shows the typical setup for marking stop lines and crosswalks in right lanes at an intersection.

For multilane intersections, this is usually done in stages, with the inner lane marking done separately from the outer lane marking to minimize disruption to traffic.

If the intersection requiring work is not depicted in the diagram, see the layouts in [Section 11: Traffic Control Layouts – Intersections](#).

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- A Right Lane Closed Ahead C-130-R sign with a C-130-T distance tab is required in advance of a second Right Lane Closed Ahead C-130-R sign.
- Flashing arrow boards (FABs) shall be used inside all lane closure tapers.
- If the speed limit is ≥ 70 km/h, a buffer space is required.

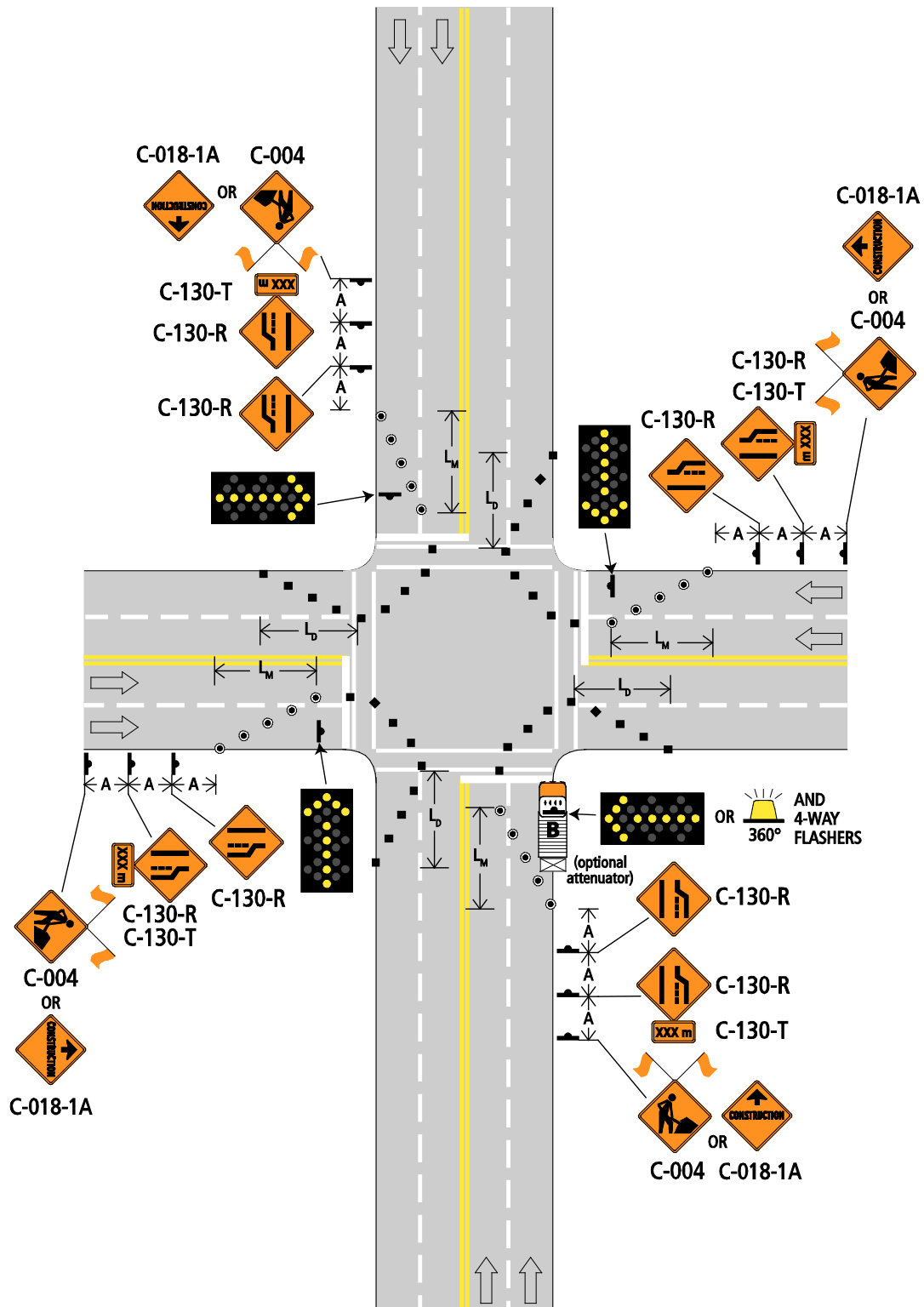
Guidance:

- A buffer vehicle with a 360-degree light and 4-way flashers should be used when workers are on the roadway.
- When a buffer space is provided, it may be less than the length specified in [Table B – Device Spacing](#) if space is limited and the adaptation is approved by the Road Authority.

Options:

- During periods of higher traffic volumes:
 - Left turns may be restricted.
 - The number of intersection legs with active work may be reduced.
- For low-volume, low-speed (≤ 60 km/h) roadways:
 - A Lane Closure Arrow C-053 sign may replace the flashing arrow board (FAB).
 - The advance lane drop sign and tab may be removed, and the Crew Working Ahead C-004 sign moved upstream by Table B Distance A.

Figure 14.11: Stop Line and Crosswalk Marking – Right Lanes – Multilane Roadway – Short and Long Duration



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PART B – TRAFFIC CONTROL

Section 15: Traffic Control Layouts – Surveying
Contents

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15.4 Surveying in Intersections.....15-8

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PART B – TRAFFIC CONTROL

Section 15: Traffic Control Layouts – Surveying

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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15.1 General Information - Surveying

1. Survey crews shall use extra caution because survey work areas often do not have the easily identifiable vehicles and equipment typically present at construction and maintenance work sites.
2. It may be advantageous for survey crew members to become qualified as Traffic Control Persons (see [Section 5: Traffic Control Persons](#)) so that they are authorized to control traffic when required. This will also enable them to supplement personnel who are working solely as TCPs.
3. All signs related to survey activities shall be removed or covered when no survey crew member is working on or adjacent to the roadway.
4. For traffic control layouts applicable to surveying on complex roadways, see:
 - [Section 7: Traffic Control Layouts – Two-Lane, Two-Way Roadways](#)
 - [Section 8: Traffic Control Layouts – Multilane Undivided Roadways](#)
 - [Section 9: Traffic Control Layouts – Multilane Divided Roadways](#)
 - [Section 11: Traffic Control Layouts – Intersections](#)

15.2 Surveying on Shoulder

Purpose:

This layout shows the typical setup for survey work occurring on the shoulder when both the instrument person and the instrument are off the travelled portion of the roadway.

Although the diagram depicts a two-lane, two-way roadway, this setup can also be used for multilane roadways.

Standard:

- A Survey Crew Working Ahead C-003 sign with flags is required in advance of the work area.
- For all speed limits, the work vehicle shall have a 360-degree flashing yellow light and 4-way flashers.

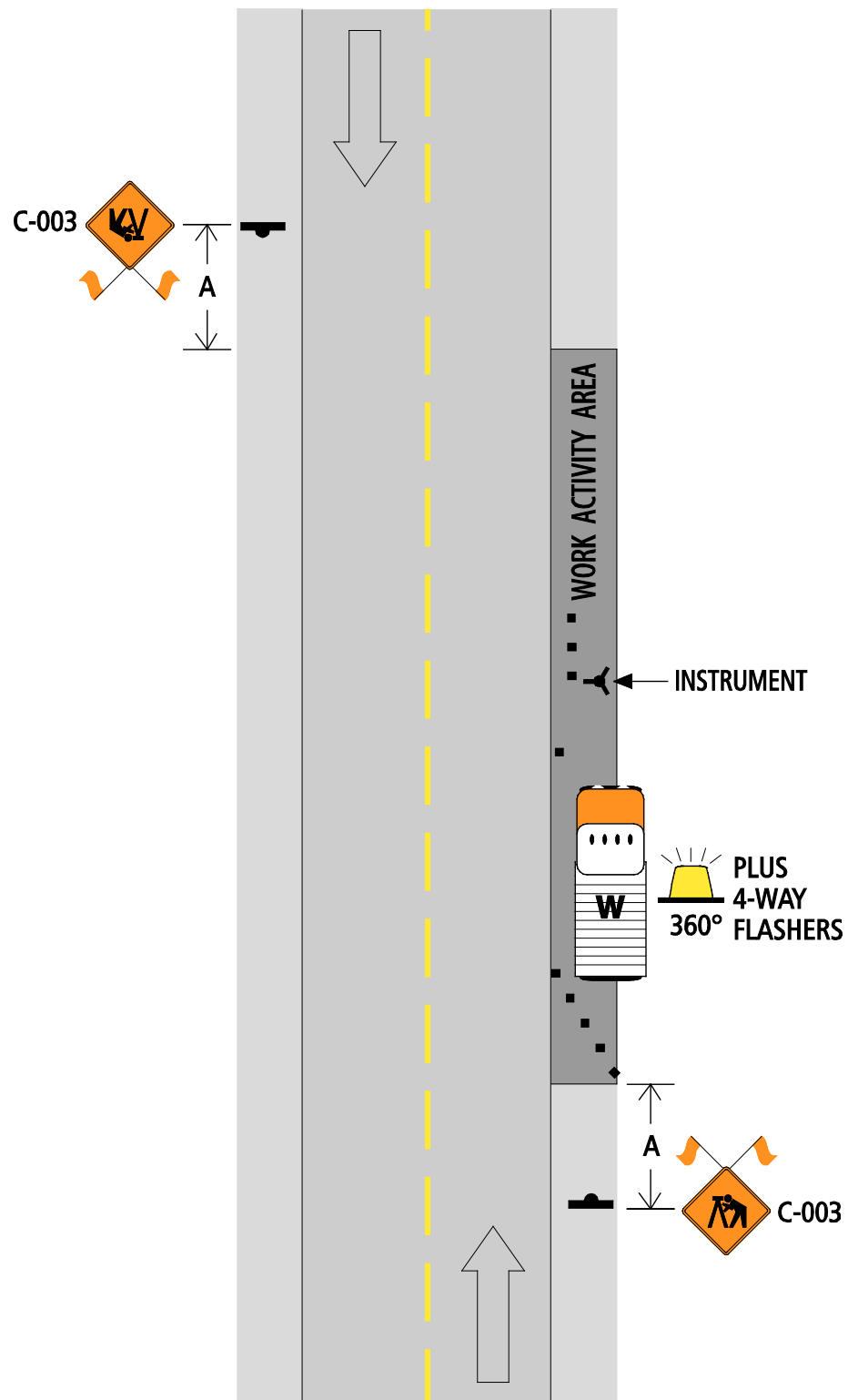
Guidance:

- For high-volume roads and speed limits ≥ 70 km/h, a buffer vehicle with a 360-degree flashing yellow light and 4-way flashers should also be used.
- If the roadway is a multilane divided roadway, the Survey Crew Working Ahead C-003 sign in the opposing direction should be omitted.

Options:

- A flashing arrow board (FAB) in caution mode may be used instead of the work vehicle with a 360-degree flashing yellow light and 4-way flashers.
- Where cyclists are regularly observed using the shoulder, a Share the Road W-132-1 sign may be used with an appropriate cycling hazard tab (see [Section 18: Traffic Control Layouts – Bicycle Lanes](#) for additional information).

Figure 15.2: Surveying on Shoulder



15.3 Surveying on Centreline

Purpose:

This layout shows the typical setup for surveying on centreline.

If passing traffic is a concern, other traffic control methods and layouts shall be used.

Standard:

- A Road Survey Ahead C-018-4 sign shall be used in advance of the general survey area. The distance between opposing C-018-4 signs shall not exceed 2 kilometres. The signs should be moved as the work progresses so that the work vehicles remain within the distance indicated on the signs.
- A Survey Crew Working Ahead C-003 sign with flags shall be used in advance of the work area.
- A shadow vehicle shall be used to provide advance warning to approaching vehicles.
- All vehicles shall be equipped with a 360-degree flashing light and 4-way flashers.
- If sufficient shoulder width (≥ 3.5 metres) is available for traffic to pass the survey crew on the right, a Pass this Side C-042-R sign shall be installed on the rear of the shadow vehicle. Otherwise, a Yield to Oncoming Traffic R-056-1 sign shall be used.

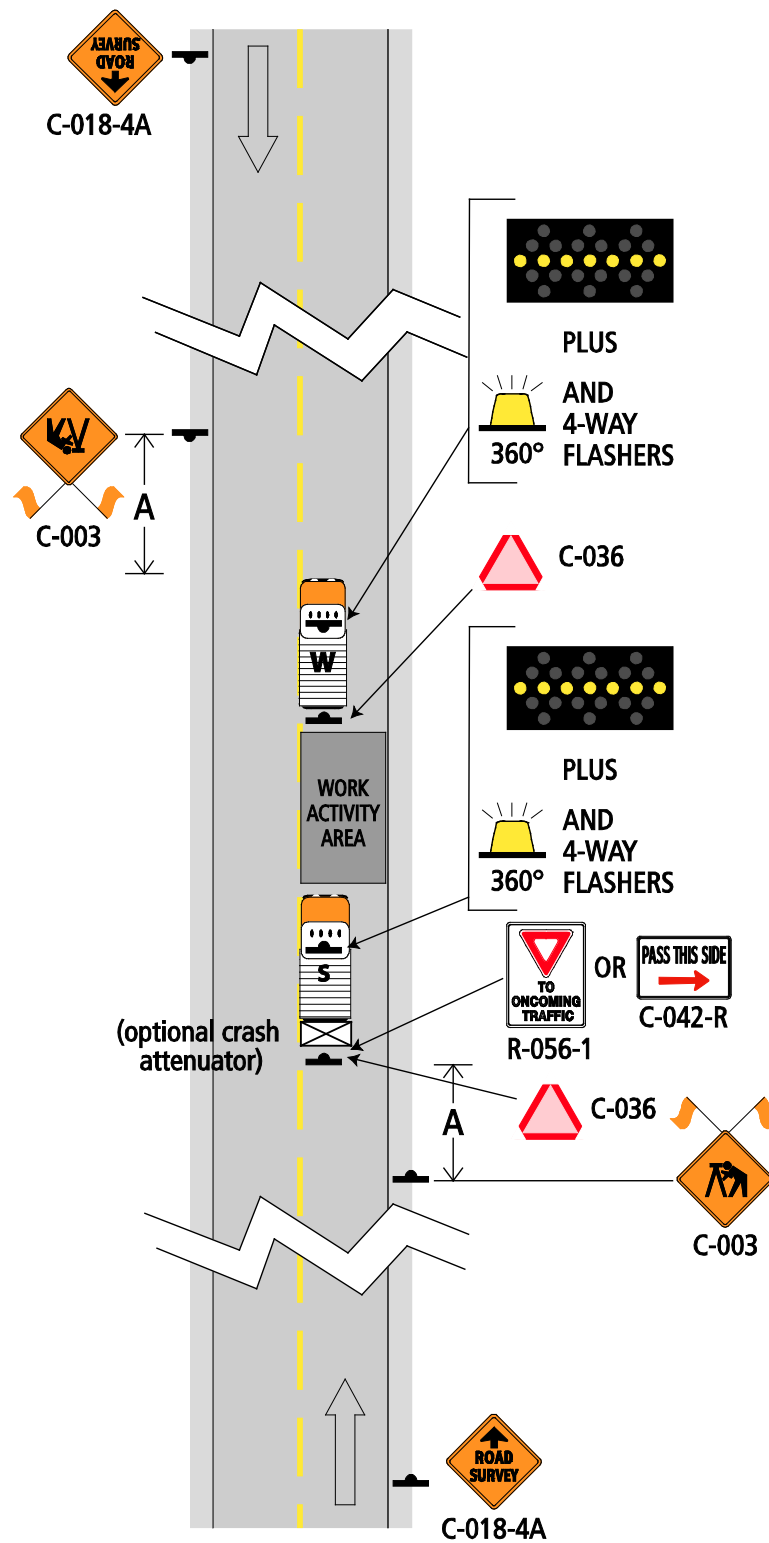
Guidance:

- A Survey Crew Working – Maximum Speed C-002-1 sign and a Thank You Resume Speed C-086-1 sign should be used only where conditions warrant (see [Section 2.4: Management of Speed](#) and [Section 5: Traffic Control Persons](#) for speed zone information). The distance between the opposing C-002-1 signs should not exceed 2 kilometres.

Options:

- The nature of the work activity area will vary, depending on the length and type of survey being completed. For example, a centreline survey may be completed using a rolling setup, in which case a more appropriate traffic control layout from the Manual should be applied.
- A spotter may be required to assist the instrument person by watching traffic.

Figure 15.3: Surveying on Centreline



15.4 Surveying in Intersections

Purpose:

This layout shows the typical setup for survey work occurring in an unsignalized intersection.

For more complex intersection layouts, see [Section 11: Traffic Control Layouts – Intersections](#).

Standard:

- Survey Crew Working Ahead C-003 signs with flags shall be used in advance of the work area.
- A Survey Crew Working – Maximum Speed C-002-1 sign and a Thank You Resume Speed C-086-1 sign should be used only where conditions warrant (see [Section 2.4: Management of Speed](#) and [Section 5: Traffic Control Persons](#) for speed zone information).

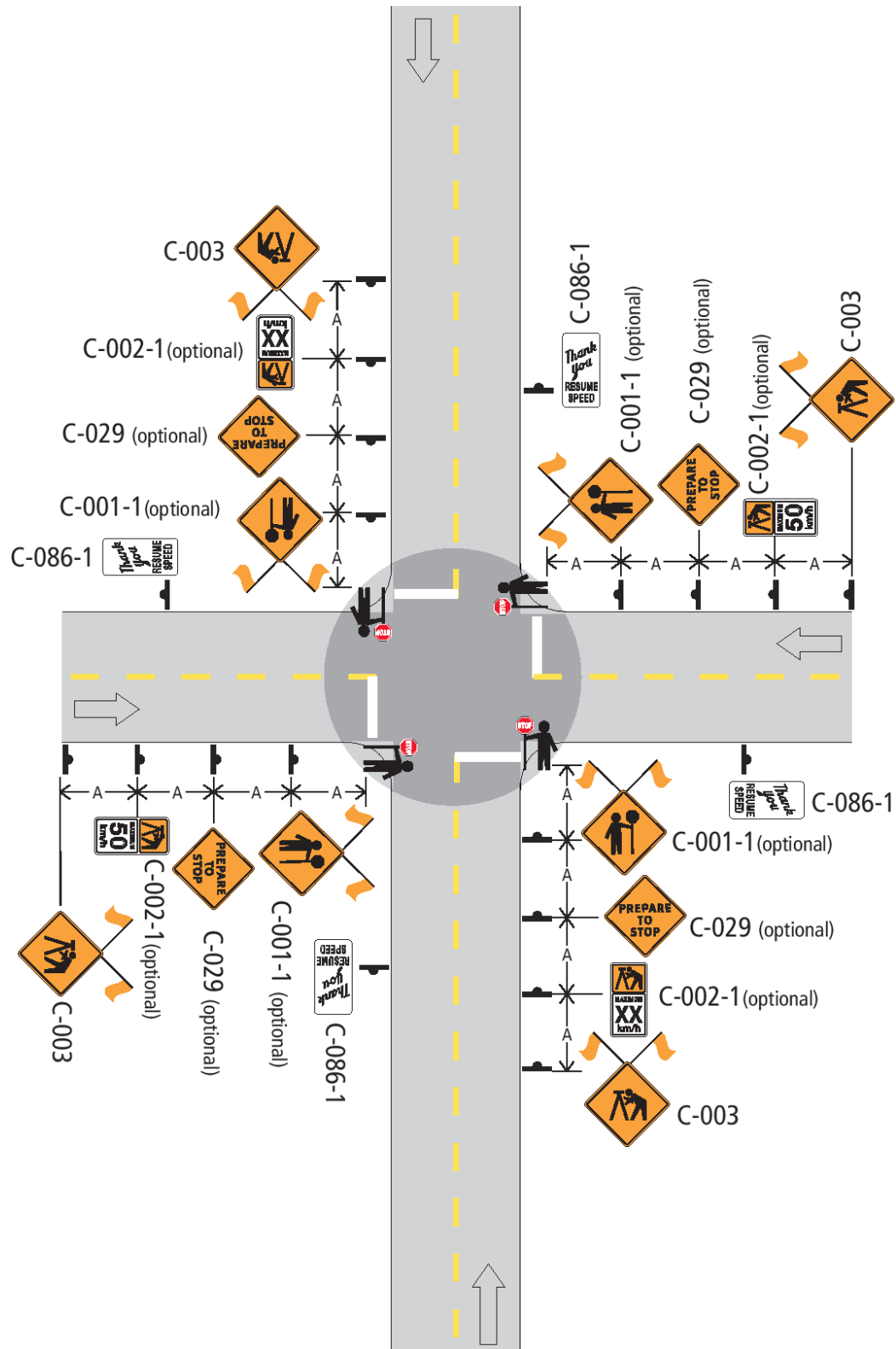
Guidance:

- If the Survey Crew Working – Maximum Speed C-002-1 sign is not required, the Survey Crew Working Ahead C-003 sign can be moved downstream by Table B Distance A.
- If no Temporary Speed Zone is used, the Work Zone Ends C-088 sign can be used instead of the Thank You Resume Speed C-086-1 sign.

Options:

- Traffic Control Persons are optional for this setup. If they are used, the Traffic Control Person Ahead C-001-1 sign and Prepare to Stop C-029 sign are required and the Flagger Ahead C-001-2 sign may be used for additional advance warning.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

Figure 15.4: Surveying in Intersections



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PART B – TRAFFIC CONTROL

Section 16: Traffic Control Layouts – Avalanche Control

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PART B– TRAFFIC CONTROL

Section 16: Traffic Control Layouts – Avalanche Control

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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16.1 General Information

Where snow avalanche conditions warrant, a highway may be closed at:

- locations with gates
- designated locations without gates
- other locations approved by the Ministry Avalanche Technician

Closure locations should be on a relatively level grade, be free of avalanche hazard, and have a turnaround capacity for large vehicles.

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For night operations, Type A yellow flashing lights are required on Avalanche Control C-057 signs, Prepare to Stop C-029 signs, and Traffic Control Person Ahead C-001-1 signs (when TCPs are used).
- Gate bases should be marked with Hazard W-154-L/R markers.

Guidance:

- When signs are not required—including those on gates—they should be removed, folded, or covered, and flags and flashing lights should be removed except for the flashing red lights installed on avalanche gates.
- On multilane divided roadways, and where space allows, the specified signing should be repeated in the median straight across from the shoulder signage.
- In addition, signage may be erected on the left shoulder where space allows, provided that it does not block sight lines or conflict with other signage.
- This work typically takes place during daylight hours. If the work will continue into the night, any TCP stations should be illuminated by overhead lighting.

Options:

- Additional advance signing—such as Avalanche Control C-057 signs or dynamic message signs (DMS)—may be used on curvilinear approaches or where it is anticipated that vehicle queues may extend past the standard signage layouts.

16.2 Road Closure for Avalanche Control – Gates without TCPs

Purpose:

This layout shows the typical setup where the highway must be closed for avalanche control, and the existing gates are used, without Traffic Control Persons.

Standard:

- A Stop R-001 sign and a Road Closed R-012 sign shall be clearly displayed on the gate as shown in the diagram.
- Type B red flashing lights shall be erected on the gate.
- The Avalanche Control C-057 sign and the Prepare to Stop C-029 sign shall have flags during the daytime.
- A Stop Ahead C-111 sign shall be positioned in advance of the closed gates.

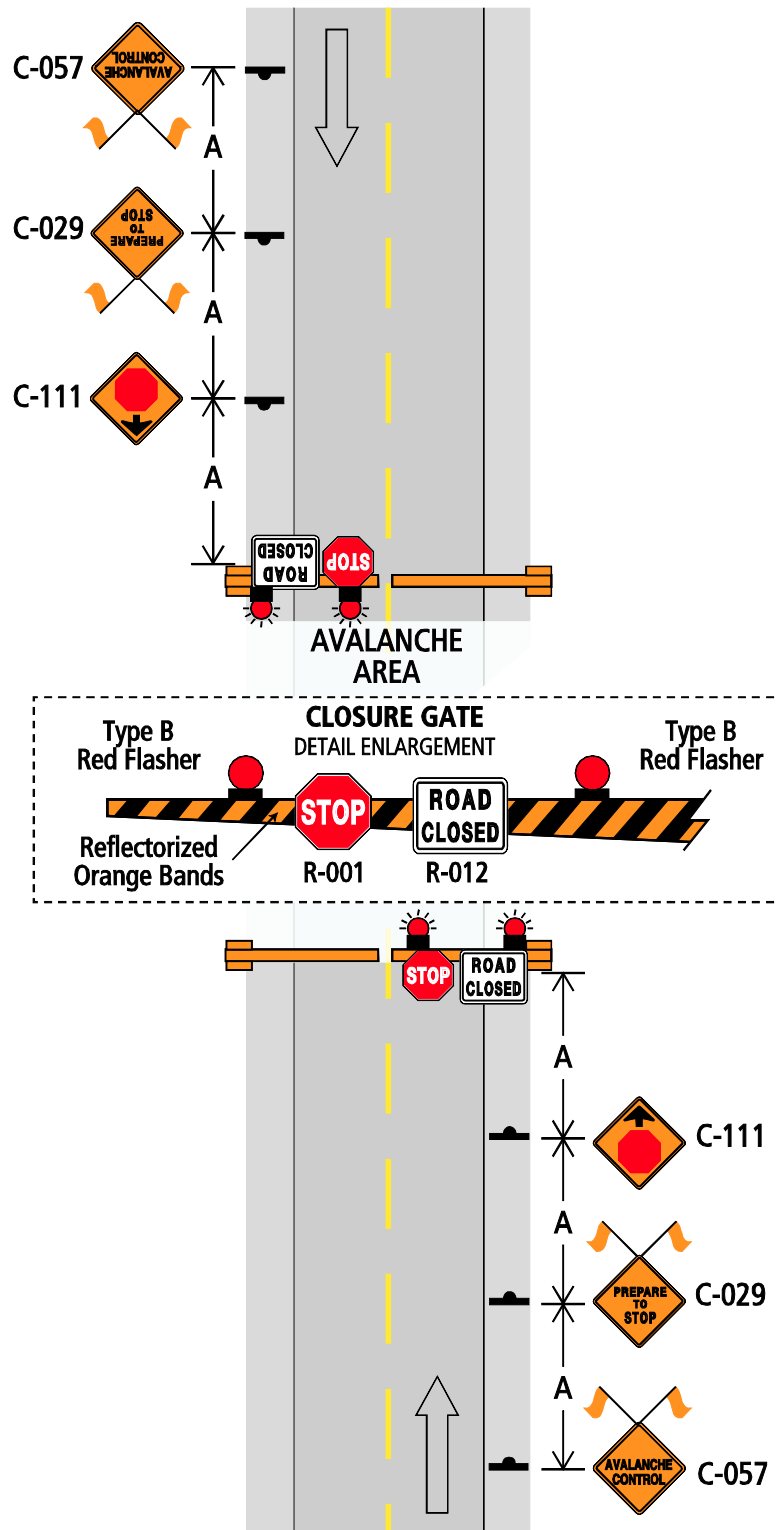
Guidance:

- If TCPs are not used, the avalanche barrier gates should be locked as authorized by the Ministry Avalanche Technician.
- Overhead permanent dynamic message signs (DMS) should be used whenever possible to inform travellers of the road closures.
- Additional portable dynamic message signs (DMS) may be used closer to the closure area to advise of closure periods, wait times, instructions for motorists in the waiting queue, and other details. See [Section 4.3.3: DMS Fundamentals](#) for sample messages and abbreviations.

Options:

- None at this time.

Figure 16.2: Road Closure for Avalanche Control – Gates without TCPs



16.3 Road Closure for Avalanche Control – Gates with TCPs

Purpose:

This layout shows the typical setup where the highway must be closed for avalanche control, and existing gates and Traffic Control Persons are both present.

In addition to directing traffic, TCPs may be useful for providing information to motorists about the closure, monitoring queue lengths, and adjusting signage as necessary.

Standard:

- A Stop R-001 sign and a Road Closed R-012 sign shall be clearly displayed on the gate as shown in the diagram.
- Type B red flashing lights shall be erected on the gate.
- The Avalanche Control C-057 sign, Prepare to Stop C-029 sign, and Traffic Control Person Ahead C-001-1 sign shall be positioned in advance of the TCP, and shall have flags during the daytime.

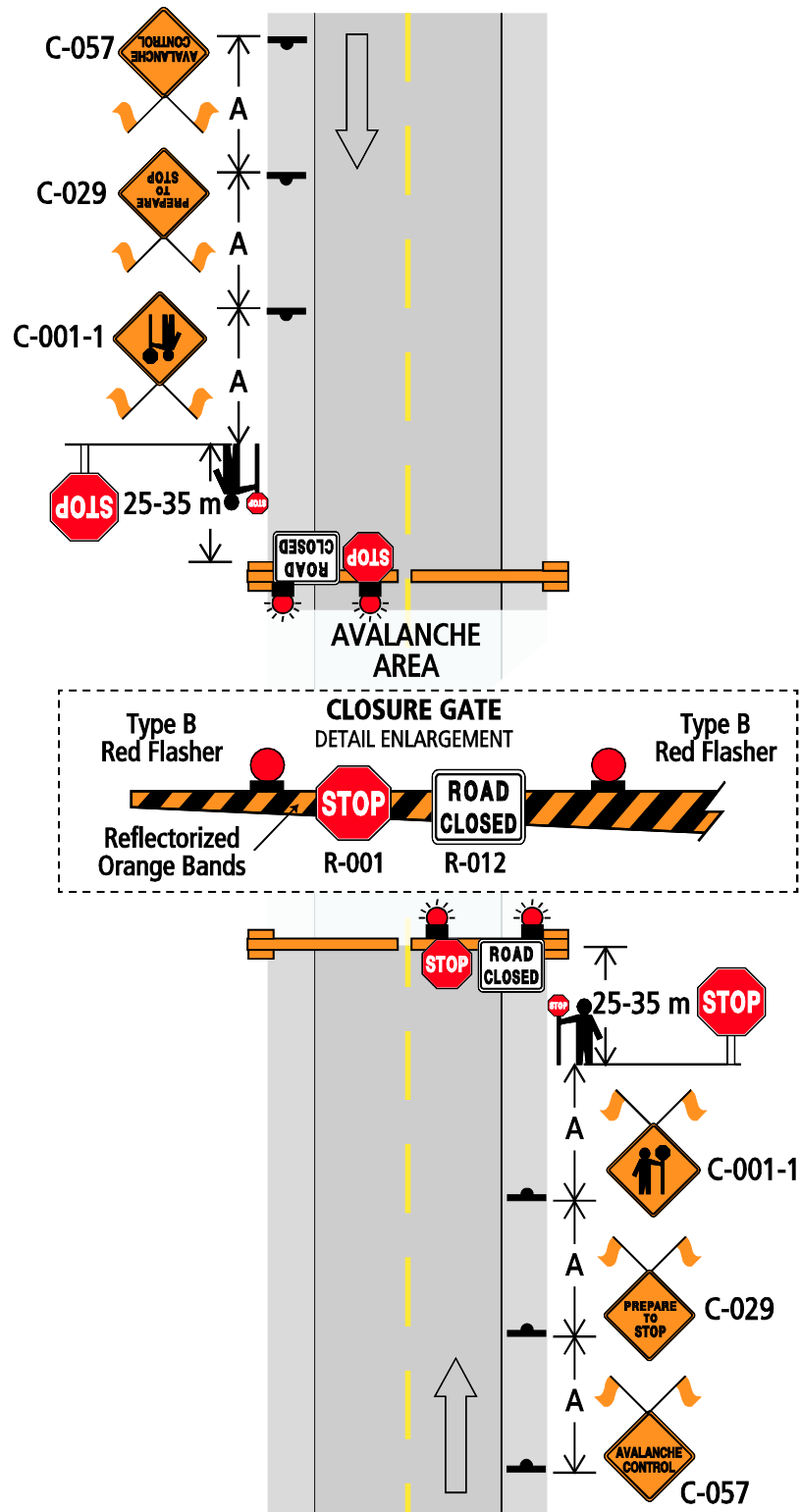
Guidance:

- Overhead permanent dynamic message signs (DMS) should be used whenever possible to inform travellers of the road closures.
- Additional portable dynamic message signs (DMS) may be used closer to the closure area to advise of closure periods, wait times, instructions for motorists in the waiting queue, and other details. See [Section 4.3.3: DMS Fundamentals](#) for sample messages and abbreviations.
- TCPs should monitor queue lengths, and adjust or add more advance warning signage as required.

Options:

- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

Figure 16.3: Road Closure for Avalanche Control – Gates with TCPs



16.4 Road Closure for Avalanche Control – Barricades and TCPs

Purpose:

This layout shows the typical setup where the highway must be closed for avalanche control in a location where no gates are present.

When avalanches occur in non-gated areas, Ministry Avalanche Technicians determine the closure and traffic control requirements for using barricades and Traffic Control Persons.

In addition to directing traffic, TCPs may be useful for providing information to motorists about the closure, monitoring queue lengths, and adjusting signage as necessary.

Standard:

- A Stop R-001 sign and a Road Closed R-012 sign shall be clearly displayed on the barricade as shown in the diagram.
- Type B red flashing lights shall be erected on the barricade.
- The Avalanche Control C-057 sign, Prepare to Stop C-029 sign, and Traffic Control Person Ahead C-001-1 sign shall be positioned in advance of the TCP, and shall have flags during the daytime.

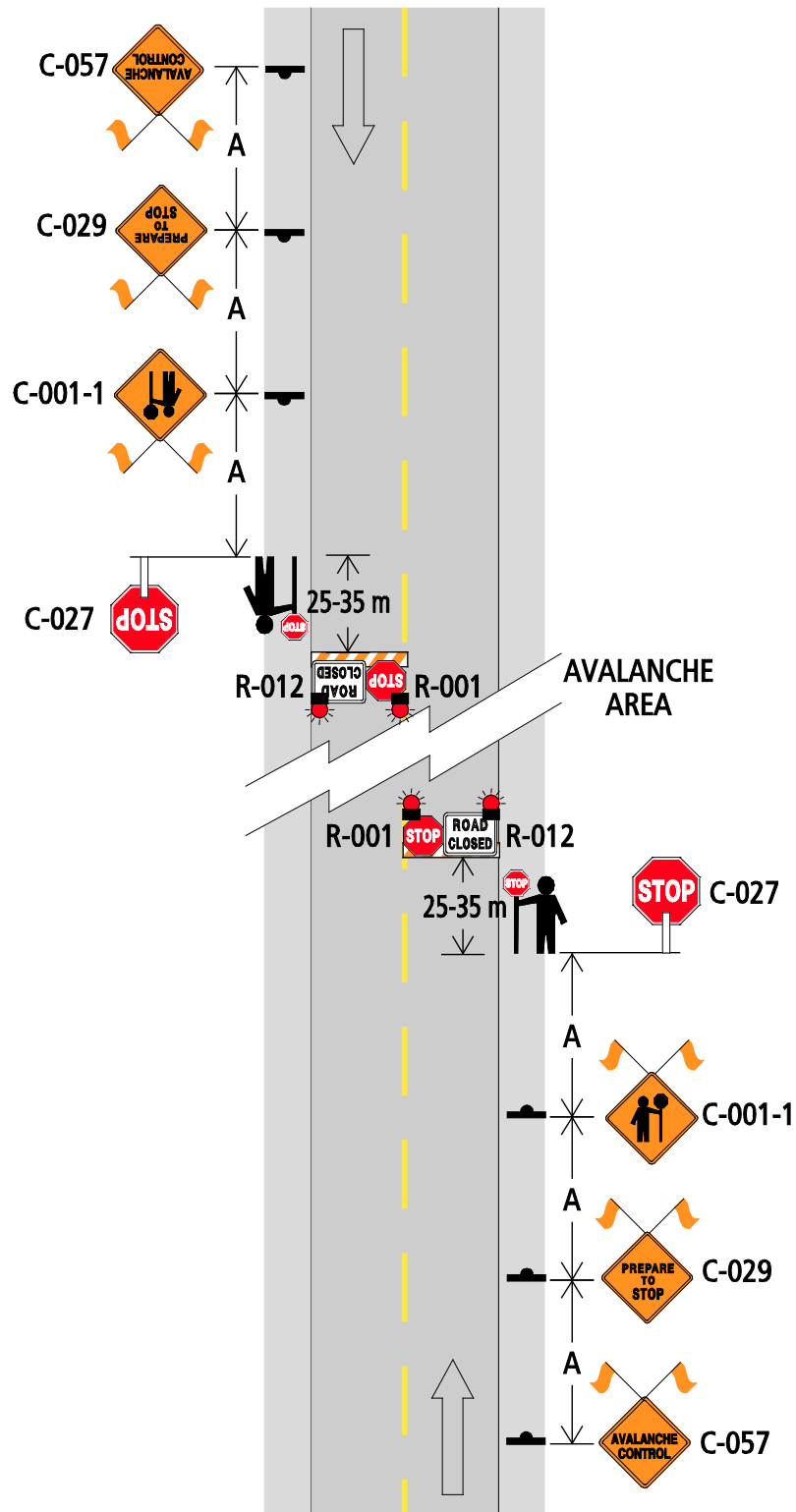
Guidance:

- Overhead permanent dynamic message signs (DMS) should be used whenever possible to inform travellers of the road closures.
- Additional portable dynamic message signs (DMS) may be used closer to the closure area to advise of closure periods, wait times, instructions for motorists in the waiting queue, and other details. See [Section 4.3.3: DMS Fundamentals](#) for sample messages and abbreviations.
- TCPs should monitor queue lengths, and adjust or add more advance warning signage as required.

Options:

- The Flagger Ahead C-001-2 sign or Prepare to Stop C-029 sign may be used for additional advance warning where TCPs are stopping traffic.
- When TCPs are directing traffic, the construction speed limit shall be ≤ 70 km/h.

Figure 16.4: Road Closure for Avalanche Control – Barricades and TCPs



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PART B – TRAFFIC CONTROL

Section 17: Traffic Control Layouts – Utility Work

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17.3 Traffic Signal Relamping/Cleaning17-6
– Short Duration

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PART B – TRAFFIC CONTROL

Section 17: Traffic Control Layouts – Utility Work

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
	Dynamic Message Sign (DMS)		Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

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17.1 General Information - Utility Work

1. The traffic control required for utility work on roadways is typically no different from that required for road construction or maintenance on roadways.
2. The layouts in Section 17 are designed for utility work in a low-speed, low-volume setting.
3. When these layouts are not sufficient for the identified work—that is, if the work is being done in a higher speed or higher volume environment, or if it is related to overhead power, phone, or fibre optic lines—the other Traffic Control Layouts in the Manual (i.e., those in Sections 7 to 18) shall be considered, and the appropriate ones applied.

17.2 Utility Work on Centreline – Urban Area – Short and Long Duration

Purpose:

Various utilities may be situated within the roadway, including manholes and catch basins.

This layout is intended for utility works that can take place in a single shift on low-speed urban roadways.

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- Where the posted speed limit is ≥ 70 km/h, a flashing arrow board (FAB) is required.
- For two-lane, two-way roadways, at least 3 metres of roadway shall remain available on each side of the work area for vehicles to pass on either side. If this cannot be achieved on each side, single lane alternating traffic is required.
- For multilane roadways, lane closures are required.
- Night work may be required because of the site conditions, in which case traffic control signage and devices shall be increased to include:
 - tubular markers instead of cones
 - flashing yellow lights on signs instead of flags

Guidance:

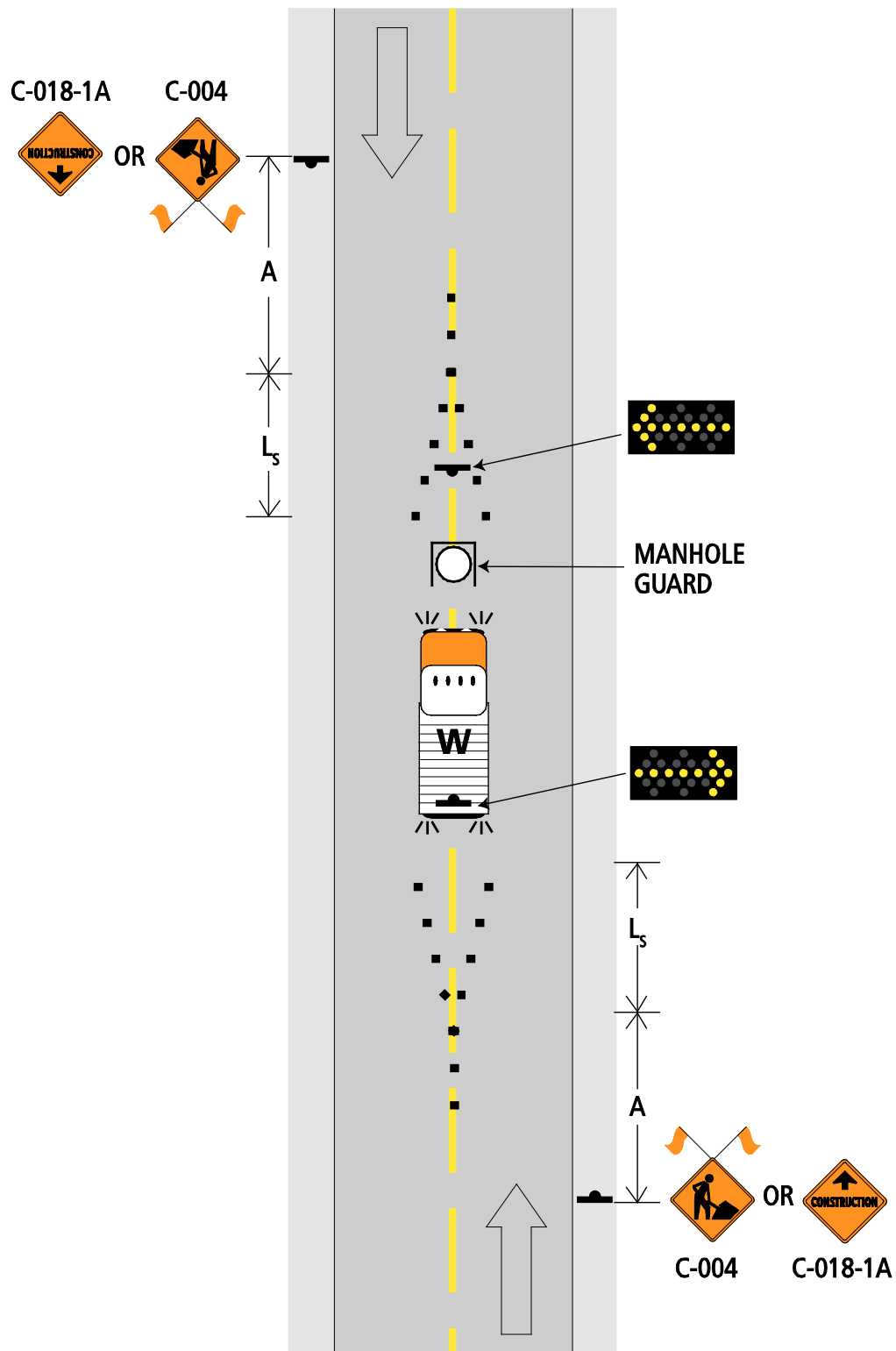
- A Crew Working – Maximum Speed C-002-2 sign and a Thank You Resume Speed C-086-1 sign should be used only where conditions warrant.

Options:

- The flashing arrow board (FAB) may be replaced as shown below.

Speed Limit	Workers or Work Vehicles Present	No Workers or Vehicles Present
≤ 60 km/h	Lane Closure Arrow C-053 sign plus 360° flashing light and 4-way flashers.	Lane Closure Arrow C-053 sign plus barricade and Type A yellow warning light.
≥ 70 km/h	No substitution.	

Figure 17.2: Utility Work on Centreline – Urban Area – Short and Long Duration



17.3 Traffic Signal Relamping/Cleaning – Short Duration

Purpose:

Electrical utilities within a signalized intersection periodically require the installation of a new signal head or lamps, or cleaning.

This layout is for short-duration work on low-speed, low-volume roadways.

For work on high-volume roadways, which require more complex layouts, and for night work (long-duration work), see [Section 11: Traffic Control Layouts – Intersections](#).

Standard:

- A work vehicle equipped with 4-way flashers shall be stopped under a signal head where lamps are to be replaced or cleaned. It requires a flashing arrow board (FAB) that directs traffic into the right or left lane.
- A Crew Working Ahead C-004 sign shall be used on all approaches to the intersection.
- If Traffic Control Persons are used, they shall never provide direction that conflicts with that provided by a traffic signal. Traffic shall be directed by a police officer or the signal shall be turned off or covered.

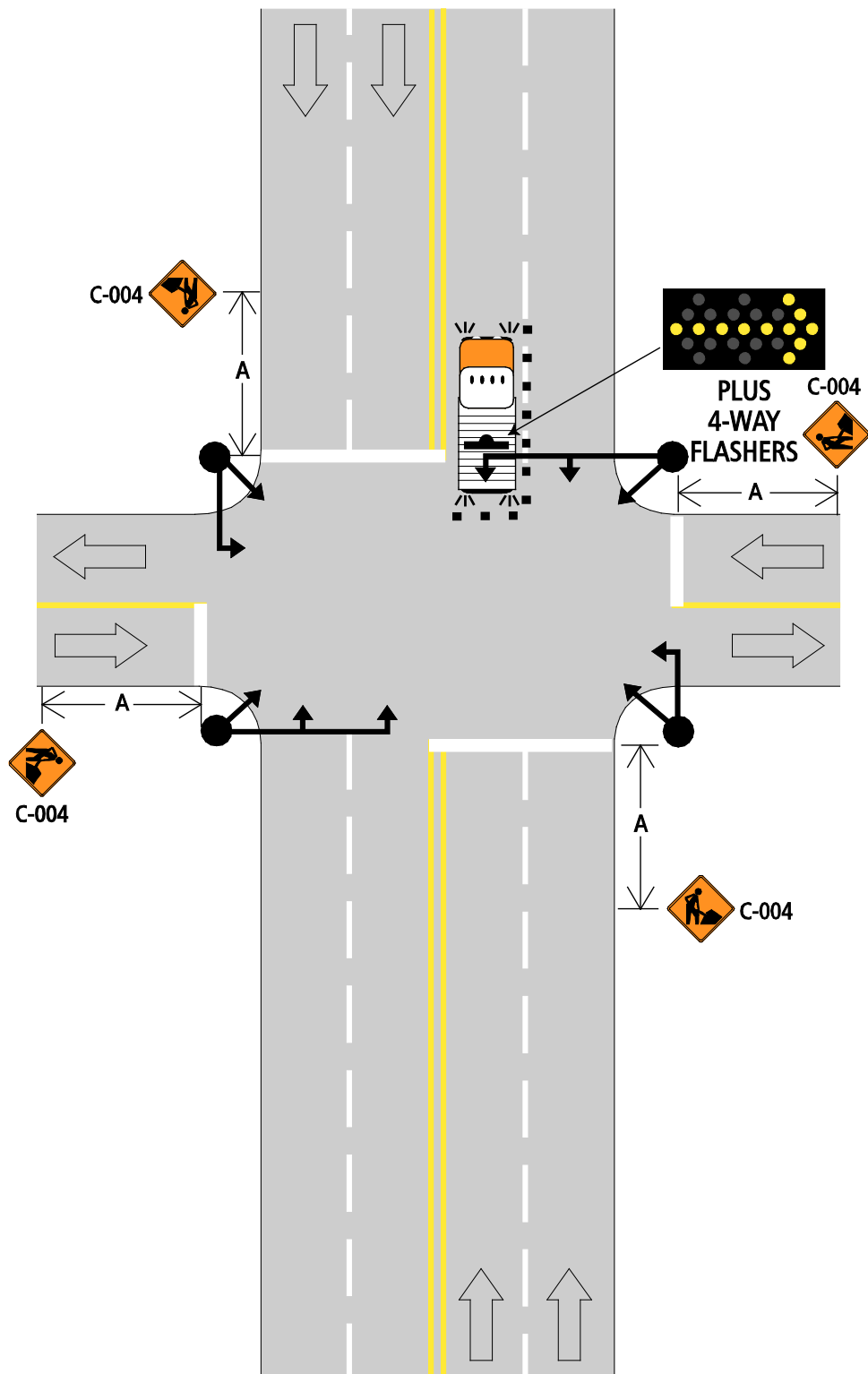
Guidance:

- None at this time.

Options:

- None at this time.

Figure 17.3: Traffic Signal Relamping/Cleaning – Short Duration



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PART B – TRAFFIC CONTROL

Section 18: Traffic Control Layouts – Bicycle Lanes

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18.1.2 Roads with Bike Lanes or Paved Shoulders	18-3
18.1.3 Roads with Shared Lanes	18-3
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PART B – TRAFFIC CONTROL

Section 18: Traffic Control Layouts – Bicycle Lanes

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
			Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

18.1 General Information on Accommodating Cyclists

Under the Motor Vehicle Act, cyclists have the same rights and duties as operators of motor vehicles. Therefore, the signage and traffic control measures used for drivers also applies to cyclists.

The potential for cyclists to respond differently than drivers under certain conditions should be anticipated and considered. For example, road surface conditions can impact cyclists more so than motor vehicles.

The following factors shall be considered when establishing or inspecting a work zone that may be traversed by cyclists:

- Cyclists are vulnerable road users who have little protection from falls and collisions.
- Cyclists ride on two narrow tires.
- The loss of traction or deflection of the front bicycle wheel can cause a fall.
- Loose gravel, uneven surfaces, milled pavement, and tack coats can create problems for cyclists.
- In the dark, the limitations of bicycle lights make temporary road works difficult for cyclists to see.
- Road works on urban roadways may affect a large variety of cyclists with varying abilities, ranging from children to commuters.

Specific ways to accommodate cyclists during road works are addressed below.

18.1.1 Roadway Surface Conditions

Since cyclists operate on two narrow tires, the quality of the road surface is more important than it is for cars and trucks.

Wherever possible, a smooth, hard surface (such as asphalt) should be maintained for cyclists. Compacted gravel may be acceptable for temporary conditions.

Loose or uneven surfaces should be avoided, and signs indicating bumps or changes in the roadway surface should be used to notify cyclists.

18.1.2 Roads with Bike Lanes or Paved Shoulders

Where cyclists approach the work zone in a bike lane or on a paved shoulder, it is preferable to maintain those facilities within the work zone.

At temporary facilities, a minimum 1-metre width may be used as the space for riding cyclists, with a 0.3-metre clearance from vertical obstacles like cones or barriers.

If there is insufficient space for bicycles and motor vehicles to operate side-by-side, a temporary shared lane may be created. Cyclists and motorists can share a lane over a short distance in low-speed environments (≤ 60 km/h).

Notification should be provided that the roadway is a shared roadway and that the lane is too narrow for side-by-side operation. Cyclists and motorists should operate single file (e.g. Cyclist Right-of-Way Take the Lane C-184 sign).



C-184
Cyclist Right-of-Way
Take the Lane

18.1.3 Roads with Shared Lanes

A shared lane should be used where the width required for a separate bike lane or paved shoulder cannot be maintained.

In low-speed environments (≤ 60 km/h), a shared lane width less than 4.3 metres may be used. Where lane widths are less than 4.0 metres, a shared lane may not be feasible because drivers may have to enter the oncoming lane in order to pass cyclists.

Where the shared lane width is less than 4.0 metres, consider prohibiting motor vehicles from passing cyclists (i.e., single file vehicle/bicycle operation) or detouring cyclists.

Where speeds exceed 60 km/h, a shared lane width of 4.3 metres should be maintained. If this is not possible, it may be necessary to detour cyclists.

18.1.4 Cyclist Detours

Accommodating cyclists within the work zone is preferable to detouring them. Bicycles require less space than cars and can often be accommodated even when vehicles must be detoured. Cyclists can share a lane over a short distance in low-speed environments (≤ 60 km/h).

Requiring cyclists to dismount should be avoided but may be preferable to a lengthy detour. The “cyclists dismount and walk” measure should be considered only if the reason for dismounting is immediately apparent to cyclists. Otherwise, many cyclists may ignore this instruction. Generally, cyclists should not be expected to dismount and walk for more than 50 metres.

Detours should be established where sufficient width or roadway surface for cyclists cannot be maintained through the work zone.

Cyclist detour signs (B-C-004 series) should be used to mark cyclist-specific detour routes and guide cyclists along the route.

Detours in which cyclists have to make left turns or cross arterial roadways without a signal or push-button crosswalks are discouraged.



B-C-004-1A
Bicycle Detour Ahead

Detours are usually not a realistic option for cyclists on rural highways because there may be few alternatives, and detours using alternative routes may cover substantial distance.

18.1.5 Signs and Other Provisions for Cyclists

Signs and other provisions to accommodate cyclists will vary with the nature of the road work, but may include:

- use of dynamic message signs (DMS) or customized signs to forewarn cyclists of construction activity
- use of a Bicycles/Pedestrians Slow B-C-020 series sign within the advance signing array to advise drivers and cyclists to slow down
- use of a Share the Road W-132-1 series sign to advise drivers that cyclists will be using the travelled roadway
- use of appropriate pavement surface condition signs (e.g., Grooved Pavement C-011 sign)
- regular sweeping of the shoulder near the active work site to reduce debris from construction activity
- providing cyclists with a ride through the work site when pilot vehicles are present
- consultation with local cycling organizations
- detouring cyclists (may not be feasible in rural areas)

The traffic control layouts are considered the minimum standard. The associated text description of each figure highlights the key standards as well as guidance and options that can be considered by the user. The following information is typical on most layouts in this section:

Standard:

- For short-duration work, a Crew Working Ahead C-004 sign is required.
- For long-duration work, a Construction Ahead C-018-1A sign is required.
- A Bike Lane Closed B-C-002 sign is required in advance of the bicycle lane closure.

Guidance:

- None at this time.

Options:

- A dynamic message sign (DMS) may be used for additional messaging if space allows.
- In low speed (≤ 60 km/h) urban areas (within municipal boundaries), customization of traffic control layouts, including closer device spacing and shorter taper lengths, may be necessary to maintain access and mobility. In these cases, document why adjustments are being made.

18.2 Bicycle Lane Shift

Purpose:

This layout shows the typical setup of a bicycle lane shift where the road width allows bicycle traffic to be maintained through the work area by shifting all vehicle and bicycle traffic and still maintaining a separated lane for bicycles.

This layout does not apply for shoulder closures.

Standard:

- A Lane Shift C-117-L/R sign shall be used in advance of the shifting lanes.
- A Lane Closure Arrow C-053 sign shall be used where the bicycle and vehicle traffic is being shifted.

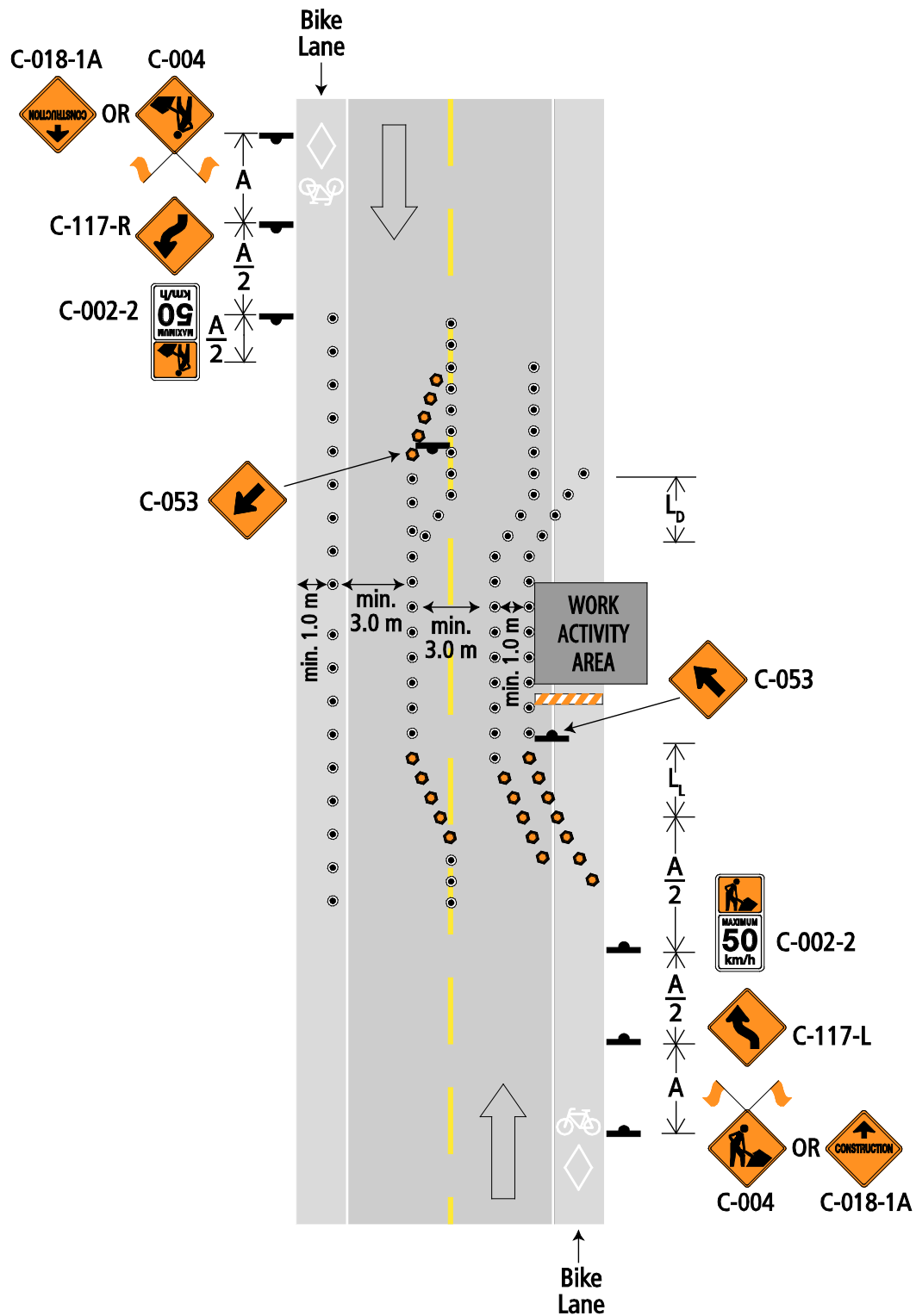
Guidance:

- If standard lane widths cannot be maintained:
 - The vehicle lane may be reduced to a minimum width of 3.0 metres.
 - The bicycle lane may be reduced to a minimum width of 1.0 metre.
- Where there are obstructions adjacent to the open lane, such as barriers, an additional 0.3 metres of bicycle lane width should be provided.
- The bicycle lane should be delineated from the vehicle lane with channelizing devices.
- Where lane widths are reduced, a Construction Speed Zone of 50 km/h or less should be implemented for the section of roadway where lanes are shifted.

Options:

- If the speed limit is ≤ 60 km/h:
 - Tubular markers may be used for leading tapers instead of drums.
 - Cones may be used for protecting the work area.
- For short-duration work when bicycle volumes are low, the bicycle lane may be closed with the following changes to the layout:
 - delineation along the bicycle lane may be removed.
 - a Share the Road W-132-1 sign should be installed upstream of the lane shift.
 - a Bike Lane Closed B-C-002 sign should be installed upstream of the lane shift.

Figure 18.2: Bicycle Lane Shift



18.3 Bicycle Lane Closed – Take the Lane (≤ 50 km/h)

Purpose:

This layout shows the typical setup of a bicycle lane closure in a low-speed urban environment where the regular posted speed is ≤ 50 km/h and a bicycle lane cannot be maintained through the work area because of lane widths or other constraints.

This layout should be used only in areas where the vehicle lane is less than 4.0 metres wide, and there is insufficient lane width for side-by-side bicycle and motor vehicle operation.

It is preferable to allow cyclists to continue cycling when work occurs on a bicycle route, so cyclists are instructed to ride in the centre of the vehicle lane (take the lane) in this layout.

This layout does not apply for shoulder closures.

Standard:

- A Cyclist Right-of-Way “Take the Lane” C-184 sign shall be placed in advance of the taper.
- The speed limit shall be ≤ 50 km/h through the section of roadway where cyclists are taking the lane.

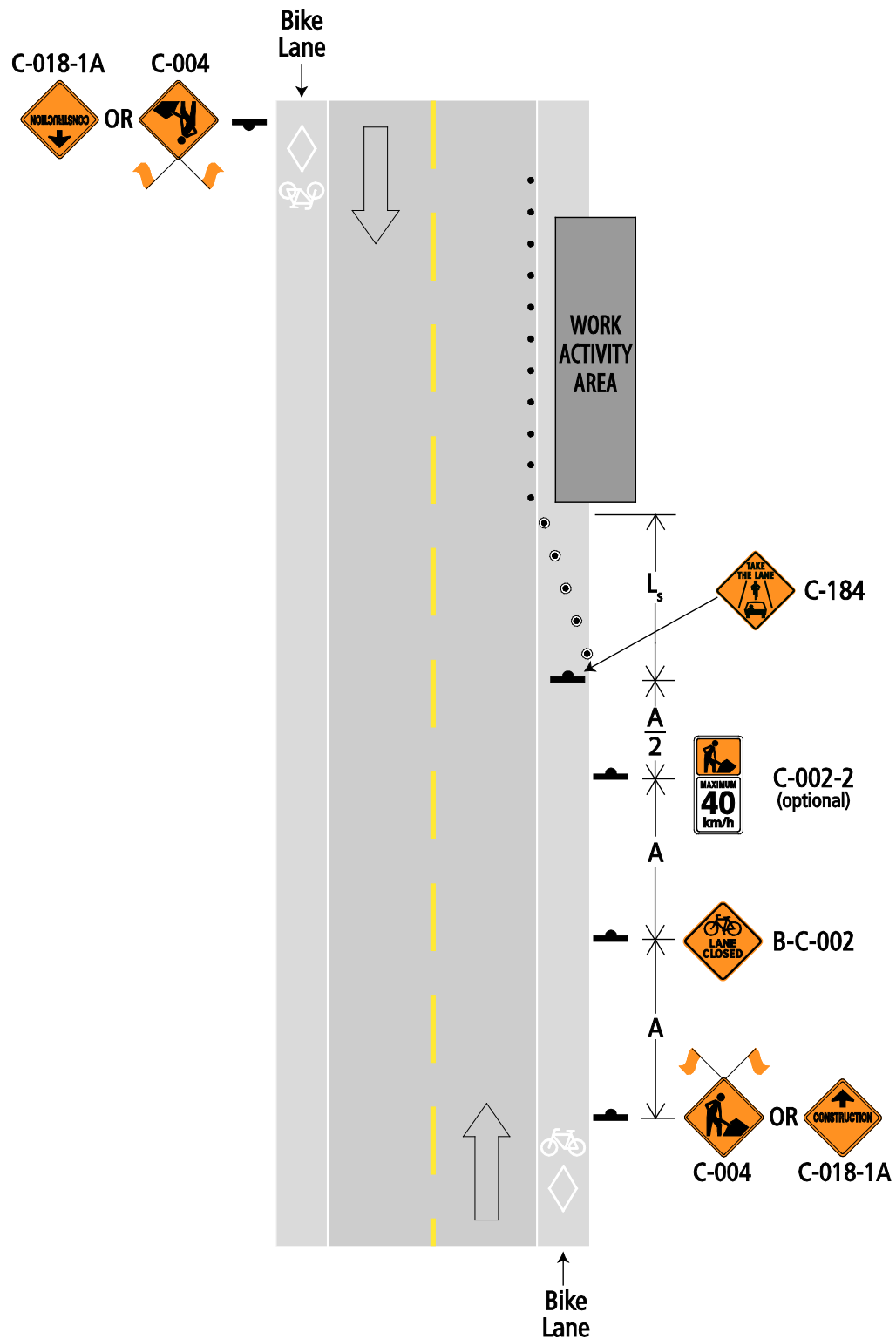
Guidance:

- A reduced Construction Speed Zone should be considered where cyclists are advised to take a vehicle lane.

Options:

- Additional steps may be taken to slow vehicle traffic, such as using a Reduce Speed C-032 sign. See also [Section 2.4: Management of Speed](#).
- For closures longer than 150 metres, alternative strategies include:
 - a bicycle lane shift - see [Section 18.2: Bicycle Lane Shift](#)
 - a bicycle detour - see [Section 18.5: Bicycle Lane Closed – Bicycle Detour](#)

Figure 18.3: Bicycle Lane Closed – Take the Lane (≤ 50 km/h)



18.4 Bicycle Lane Closed – Share the Road

Purpose:

This layout shows the typical setup for a bicycle lane closure where lane widths allow bicycle traffic to be maintained through the work area by shifting all traffic.

This layout should be used only in areas where lane widths of 4.0 metres or more can be maintained and there is sufficient lane width to have side-by-side bicycle and motor vehicle operation.

This layout does not apply for shoulder closures.

Standard:

- A Road Diversion C-052-L/R sign shall be used to identify the road pattern change.
- A Share the Road W-132-1 sign shall be positioned in advance of the taper.
- A Lane Closure Arrow C-053 sign shall be used where the bicycle and vehicle traffic is being shifted.
- A minimum overall lane width of 4.0 metres shall be maintained.

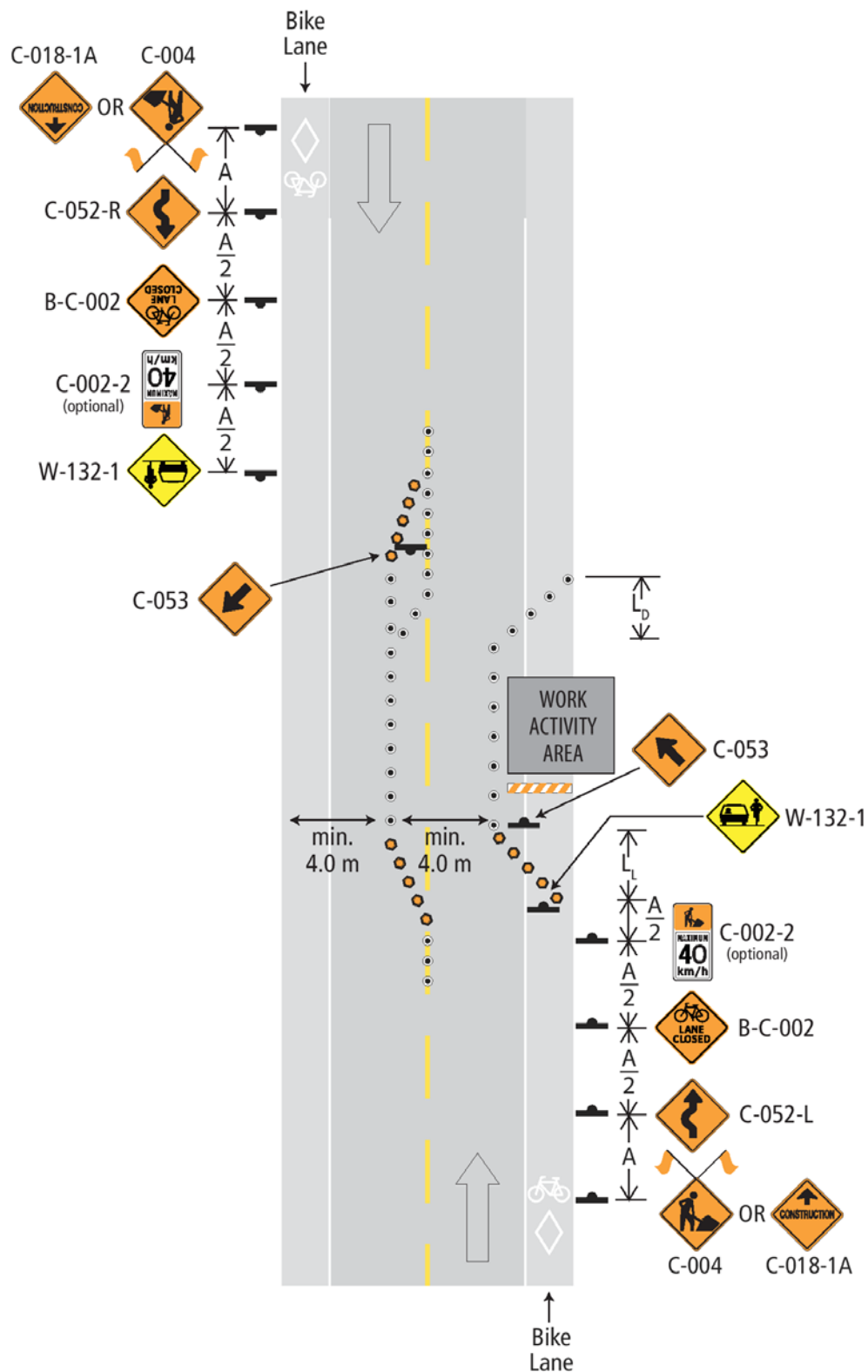
Guidance:

- Where there are vertical obstructions (e.g., barriers) or drop-offs adjacent to the open lane, an additional 0.3 metres of shy distance should be provided.
- A Construction Speed Zone of 50 km/h or less should be implemented for the section of roadway where bicycles and vehicles are sharing the lane.

Options:

- If there is sufficient lane width, the bicycle space may be delineated from the traffic space with channelizing devices or temporary pavement markings.
- If the speed limit is ≤ 60 km/h:
 - Tubular markers may be used for leading tapers instead of drums.
 - Cones may be used instead of tubular markers.
- A Lane Shift C-117-L/R sign may be used instead of a Road Diversion C-052-L/R sign in the opposite direction.

Figure 18.4: Bicycle Lane Closed – Share the Road



18.5 Bicycle Lane Closed – Bicycle Detour

Purpose:

This layout shows a bicycle lane closure where a bicycle detour is required.

A bicycle detour may be necessary where it is not possible to maintain sufficient roadway surface or width for cyclists through the work zone.

In this layout, cyclists are instructed to detour to a different route in advance of the construction area. Where possible, the detour should begin at a location where the construction is within sight so that cyclists can see the reason for the detour.

Standard:

- A series of Bicycle Detour B-C-004 signs with appropriate directions shall be used along the detour.

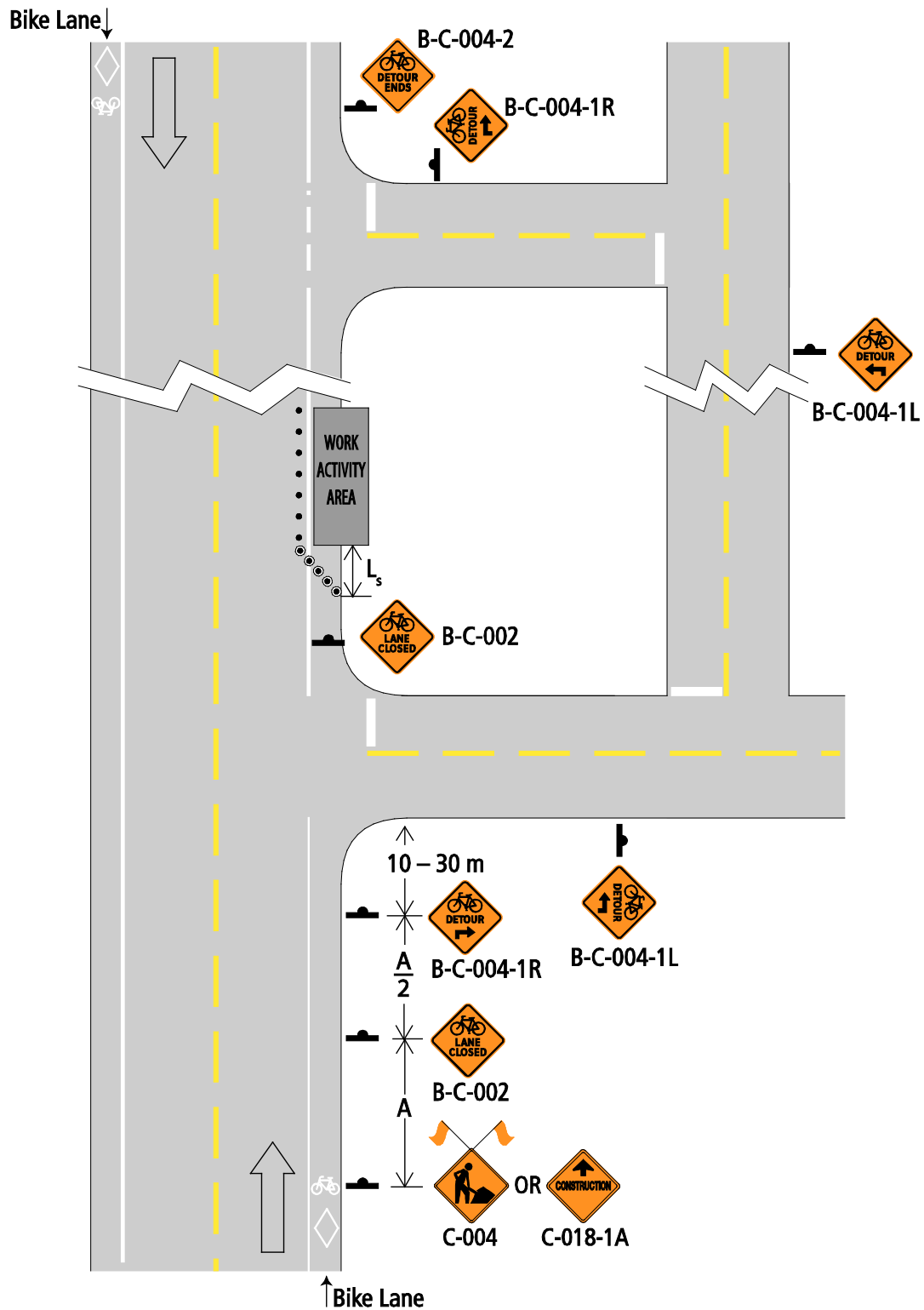
Guidance:

- Bicycle Detour Ahead B-C-004-1A signs should be used in advance of intersections along the route where the cyclist needs to continue straight ahead to stay on the detour route.
- Detours in which cyclists have to make left turns or cross arterial roadways without a signal or push-button crosswalk should be avoided.
- Detours for cyclists may not be possible on rural highways because there are few alternative routes, and detours may be lengthy. Other provisions should be considered, such as providing a shuttle service for cyclists.

Options:

- Bicycle Detour Ahead C-004-1A signs may be used along the detour route for confirmation.
- Where space allows, an additional Crew Working Ahead C-004 sign may be used in advance of the closure at a distance of one-half of Table B Distance A.

Figure 18.5: Bicycle Lane Closed – Bicycle Detour



18.6 Bicycle Lane Closed – Dismount and Walk

Purpose:

It is preferable for cyclists to continue cycling when work occurs on a bicycle route but certain conditions may prevent this, such as the nature of the road alignment or surface.

This layout shows a bicycle lane closure where cyclists must dismount and walk around the closure. This may be preferable to a bicycle detour if the closure length is relatively short (less than 50 metres). Cyclists will usually be dismounting and walking along a sidewalk. If a sidewalk is not present, the walking route must be marked with channelizing devices.

The layout illustrates a bicycle lane closure in a low-volume residential neighbourhood as a common example of where the “dismount and walk” requirement would probably occur. It is primarily intended to illustrate bicycle-related signage, but additional signage that is not bicycle-specific may also be required.

Standard:

- In advance of the work activity area, a confirmatory Bike Lane Closed B-C-002 sign with Cyclists Stop and Dismount B-R-101-Tb tab shall be used to direct cyclists to dismount.
- A Walk Bicycle B-R-101-2 sign shall be placed at the beginning of the area where cyclists shall walk. If a sidewalk is present, an On Sidewalk B-R-101-Tc tab should be used with the B-R-101-2 sign.

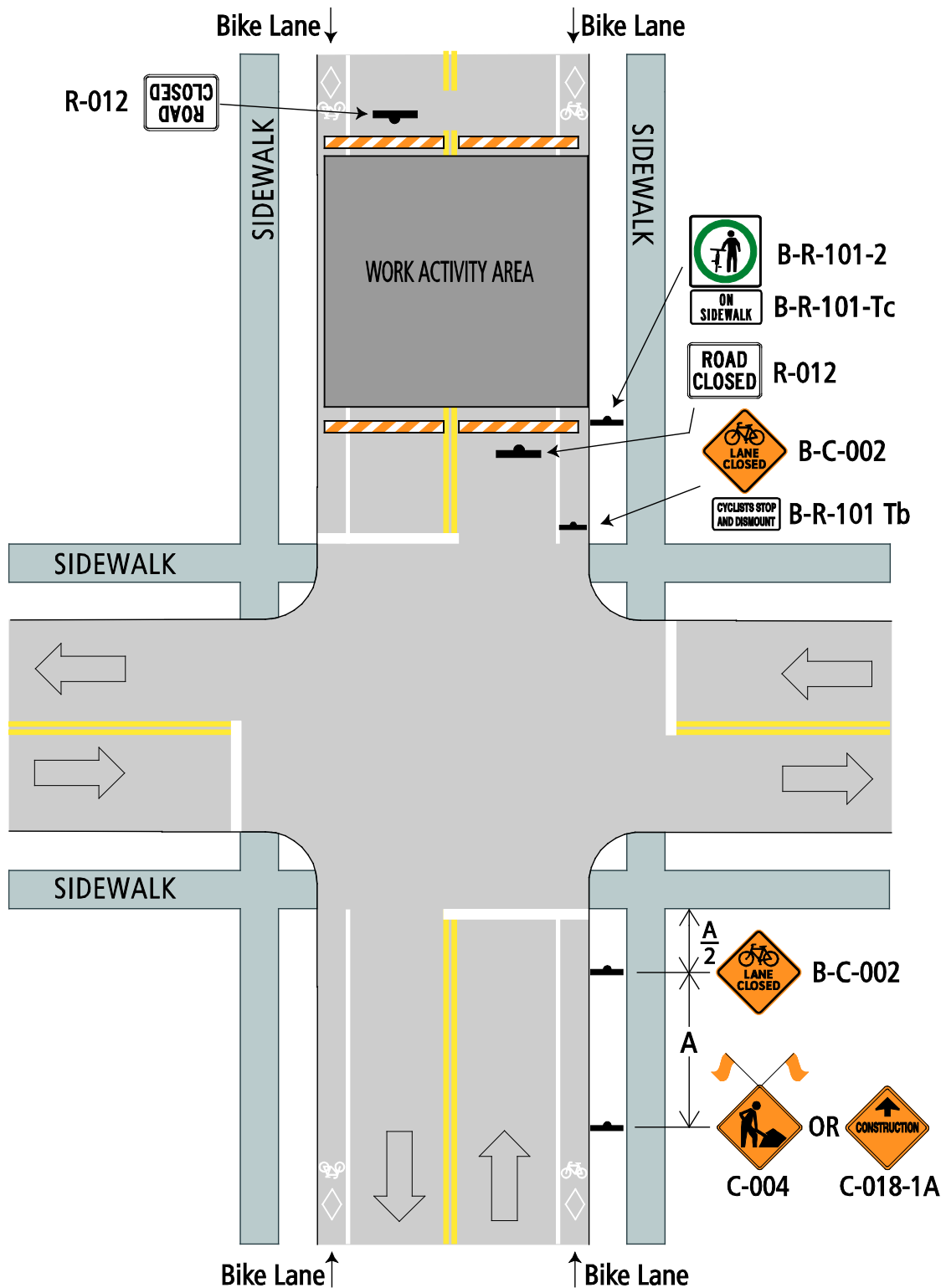
Guidance:

- If the reason for dismounting is not obvious, additional signage identifying the hazard should be installed (e.g., Loose Gravel C-015 sign).

Options:

- If cyclists are ignoring the requirement to dismount, a worker or Traffic Control Person near the dismount point may provide guidance to cyclists.

Figure 18.6: Bicycle Lane Closed – Dismount and Walk



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PART B– TRAFFIC CONTROL

Section 19: Traffic Control Layouts – Other Scenarios

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PART B – TRAFFIC CONTROL

Section 19: Traffic Control Layouts – Other Scenarios

LEGEND			
	Flexible Drum		Paint Truck
	Tubular Marker		Escort Truck
	Cone		Chaser Vehicle
	Sign		Vehicle Mounted Rear Crash Attenuator
	Traffic Control Person		
	Work Activity Area		360° Flashing Light
	Work Truck		Portable Traffic Signal
	Shadow Vehicle		Barricade and Fencing
	Shadow Vehicle #1		
	Shadow Vehicle #2		Flashing Arrow Board (FAB)
	Buffer Vehicle		Flashing Arrow Board (FAB) in caution mode
	Dynamic Message Sign (DMS)		Dynamic Message Sign (DMS)

TABLE A – TAPER LENGTHS

Taper Types (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Merge Taper Length	L _M	35	55	160	190	210	230	250	280
Lane Shift Taper Length	L _L	30	50	80	100	110	120	130	140
Downstream Taper Length	L _D	30	30	30	30	30	30	30	30
TCP, Signal, and Shoulder Taper Length (min. 5 devices)	L _S	5	8	15	15	15	15	15	15
Minimum Tangent Length between Tapers	L _T	30	60	160	190	210	230	250	280
Run-In Length on Centreline	L _R	40	50	60	60	70	80	90	100

TABLE B – DEVICE SPACING LENGTHS

Device Spacing (m)		Regular Posted Speed Limit (km/h)							
		≤50	60	70	80	90	100	110	120
Construction Sign Spacing	A	40	60	80	100	150	150	200	200
Buffer Space	B	30	40	60	80	110	140	170	200
Roll-Ahead Buffer Distance	R	30	30	40	40	40	50	50	50
Channelizing Device Spacing for Tapers	C	10	10	15	15	15	15	15	15
Channelizing Device Spacing on Curves and Tangents	D	10	10	30	30	40	40	40	50

19.1 Tow Truck Recovery Operations

Purpose:

This section outlines the key issues that should be considered to maintain public and worker safety when recovering disabled vehicles on or near the roadway.

The effects of towing operations on traffic may be similar to the effects of construction activities so the appropriate traffic control layouts in Sections 7 to 18 should be used for tow truck recovery operations.

Standard:

All work vehicles shall have 360-degree flashing lights and 4-way flashers.

- When a vehicle incident is affecting the flow of traffic, or if recovery operations could affect traffic flow for more than 15 minutes, additional traffic control is required.
- The most appropriate traffic control layouts shall be applied for vehicle recovery operations which exceed 15 minutes in duration. These may include, but are not limited to, the following scenarios:
 - A disabled vehicle and tow truck are on the shoulder, and recovery operations will not impact traffic (see [Section 7.5: Work on Shoulder](#)).
 - A disabled vehicle and/or tow truck are on the shoulder but recovery operations are encroaching, or will encroach, into the travel lane (see [Section 7.7: Roadside Work – Encroachment into Travel Lane](#)).
 - A disabled vehicle and/or tow truck are in one lane of a two-lane, two-way roadway. Operators will have to determine which layout is most appropriate based on the anticipated duration of the recovery operations (see [Section 7.3: Emergent Work](#) or [Section 7.8: Lane Closure with TCPs – Single Lane Alternating](#)).
 - In [Section 8: Traffic Control Layouts – Multilane Undivided Roadways](#), see the Right Lane Closed, Left Lane Closed, and Centre Lane Closure subsections.
 - In [Section 9: Traffic Control Layouts – Multilane Divided Roadways](#), see the corresponding subsections.
 - In [Section 10: Traffic Control Layouts – Mobile Work](#), see the corresponding subsections.
 - Other references include layouts such as [Figure 6H-35 – Mobile Operation on a Multi-Lane Road](#) found in the U.S. Department of Transportation Federal Highway Administration's [Manual on Uniform Traffic Control Devices](#)
- In addition to meeting WorkSafeBC requirements for personal protective equipment, those working on Provincial roadways shall comply with [Section 5.4.3: Apparel for Other Onsite Workers](#).

Guidance:

- For a recovery that does not pose a hazard to the travelling public but requires additional resources, it is important to secure and establish them before commencing the recovery operation. The requirements for this situation may include, but are not limited to:
 - additional traffic control signs and devices
 - Traffic Control Persons
 - special equipment
- A recovery that may encroach into the travel lane will probably require the closure of one or more lanes. This includes situations where:
 - The tow truck or disabled vehicle is fully or partially blocking a lane.
 - Tow truck equipment—cables, outriggers, cranes, and other equipment—is crossing, encroaching on, or operating above the travel lanes.

Options:

- For all the layouts in Sections 7 to 18 where a Crew Working Ahead C-004 sign or a Construction Ahead C-018-1A sign is required, an Accident Scene, Emergency Scene, Emergency Incident, or Tow Truck (C-058, C-070, C-071 series) sign with flags or a flashing light may be used instead.

19.2 Roadway Closure – No Through Road – Local Road

Purpose:

This layout shows a typical setup for a long duration local road closure where network street continuity is lost due to the closure. Advanced planning for detours is key to success as notifications, jurisdictional acceptance and/or the development of custom signs may be necessary. Emergency services (Police, Ambulance, Fire) may need to be contacted depending on the complexity of the closure (network of streets impacted), and overall length (time and distance) of detour.

[Figure 19.2: Roadway Closure – No Through Road](#) shows the general layout for a singular road closure.

Standard:

- All detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour signs shall be in place along the corresponding detour route.
- Barricades shall span the entire width of the roadway.

Guidance:

- Regulatory traffic control devices should be added or modified as needed for the duration of the detour.
- Additional signs should be erected at all connecting roadways to provide clear guidance to alternative routes for connectivity.

Options:

- If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection such as residences, the Road Closed Local Traffic Only C-201 series sign and barricades may be located at the edge of the traveled way to allow local passage.
- A Checkerboard C-114 sign may be placed at the closure, just in front of, or as part of the barricade sign assembly. If the C-114 sign is used, the Road Closed R-012 sign may be mounted on the barricade or below the C-114 sign. The C-114 sign provides for better notification and stop compliance.
- If the road closure is some distance from the intersection, the Road Closed Ahead C-030-6A sign may be added to provide additional warning of the closure ahead.
- DMS messages may be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:

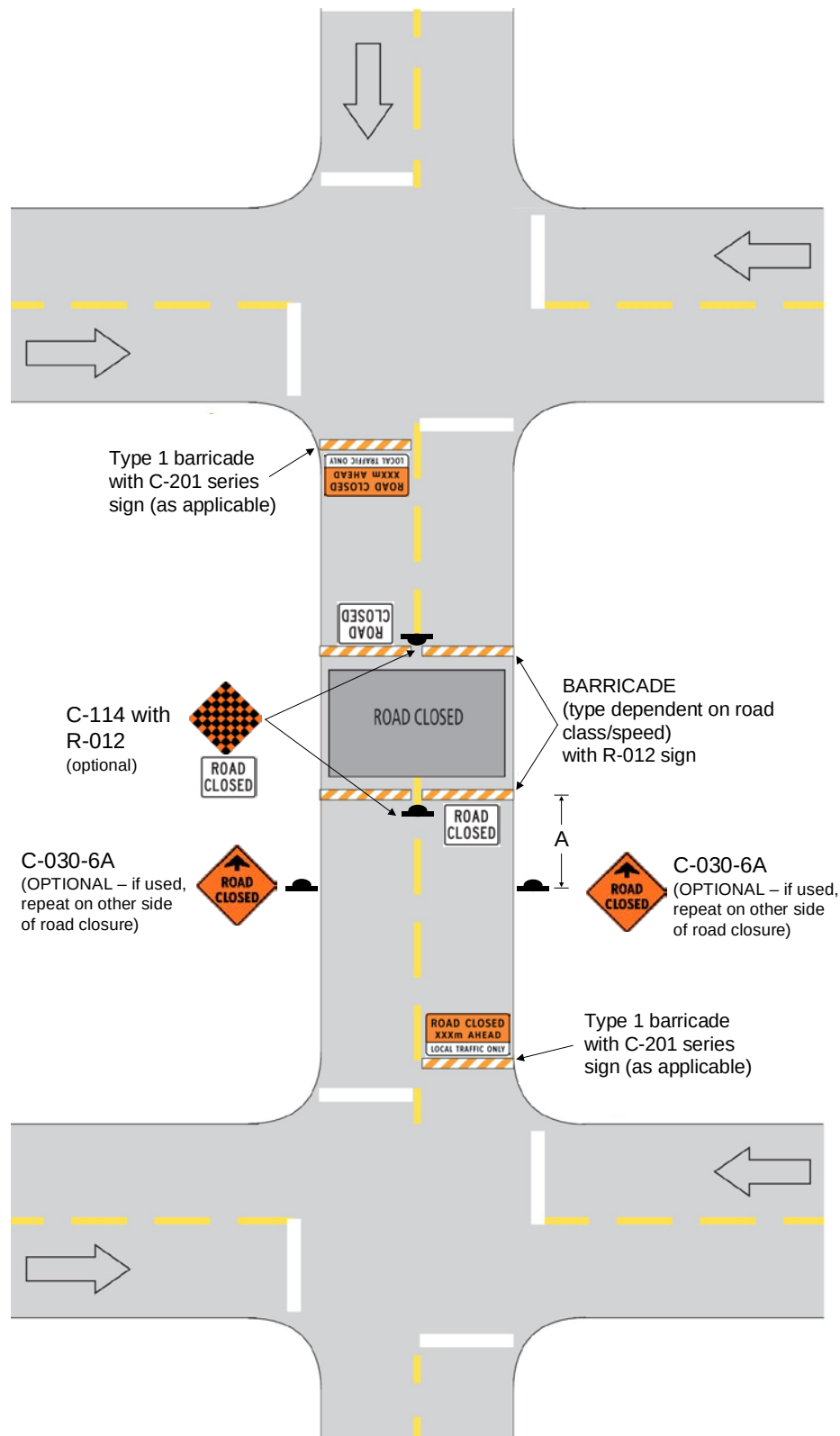
FIRST AVE CLOSED	BEGINS APRIL 20
ROAD CLOSED	DETOUR MAIN ST

- If the road closure impacts a road commonly used to access a highway or a popular destination, additional signage may be required to establish a detour.
- The “LOCAL TRAFFIC ONLY” text of the Road Closed Local Traffic Only C-201 series signs may be replaced with custom messaging such as road closure times or dates to provide more information representing local conditions to the road user.
- Typical custom signage used in detours include the following examples:



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Figure 19.2: Road Closure – No Through Road – Local Road



19.3 Roadway Closure – Two-Lane, Two-Way Roadway

Purpose:

This layout shows a typical setup for a long duration road closure on two-lane, two-way roadways. Advance planning for road closures and detours is key to success as notifications, jurisdictional acceptance and/or the development of custom signs may be necessary. Emergency services (Police, Ambulance, Fire) may need to be contacted depending on the complexity of the closure (network of streets impacted), and overall length (time and distance) of detour.

Figure 19.3: Roadway Closure – Two-Lane, Two-Way Roadway shows the general layout for a two-lane, two-way road closure.

Standard:

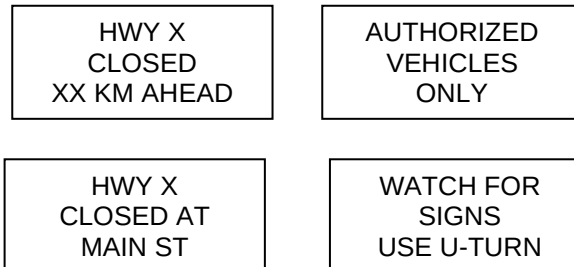
- All road closures and detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour or U-turn signs shall be in place along the corresponding detour or U-turn route.
- Barricades (typically type 3) shall span the entire width of the roadway.

Guidance:

- Regulatory traffic control devices should be added or modified as needed for the duration of the closure.
- Speed limits for road closures should be established at 50 km/h.
- Advanced information should be provided. This information can be provided by several means:
 - 1) Portable DMS - messages at major intersections prior to the closure location
 - 2) Permanent Overhead DMS managed by the Transportation Management Centre of BC (TMCBC) – closure messages may be displayed up to several hundred kilometres from the closure location, depending on availability.
 - 3) Static Signs – custom messages at major intersections prior to the closure location
 - 4) DriveBC – all closures should be posted online
 - 5) Social media, radio, television (as required based on the complexity and duration of the situation)

Options:

- DMS messages may be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:

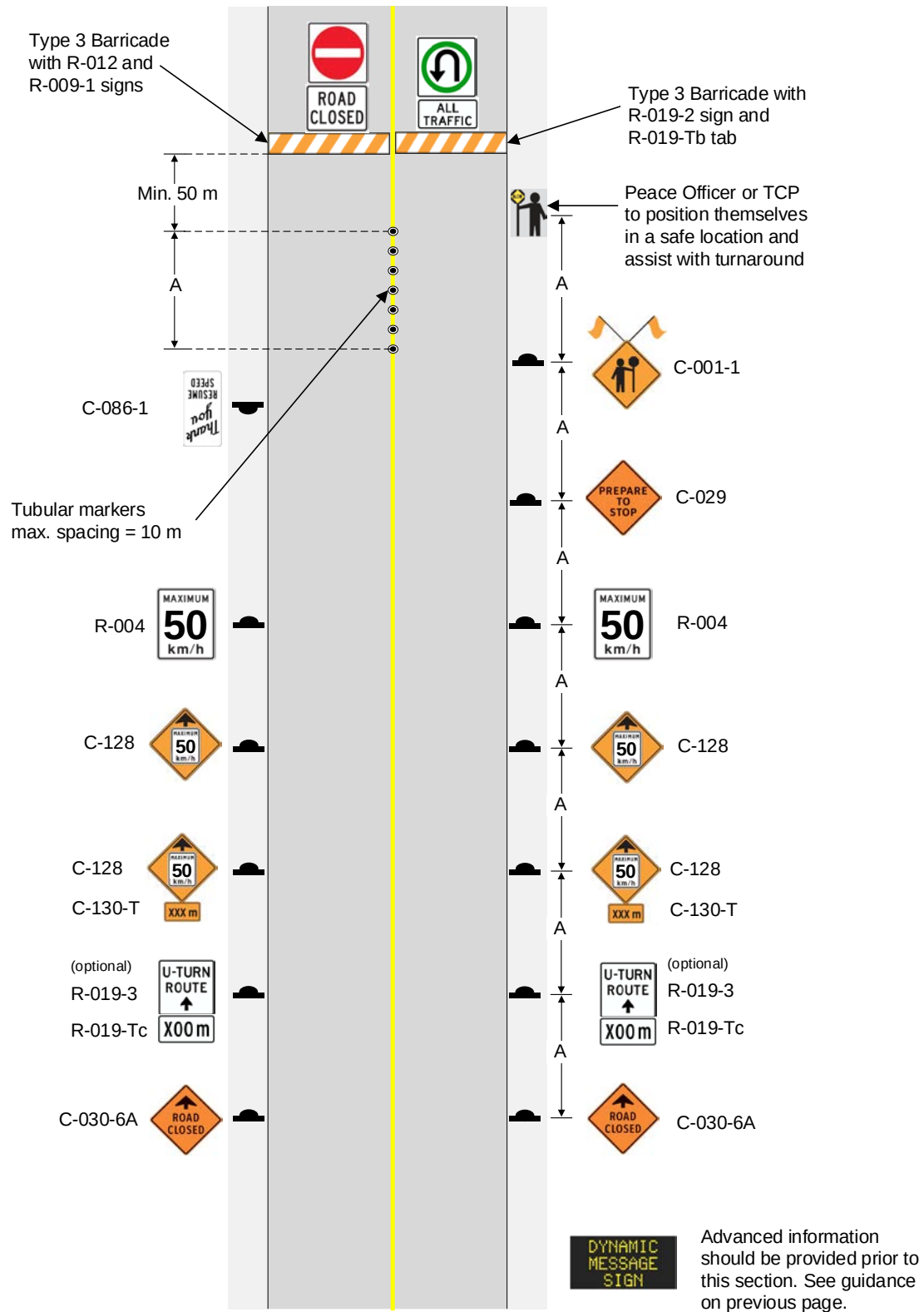


- A Checkerboard C-114 sign may be placed at the closure, just in front of, or as part of the barricade sign assembly. If the C-114 sign is used, the Road Closed R-012 sign may be mounted on the barricade or below the C-114 sign. The C-114 sign provides for better notification and stop compliance.
- The U-turn Route Ahead R-019-3 sign with R-019-Tc distance tab may be used to provide additional warning to drivers that there is an established U-turn location ahead.
- If the road closure impacts a road commonly used to access a highway or a popular destination, additional signage may be required to establish a detour.
- Typical custom signage includes the following examples:



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Figure 19.3: Roadway Closure – Two-Lane, Two-Way Roadway



19.4 Roadway Closure – Multilane Roadway

Purpose:

This layout shows a typical setup for a long duration road closure on a multilane roadway. Advance planning for road closures and detours is key to success as notifications, jurisdictional acceptance and/or the development of custom signs may be necessary. Emergency services (Police, Ambulance, Fire) may need to be contacted depending on the complexity of the closure (network of streets impacted), and overall length (time and distance) of detour.

Figure 19.4: Roadway Closure – Multilane Roadway shows the general layout for a multilane roadway.

Standard:

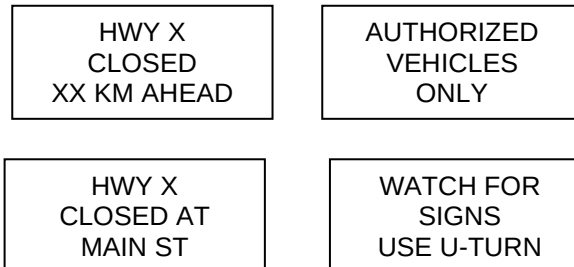
- All road closures and detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour or U-turn signs shall be in place along the corresponding detour or U-turn route.
- Barricades (typically type 3) shall span the entire width of the roadway.

Guidance:

- Regulatory traffic control devices should be added or modified as needed for the duration of the closure.
- Speed limits for road closures should be established at 50 km/h.
- Advanced information should be provided. This information can be provided by several means:
 - 1) Portable DMS - messages at major intersections prior to the closure location
 - 2) Permanent Overhead DMS managed by the Transportation Management Centre of BC (TMCBC) – closure messages may be displayed up to several hundred kilometres from the closure location, depending on availability.
 - 3) Static Signs – custom messages at major intersections prior to the closure location
 - 4) DriveBC – all closures should be posted online
 - 5) Social media, radio, television (as required based on the complexity and duration of the situation)

Options:

- DMS messages may be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:

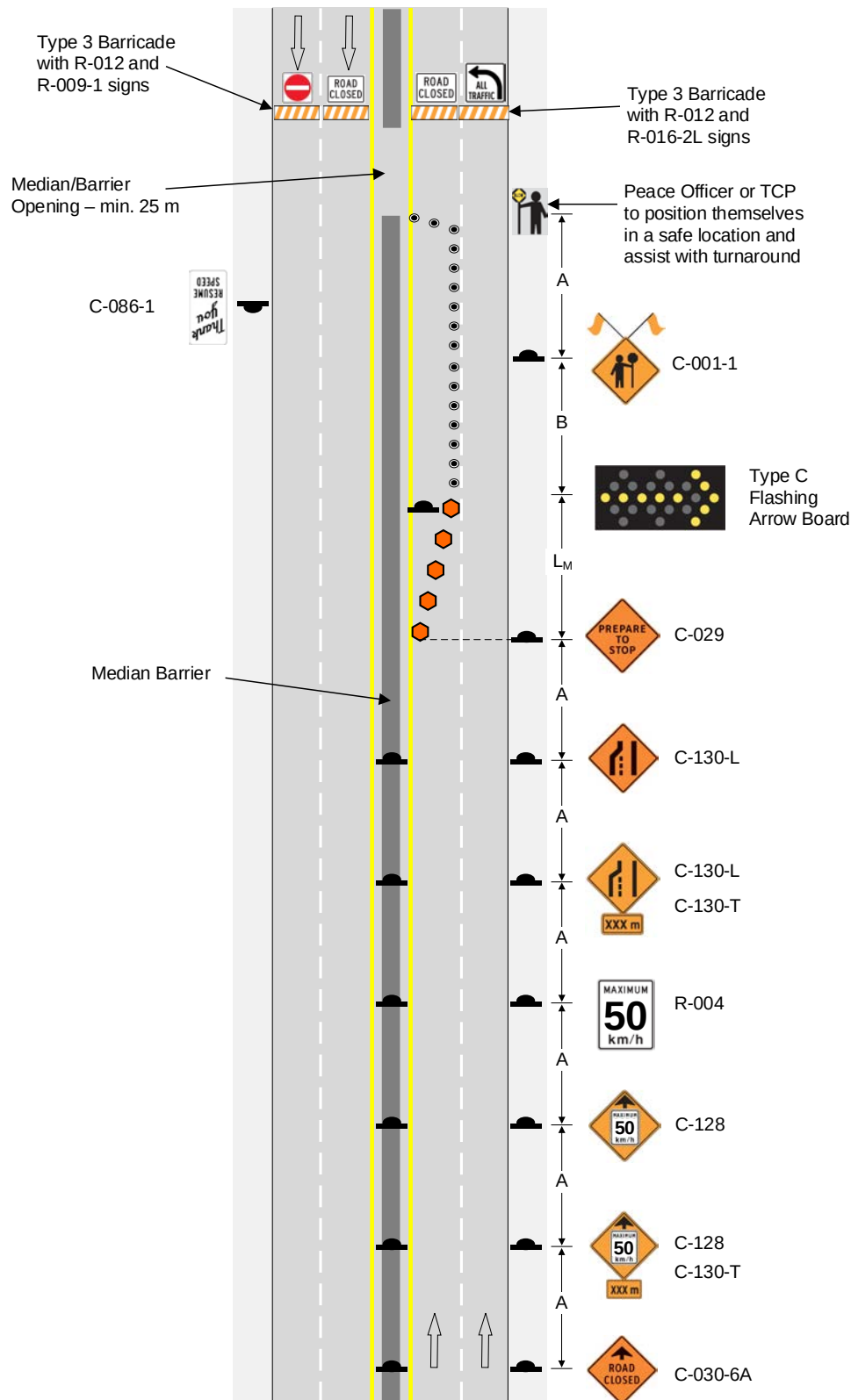


- A Checkerboard C-114 sign may be placed at the closure, just in front of, or as part of the barricade sign assembly. If the C-114 sign is used, the Road Closed R-012 sign may be mounted on the barricade or below the C-114 sign. The C-114 sign provides for better notification and stop compliance.
- The U-turn Route Ahead R-019-3 sign with R-019-Tc distance tab may be used to provide additional warning to drivers that there is an established U-turn location ahead.
- If the road closure impacts a road commonly used to access a highway or a popular destination, additional signage may be required to establish a detour.
- Typical custom signage includes the following examples:



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Figure 19.4: Roadway Closure – Multilane Roadway



19.5 Roadway Closure – Intersection (Signalized or Unsignalized)

Purpose:

This layout shows a typical setup for a long duration road closure at signalized or unsignalized intersections. Advance planning for road closures and detours is key to success as notifications, jurisdictional acceptance and/or the development of custom signs may be necessary. Emergency services (Police, Ambulance, Fire) may need to be contacted depending on the complexity of the closure (network of streets impacted), and overall length (time and distance) of detour.

Figure 19.5: Roadway Closure – Intersection (Signalized or Unsignalized) shows the general layout for a road closure at signalized or unsignalized intersections.

Standard:

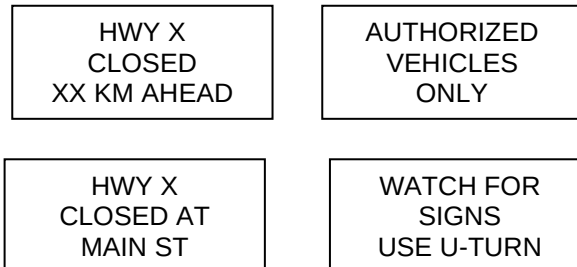
- All road closures and detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour or U-turn signs shall be in place along the corresponding detour or U-turn route.
- Barricades (typically type 3) shall span the entire width of the roadway.

Guidance:

- At signalized intersections, traffic signals should be put into flash mode, turned off, or covered/bagged.
- Regulatory traffic control devices should be added or modified as needed for the duration of the closure.
- Speed limits for road closures should be established at 50 km/h.
- Advanced information should be provided. This information can be provided by several means:
 - 1) Portable DMS - messages at major intersections prior to the closure location
 - 2) Permanent Overhead DMS managed by the Transportation Management Centre of BC (TMCBC) – closure messages may be displayed up to several hundred kilometres from the closure location, depending on availability.
 - 3) Static Signs – custom messages at major intersections prior to the closure location
 - 4) DriveBC – all closures should be posted online
 - 5) Social media, radio, television (as required based on the complexity and duration of the situation)

Options:

- DMS messages may be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:

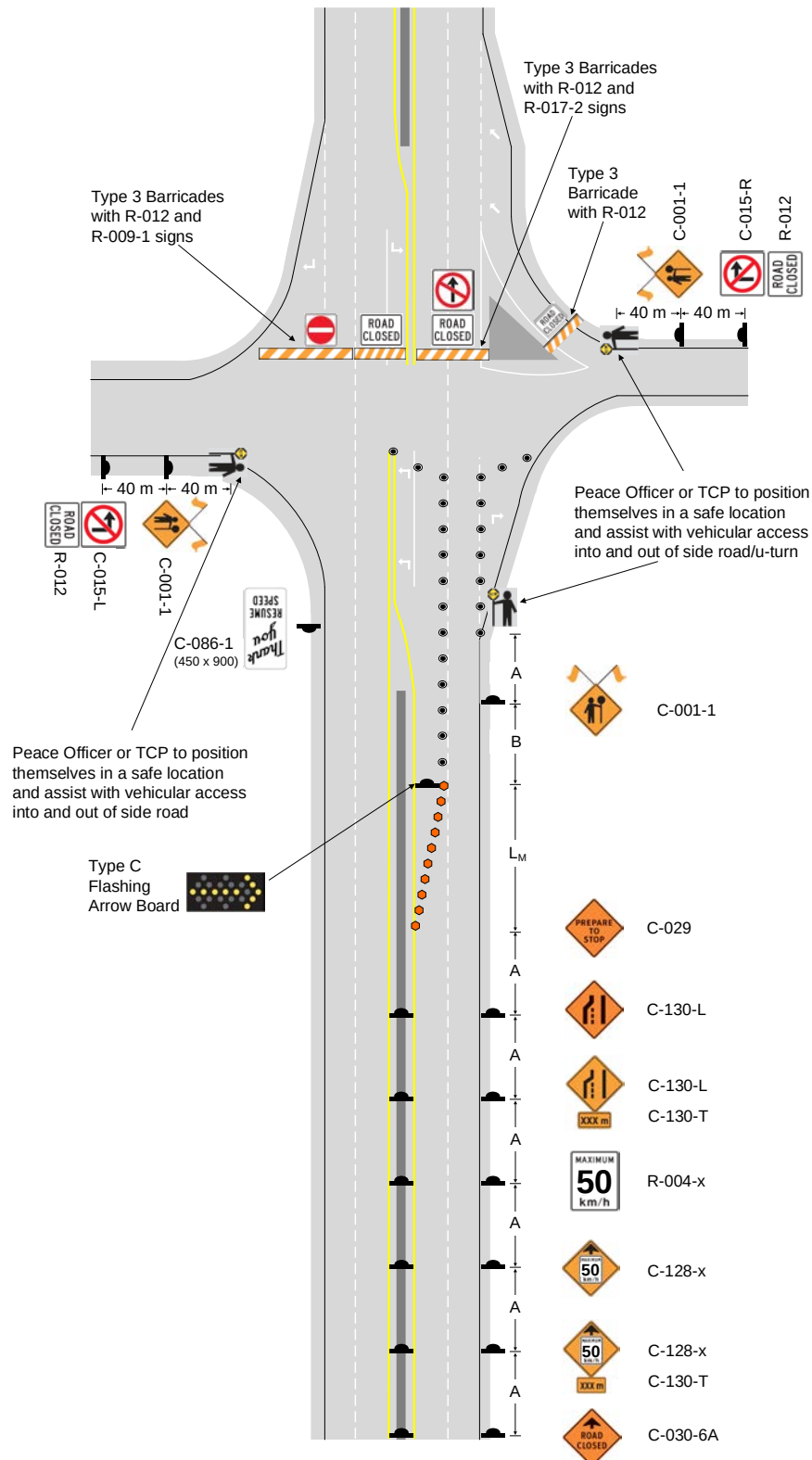


- A Checkerboard C-114 sign may be placed at the closure, just in front of, or as part of the barricade sign assembly. If the C-114 sign is used, the Road Closed R-012 sign may be mounted on the barricade or below the C-114 sign. The C-114 sign provides for better notification and stop compliance.
- If the road closure impacts a road commonly used to access a highway or a popular destination, additional signage may be required to establish a detour.
- Typical custom signage includes the following examples:



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Figure 19.5: Road Closure – Intersection (Signalized or Unsignalized)



19.6 Roadway Closure with Detour (≤ 60 km/h)

Purpose:

This layout shows a typical setup for a local street network where network street continuity is lost due to the closure of a street. Advance planning for detours is key to success, as in some cases using other jurisdictions streets or developing custom signs will be necessary. Getting acceptance from other jurisdictions or getting customized signs developed takes time, so lead time is key. Emergency services (Police, Ambulance, Fire) may need to be contacted depending on the complexity of the closure (network of streets impacted), and overall length (time and distance) of detour.

Standard:

- All detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour signs shall be in place along the corresponding detour route.

Guidance:

- Regulatory traffic control devices should be added or modified as needed for the duration of the detour.
- [*Figure 19.3: Roadway Closure with Detour \(\$\leq 60\$ km/h\)*](#) shows the general layout of detour signs. Additional detour signs should be erected at all connecting roadways to provide clear guidance.

Options:

- DMS messages may be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:

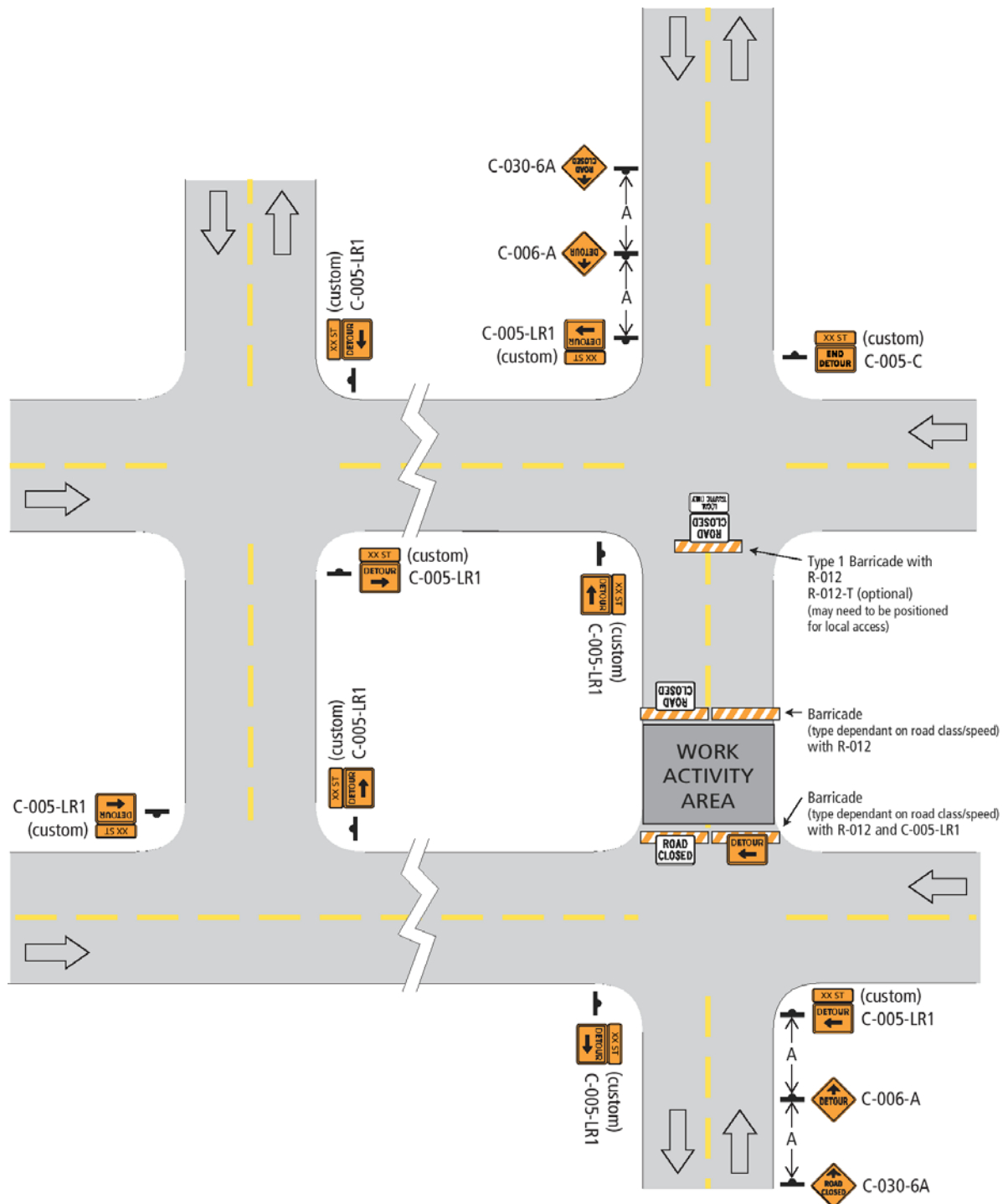
FIRST AVE CLOSED	BEGINS APRIL 20
ROAD CLOSED	DETOUR MAIN ST

- If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection such as residences, the Road Closed R-012 and Detour C-005-LR1 signs on barricades may be located at the edge of the traveled way to allow local passage.
- If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection such as residences, a Road Closed Local Traffic Only C-201 series sign may be used in place of the Road Closed R-012 and Local Traffic Only R-012-T sign assembly on the barricade.
- A Street Name sign may be mounted with the Detour sign.
- Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- If the road closure impacts a main collector route to a highway, detours may require route shields and the required direction arrows.
- Typical custom signage used in detours include the following examples:



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Figure 19.6: Roadway Closure with Detour (≤ 60 km/h)



19.7 Roadway Closure with Detour (≥ 70 km/h)

Purpose:

This layout shows a typical setup for a long duration highway closure, or main arterial closure where the highway is closed, or if a direction of the highway is closed for more than 3 days. A detailed traffic management plan will be required as advanced planning for detours is key to success, especially in cases where another jurisdiction's roads, or the need to develop custom signs is necessary.

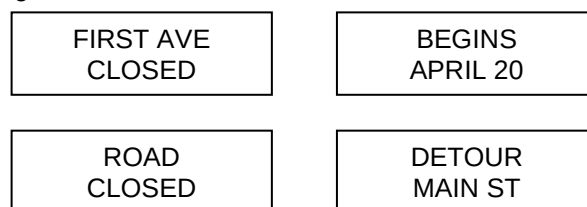
Obtaining acceptance from other jurisdictions or developing custom signs takes time, so lead time is key. Emergency services (Police, Ambulance, Fire) shall be contacted, as incident planning is required. Prior to a planned highway closure, information signs for road users shall be deployed.

Standard:

- All detours affecting provincial roadways and highways shall have a plan accepted by the Ministry.
- Before a road is closed to traffic, all necessary detour signs shall be in place along the corresponding detour route.

Guidance:

- A Traffic Management Plan including the four sub-plans should be developed (Traffic Control Plan, Incident Management Plan, Public Information Plan, and Implementation Plan).
- Advanced information signage regarding the detour should be in place at least 8 days prior to the detour opening, and may require longer notification for lengthy and complex detours.
- DMS messages should be used to provide enhanced information regarding the closure and detour. Typical messages are shown below:



- For long duration detours, signage should be placed on permanent structures such as telespar.
- Route shields and directional arrows should be placed to clearly direct all users through the detour route.
- Regulatory traffic control devices should be added or modified as needed for the duration of the detour.
- [Figure 19.4: Roadway Closure with Detour \(\$\geq 70\$ km/h\)](#) shows the general layout of detour signs. Additional detour signs should be erected at all connecting roadways to provide clear guidance.

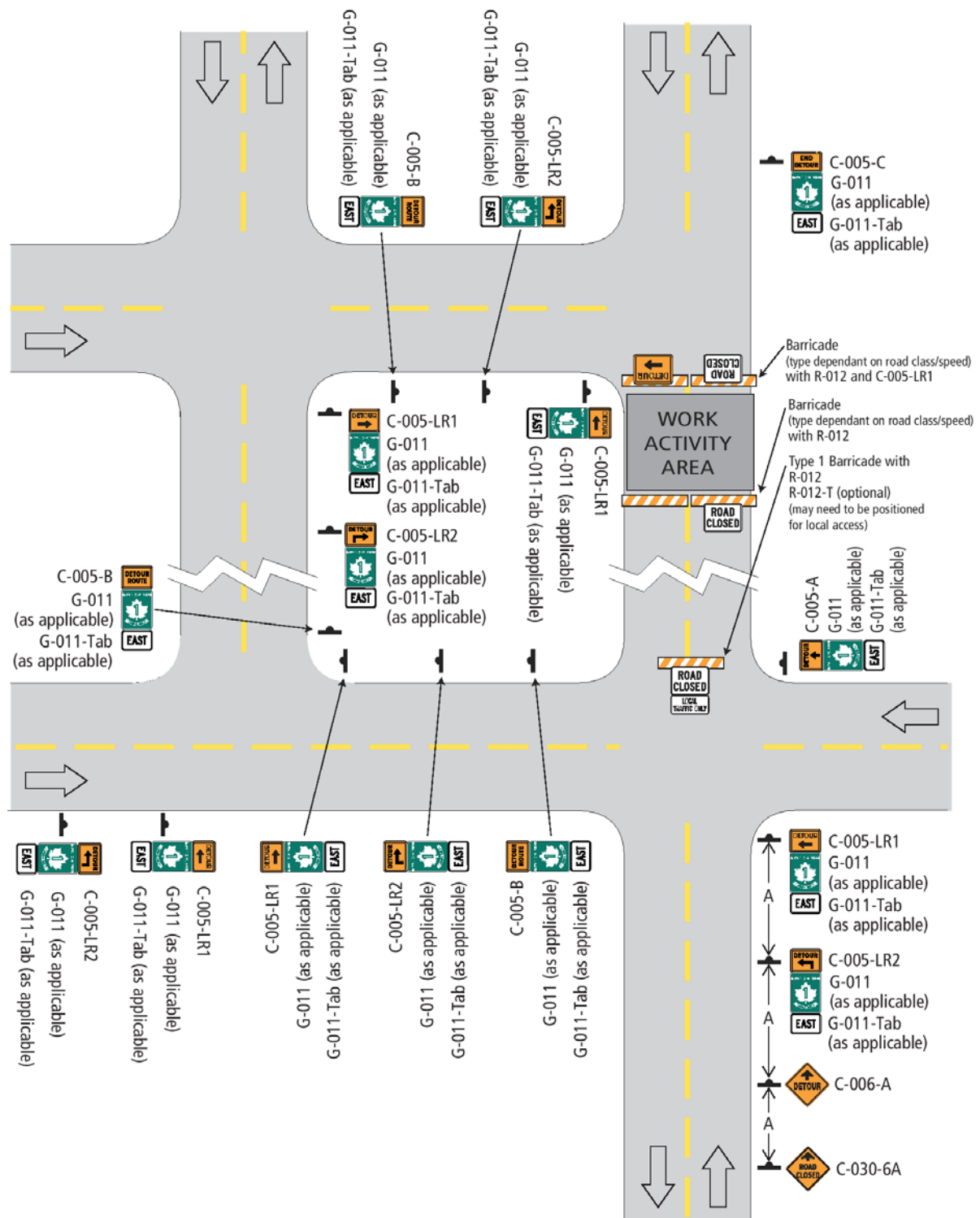
Options:

- Placement of detour signage on both sides of the road may be necessary for clearer guidance.
- When adding signs, utilizing the back of detour signs for one direction for the other will minimize the number of sign structures added.
- If the road is opened for some distance beyond the intersection where the detour begins and/or there are significant origin-destination points beyond the intersection such as commercial businesses, the Road Closed R-012 and Detour C-005-LR1 signs on Type 3 barricades may be located at the edge of the traveled roadway to allow local passage.
- If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection such as residences, a Road Closed Local Traffic Only C-201 series sign may be used in place of the Road Closed R-012 and Local Traffic Only R-012-T sign assembly on the barricade.
- Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
- Typical custom signage used in detours include the following examples:



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Figure 19.7: Roadway Closure with Detour (≥ 70 km/h)



19.8 Emergency Response

Purpose:

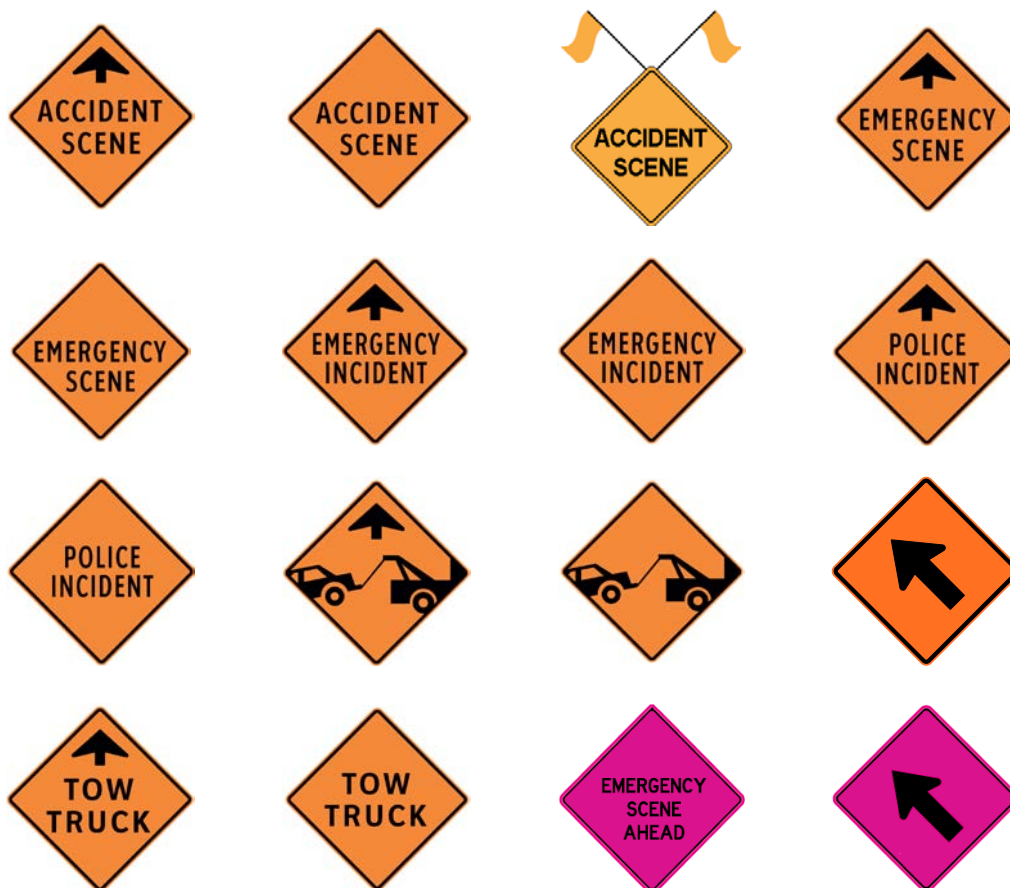
This layout shows a typical setup of signs that may be used by those who attend incidents prior to the arrival of planned and organized traffic management and traffic control. First responders may carry flexible signs that can be set up quickly using portable lightweight spring stands, or other appropriate temporary mounting at an incident site.

The purpose of the signs is to alert drivers that the temporary traffic control is a result of an emergency situation, to expect responders on the roadway, and to proceed with caution as full temporary traffic control may not yet have been established.

C-058 series signs used for emergency response can be either the Ministry's standard retroreflective fluorescent orange or they may be the flexible roll-up retroreflective pink which some organizations have purchased.

Standard:

- Emergency response signs include the following:



Guidance:

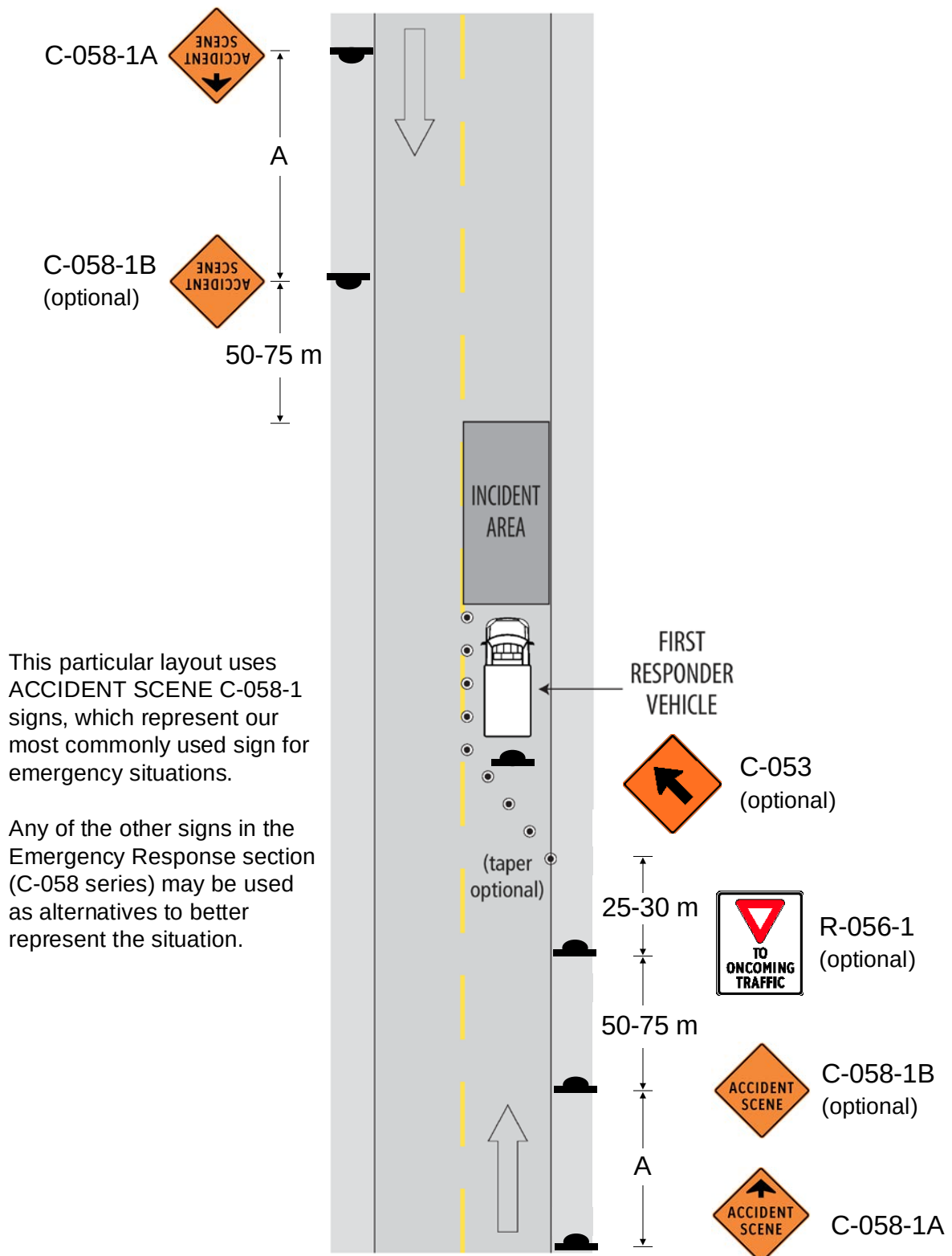
- First responders may carry rigid or flexible roll-up signs, using messages that coincide with their field activity. Default messages include Accident Scene C-058-1 or Emergency Scene C-058-2 series signs.
- Signs placed and positioned by first responders should follow the guidelines established in this Manual.
- Wind and vehicles can blow signs over. Therefore, signs should be placed on the shoulder of the road as far off the travelled portion of the road as reasonably possible.
- An unplanned event such as an emergency leads to a variety of activities taking place at the same time. Those responding to the emergency should only undertake traffic control activities if practical.

Options:

- The Accident Scene Ahead C-058-1A sign (or similar), and the Lane Closure Arrow C-053 sign (if used), should be placed on the shoulder of a roadway by a qualified first responder (fire, enforcement, ambulance, HAZMAT, or recovery) in advance of the incident scene.
- Accident Scene Ahead C-058-1A signs should be placed in both directions so that they will provide enough warning for vehicles to slow down before reaching the incident scene. Placement of an advance warning sign for situations near a corner, hill, or other reduced visibility situations, may require the placement to be adjusted.
- The Accident Scene C-058-1B sign (or similar) may be used to provide additional warning for vehicles to slow down before reaching the incident scene.
- Where the road user is required to navigate around an incident, the Lane Closure Arrow C-053 sign should be placed. If no cones are utilized, the directional arrow sign should be placed in a location which provides enough separation for road users to navigate around the incident.
- If the Lane Closure Arrow C-053 sign is used, it should be placed sufficiently far back from the incident to allow motorists to both see beyond the incident, and easily manoeuvre around the incident.
- If the Lane Closure Arrow C-053 sign is used, it should be located to close off the approach to the incident scene. For example, if the incident is contained within a travel lane, it should be placed at the midpoint of the lane, or towards the centre line or lane line.
- If the incident is blocking a travelled lane on a two-lane two-way roadway, the Lane Closure Arrow C-053 sign requires the addition of the Yield to Oncoming Traffic R-056-1 sign, as the Lane Closure Arrow C-053 sign would otherwise be directing traffic into the opposing lane.

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Figure 19.8: Emergency Response



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