

1 General Information

1.1 Introduction

The *Work Area Traffic Control Manual* (WATCM) provides a uniform set of traffic control guidelines for all work carried out on New Brunswick provincially designated roads. Any work that occurs within the right-of-way of a provincially designated road,(see Highway Act), must conform to the guidelines prescribed by this manual, effective May 4th, 2009, which supercedes all previous versions.

The WATCM is meant to be a practical guide that assists the user in identifying the appropriate level of traffic control necessary for a particular activity or situation. Unless otherwise stated, the WATCM depicts the minimum level of traffic control required. It sets forth basic principles and prescribes guidelines for the design, application, installation, maintenance, and removal of the various types of Traffic Control Devices approved for use in New Brunswick. A number of illustrations of common traffic control layouts are also included. Snow removal activities are not covered in the WATCM.

The traffic control layouts contained in this manual cannot possibly cover all of the different scenarios that may occur. In cases where the user is unsure of which traffic control layout should be applied, they shall consult with their supervisor, or contact the Department of Transportation and Infrastructure's Operations Branch.

1.2 Legal Authority

The WATCM provides specific guidelines on the erection and placement of work area traffic control devices on provincially designated roads in the province of New Brunswick and is supplementary to the Manual of Uniform Traffic Control Devices Canada (MUTCDC). Individuals engaged in work within the Right of Way of provincially designated roads are expected to utilize and comply with the WATCM.

The WATCM shall also be applied where the guidelines are referenced in contract documents and agreements between Contractors and the New Brunswick Provincial Government.

1.3 Planning & Preparation

Traffic Control Plans

Planning for traffic control in Work Areas is very important. Before any maintenance, construction, or utility work can begin on a provincial road, a *Traffic Control Plan* shall be prepared that addresses the following items as a minimum:

- Required devices, including placement and location (WATCM typical layout);
- Traffic Control Persons (where needed);
- Setup and removal procedures; and
- Public advisory notices (where applicable).

A Traffic Control Plan can vary in detail depending on the complexity and location of the work. In many cases, a simple reference to a typical layout contained in this manual may be adequate. However, for complex situations or special projects, a more detailed design will be required. Any user who is unsure of the level of detail required by the Traffic Control Plan should contact the Department of Transportation and Infrastructure's Operations Branch.

Site Visits

Site visits are also an important part of the planning process. It is highly recommended that a site visit be carried out prior to preparing the Traffic Control Plan to identify:

- Traffic volumes and speeds;
- Sight distance limitations;
- Sidewalks or other pedestrian routes;
- Conflicts with driveways or intersecting roads;
- Existing signs which may need to be removed or covered;
- The amount of shoulder space available; and
- Any other condition that may impact traffic control in the Work Area.

The findings from the site visit will assist in preparing the Traffic Control Plan.

Public Advisory Notices

Public advisory notices are an effective means of alerting road users and pedestrians of planned roadwork activities, thus giving them the opportunity to adjust their travel schedule or choose an alternate route. Public advisory notices shall be issued by the New Brunswick Department of Transportation and Infrastructure (or whoever has jurisdictional authority over the road) in advance of any projects where significant delays (longer than 15 minutes) are expected, or where traffic will be detoured as a result of a road closure. Utility Agencies shall be responsible to issue public advisory notices related to their work.

1.4 Responsibility

Each Work Area shall have a *Traffic Control Agent* who is responsible for the Traffic Control Plan. The specific duties of the Traffic Control Agent are described in Section 5.1 of this manual.

1.5 Technical Judgement

Every Work Area presents its own unique and varying conditions that may not be specifically covered in this manual. These conditions must be addressed on a project by project basis by applying sound technical judgement.

The decision of whether to use a particular device at a particular location must consider the local conditions in the Work Area. Although this manual provides guidelines for the design and application of Traffic Control Devices, it is not a substitute for technical judgement. It is acceptable for a Traffic Control Agent to make changes to the Traffic Control Plan to adjust to local conditions, providing technical judgement is used and safety is not diminished. If there are questions in regards to specific issues, the Department of Transportation and Infrastructure's Operations Branch may be contacted for guidance.

3. Routine inspections of traffic control shall be performed.

- Ensure that all individuals responsible for traffic control have received the required training as prescribed by Section 5 of this manual;
- Verify that all Traffic Control Devices conform to the Traffic Control Plan;
- Immediately modify traffic control to accommodate changes in traffic or working conditions;
- Verify the effectiveness of traffic control under a variety of light and weather conditions to ensure acceptable visibility (including at night);
- Perform inspections on holidays, weekends, and other times when a Long Duration Work Area is not Active;
- Check that all Traffic Control Devices are kept clean, visible, and in good repair. Devices that are damaged or defaced should be replaced as quickly as possible;
- Document at least two times per day the location of all Traffic Control Devices, including any changes that have been made to accommodate prevailing conditions; and
- Remove or cover all Work Area Traffic Control Devices when no longer applicable.

It should be noted that for activities requiring a worker to be in a travelled lane for only a very brief period, a Dedicated Traffic Observer may be used instead of warning signs, provided the worker can easily clear the lane when a vehicle approaches. An example of such an activity may include removing debris from the road. If debris is discovered that poses an immediate safety threat to road users, then it may be removed without a Dedicated Traffic Observer, provided it only requires a momentary pause in the roadway.

2.2 Work Area Speed Control

Most drivers will only reduce their speeds if they see a clearly demonstrated need to do so. If the speed reduction is perceived to be unwarranted, it will often be disregarded by the driver. For this reason, it is recommended that reduced speed zones be limited to locations where restrictive features or unsafe conditions are present. Examples of such locations may include narrowed travel lanes, unpaved road surfaces, or where the road deviates from its normal alignment (Diversion). Where speed reductions are used, signs shall also be erected to notify road users when the original speed limit has been reinstated.

If reduced speed zones are to be used, the Traffic Control Plan shall be adequately designed so that vehicles can travel safely through the Work Area without reducing their speed by more than 20 km/h. Research has shown that large reductions in the posted speed limit result in greater variation amongst vehicle speeds, which in turn increases the potential for rear-end collisions. Speed reductions greater than 20 km/h must be approved by the Department of Transportation and Infrastructure's Operations Branch.

Where speed management is a particular concern in Work Areas, the Traffic Control Plan may incorporate additional speed reducing strategies such as 1) selective target enforcement by RCMP or local police, or 2) using a radar speed display sign. Any other speed management strategies must be approved by the Department of Transportation and Infrastructure's Operations Branch.

2.4 Activity Area Lengths

A fundamental principal of traffic control is to minimize the length of road affected by work. The longer the Work Area, the more road users will be delayed and thus become frustrated.

Unless otherwise stated in the typical layouts, the maximum length of an Activity Area shall not exceed 2 km on a two lane road and 4 km on a multilane road (Note: This does not apply to Moving Operations). In special circumstances, the length of an Activity Area may be extended. This shall only be permitted upon consultation with the Department of Transportation and Infrastructure's Operations Branch.

2.5 Intersecting Roads

Advance warning shall be provided on all secondary roads that intersect the Work Area and, as a minimum, shall consist of a Construction Ahead sign displaying the appropriate directional arrow. Depending on where the road intersects the Work Area, additional signage may be required to provide road users with pertinent information. The Traffic Control Agent is responsible for determining which additional signs are required.

2.6 Night Work

Additional consideration is required whenever work is carried out at night (½ hour before sunset and ½ hour after sunrise). Road users must be provided with the same level of warning at night as during the day. This means all devices and personnel must be clearly visible during hours of darkness. The minimum retro-reflectivity standards for all Traffic Control Devices and personal protective equipment contained in this manual have been selected to allow for adequate visibility at night. However, additional warning devices, such as flashing amber beacons, may be used to enhance visibility where deemed necessary.

The following additional safety measures shall be applied whenever work is carried out at night:

- All Traffic Control Devices shall be inspected during hours of darkness to ensure adequate visibility;
- Traffic Control Persons, if used, shall wear white coveralls under their safety vests and shall carry a flashlight with a semi-transparent red cone;
- Hard hats shall have at least 80 cm² of reflective material visible from all sides;
- Work vehicles shall not turn around in the Work Area to avoid confusing other road users; and
- Minimum illumination shall be provided as per the following section.

Illumination

Illumination shall be provided for all night work. Luminaires shall be installed so they are oriented between 45 and 90 degrees away from the flow of traffic. Under no circumstances shall lights be aimed at, or spill over onto, oncoming traffic.

Luminaires shall be of sufficient wattage and quantity to provide a minimum horizontal illuminance as depicted in Table 2-4.

3 Traffic Control Devices

Traffic control in a Work Area is achieved using a combination of Traffic Control Devices. It is important that a consistent standard for these devices be applied in all Work Areas.

This chapter provides a listing of Traffic Control Devices approved for Work Areas on provincial roads in New Brunswick. All devices must be of the same shape, colour, sheeting, and minimum dimensions specified, as well as bear the exact message or lettering shown. All other devices must be approved by the Department of Transportation and Infrastructure's Operations Branch.

3.1 Traffic Control Signs

Traffic control signs are used in Work Areas to 1) warn approaching road users about upcoming roadway construction or maintenance activities, and 2) provide them with instructions for manoeuvring safely past the Activity Area.

Sheeting

All signs shall be constructed of high intensity sheeting that conforms to an ASTM D4956 Type III / Type IV standard.

Schedule of Signs

The following schedule of traffic control signs has been approved by the Department of Transportation and Infrastructure for use on provincial roads in New Brunswick. The reference numbers that accompany each sign refer to the Department of Transportation and Infrastructure's Sign Catalogue. Custom signs (those not contained in the catalogue) require approval from the Department of Transportation and Infrastructure's Operations Branch for use on provincial roads.

Sign Size

Unless otherwise noted in this manual, the sign sizes in Table 3-1 are the minimum which shall be used for the corresponding speeds shown.

Table 3-1: Minimum Sign Sizes

Normal Posted Speed Limit (km/h)	Minimum Sign Size
50	75 cm x 75 cm
60 - 90	90 cm x 90 cm
100 - 110	120 cm x 120 cm

However, for Short Duration Work, 90 cm x 90 cm signs may be used for roads with speeds of 100-110 km/h in all areas except the Advance Warning Area. In the Advance Warning Area, the signs shall still be 120 cm x 120 cm.

3.2 Variable Message Signs

Variable Message Signs (VMSs) are electronic signs used to provide road users with additional information about upcoming road work. They may be used prior to or in the Advance Warning Area as a supplement to, but not a substitute for, conventional traffic signs. The Department of Transportation and Infrastructure's Operations Branch shall be contacted prior to the use of a VMS.

VMSs can be programmed to display a single fixed message or a number of sequential messages. Each message is known as a phase, and must be visible for a minimum of three seconds so approaching road users are able to read the message at least twice. The minimum letter height shall be at least 45 cm.

The following factors must be considered when designing a message for a VMS:

- Each phase should convey a single thought;
- The message should be as brief as possible;
- All messages must appear in both English and French (it is acceptable to have them programmed as sequential phases);
- Abbreviations can be used provided they are easily understood; and
- If a message is longer than two phases, additional VMSs should be used.

The following are examples of messages approved for use on New Brunswick roads: EXPECT DELAYS, REDUCE SPEED, DETOUR AHEAD, RIGHT LANE CLOSED, LEFT LANE CLOSED, and PREPARE TO STOP.

In order to achieve a high level of respect for VMSs, the messages must only provide road users with information which is directly relevant to the situation they will be encountering. Providing inaccurate or unnecessary information will cause VMSs to lose credibility.

Some applications where VMSs may be considered include locations where:

- Significant queuing or delays are expected;
- Traffic speeds are expected to drop substantially (20 km/h or greater);
- Changes in road alignment or surface condition exist; and
- Advance notice of a ramp, lane, or roadway closure is needed.

3.3 Radar Speed Display Signs

Radar Speed Display Signs (RSDSs) are a special type of VMS, equipped with a radar unit that displays an approaching vehicle's speed back to the driver. RSDSs may be used as a supplement to, but not a substitute for, conventional traffic signs in the Approach Area, where speed management is a particular concern. The Department of Transportation and Infrastructure's Operations Branch shall be contacted prior to the use of an RSDS.

A 35 watt incandescent bulb is the standard for FABs. Alternate elements such as halogen bulbs, low wattage bulbs, and light-emitting diodes (LEDs) may be used provided they maintain the same flash rate and brightness as a 35 watt incandescent bulb. All FABs used during night work shall be equipped with at least one photocell that progressively reduces light intensity during hours of darkness to prevent road users from being temporarily blinded.

3.5 Flashing Lights

360 Degree Amber Lights

All Work Vehicles stationed in a Work Area must be equipped with an amber light visible from all sides (360 degrees). This includes round or rectangular lighting devices. If the ability to view a light is obscured, other lights shall be mounted to ensure visibility on all sides. These lights shall be displayed whenever a vehicle is positioned such that it could influence traffic. Standard vehicle 4-way flashers shall not be used as a substitute.

Flashing Beacons

Flashing amber and flashing red beacons may be mounted on Barricades or other special construction signs to provide additional emphasis, particularly at night. Amber warning lights are used to indicate “caution”, while red warning lights are used to indicate “do not enter”. Note: beacons shall not be used on Barricades in close proximity to traffic control signals.

Flashing beacons must be at least 30 cm in diameter and maintain a flash rate of 25 to 40 flashes per minute. Electrical, solar, and battery power sources are all acceptable, provided the beacons are visible for up to 800 m under clear night-time conditions. If a temporary power line must cross over the road, the clearance above the road surface shall be at least 7.0 m.

3.6 Traffic Control Signals

Traffic Control Signals may be used for work on two lane roads for which traffic is reduced to one lane. The area controlled by signals shall not include any intersections or driveways to avoid possible conflicts.

Traffic control signals may be either semi-permanently mounted or mounted on portable trailers. Communication between the traffic control units may either be by hard wiring or radio communication. The traffic control signals shall have two heads in each direction and be oriented to provide maximum visibility to the approaching road users. The signals must be designed in accordance with “The Manual of Uniform Traffic Control Devices for Canada.”

The use of Traffic Control Signals requires approval from the Department of Transportation and Infrastructure’s Operations Branch.

3.7 Delineation Devices

Delineation Devices are used to clearly highlight the traffic's path through any Work Area where Diversions or tapers are required. They also delineate a separation between traffic and the Activity Area. Delineation Devices shall be spaced sufficiently close such that the appropriate path is clearly recognized by road users at all times. The maximum centre to centre delineator spacing for tangents and tapers is shown in Table 3-3 for varying speed limits.

Table 3-3: Maximum Spacing for Delineation Devices

Normal Posted Speed Limit (km/h)	Maximum Spacing Tangents (m)	Maximum Spacing Tapers (m)
50	8	6
60 - 70	10	8
80 - 90	14	10
100 - 110	24	18

Note: Flexible drums are the preferred device for tapers. Delineator posts may be used for Short Durations provided spacing is half the distance in Table 3-3.

There are four types of acceptable Delineation Devices: delineator posts, traffic cones, flexible drums, and hazard markers. These devices must all be orange in colour and, with the exception of hazard markers, shall display one or more bands of white retroreflective striping as shown in Figure 3-2 that meet, as a minimum, ASTM D4956 Type III. Delineation Devices must also have sufficient ballast so they are not easily displaced by wind or passing vehicles.

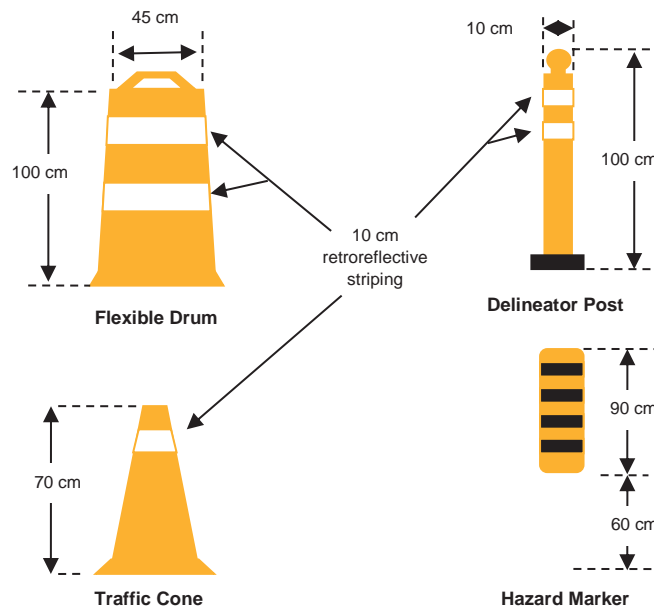


Figure 3-2: Delineation Devices

Flexible Drums offer a larger visible warning than delineator posts and traffic cones. They shall be constructed of low density polyethylene, have a minimum height of 100 cm, and display two 10 cm retroreflective white stripes. Flexible drums are the preferred device for delineating tapers, and are also used on tangent sections adjacent to the Buffer and Activity Areas.

Delineator Posts (commonly referred to as traffic candles) are lightweight Delineation Devices that offer the least amount of impedance to road users due to their narrow width. They shall be constructed of a low density polyethylene, have a minimum height of 100 cm, and display two 10 cm retroreflective white stripes. Delineator posts are commonly placed along the tangent sections of the road adjacent to the Buffer and Activity Areas. They are not recommended for providing delineation along tapers, due to the low visual target they offer. However, delineator posts may be used in tapers provided they are spaced at half the distance shown in Table 3-3.

Traffic Cones are lightweight Delineation Devices that may be easily stacked for storage. They shall be constructed of polyvinyl chloride (PVC), have a minimum height of 70 cm, and display one 10 cm retroreflective white stripe. Traffic Cones may be placed along the tangent sections of the road adjacent to the Buffer and Activity Areas for Very Short and Short Duration Work only. They may not be used for night time operations. In addition, they are not recommended for providing delineation along tapers, due to the low visual target they offer.

Hazard Markers are signs consisting of nine alternating black and orange retroreflective stripes, each having a thickness of 10 cm. The base of a hazard marker shall be mounted at least 60 cm above the road surface. Hazard markers are typically used to delineate a hazard immediately adjacent to the travelled lanes, such as a continuous Barrier or a low shoulder. They shall not be used to provide centreline delineation in high speed or high volume Work Areas.

3.8 Temporary Pavement Markings

Temporary Pavement Markings are used in Work Areas greater than 150m in length, in combination with appropriate warning signs and Delineation Devices, to highlight the intended path that traffic is to follow.

Temporary pavement markings shall be used in Work Areas where a paved diversion is constructed to bypass work activities or partial pavement removal (i.e. milling, grinding) or overlays have caused the original markings to be removed or covered.

For paved Diversions, all temporary markings must be in place before the Diversion is opened to traffic. During pavement removal and overlay operations, temporary markings shall be placed at the end of each work day, prior to night time conditions.

Wherever temporary markings are applied, any conflicting markings must be removed or covered as soon as possible, to avoid driver confusion. If the original markings will be restored within two weeks, they may be covered using black paint; otherwise the markings must be milled out.

There are three types of acceptable devices for temporary pavement marking: pavement marking tape, raised pavement markers, and pavement marking paint with glass beads. When applied, all three should be the same color as the original markings which they replace. In addition, these devices shall meet the following minimum retroreflectivity requirements: 250 millicandelas for white markings and 200 millicandelas for yellow markings.

Pavement Marking Tape shall be applied in 2 m strips spaced at 50 m on tangent sections of road and 25 m on horizontal and vertical curves.

4 Installation and Inspection of Traffic Control Devices

4.1 Sign Installation

Sign Supports

Signs in Work Areas shall either be mounted on fixed or portable sign supports.

Fixed supports can either be constructed of wood or metal, and shall be installed directly into the ground. Wooden posts shall be a maximum size of 10 cm x 10 cm. Metal posts shall be a maximum size 5 cm x 5 cm, and have 11 mm diameter holes drilled on 25 mm centers on all four sides. Signs are not to be mounted in orange steel drums.

Portable sign supports may be used in place of fixed supports provided they have sufficient ballast to prevent them from being easily blown over or displaced by wind or passing vehicles. Sand-filled bags are recommended for providing extra ballast. Materials that may pose a hazard to road users, such as concrete blocks, shall not be used to provide ballast.

Alternate mounting devices shall be approved by the Department of Transportation and Infrastructure’s Operations Branch.

Sign Spacing

Signs shall be spaced so approaching road users have sufficient time to recognize the message and take any necessary action(s). The spacing shown in Table 4-1 shall be used as a minimum.

Table 4-1: Minimum Sign Spacing in Work Areas

Normal Posted Speed Limit (km/h)	Minimum Spacing (m)
50	50
60 - 70	75
80 - 90	100
100 - 110	150

In situations where the minimum spacing offers poor visibility to road users, such as on a hill or a curve where sight distance may be restricted, sign spacing should be increased accordingly. Similarly, the distance can also be increased where the minimum spacing causes signs to conflict with driveways.

Sign Position and Height

All signs on fixed supports shall be installed within a distance of 1.5 m to 4.0 m from the edge of the travelled lane, and oriented approximately 90 degrees to approaching traffic. In instances where portable sign supports cannot be placed at a minimum 1.5 m (due to narrow shoulders), the sign may be moved closer to the edge of the travelled lane provided it does not pose a hazard to approaching traffic.

Sequence

1. Begin at the first advance warning sign on the same side of the road as the Activity Area.
2. Proceed with the flow of traffic, placing all signs on the same side of the road as the Activity Area.
3. Make a legal turn.
4. Sign the opposite approach, beginning at the first advance warning sign and working with the flow of traffic.

Special Instructions

- Sign truck must display either 1) a Flashing Arrow Board set to the caution mode (recommended), or 2) a 360 degree amber light.
- A Trail Vehicle may be used in addition to the Sign Truck based upon site specific conditions such as restricted sight distances or high traffic volumes.

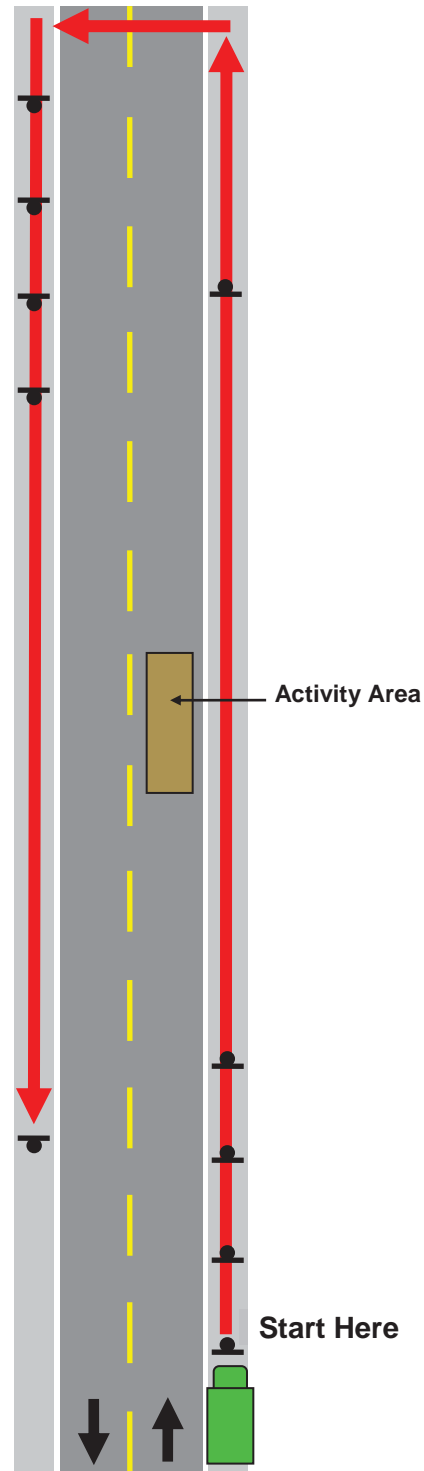


Figure 4-3: Sign Setup (Two Lane Roads)

Sequence

1. Ensure that the Activity Area is clear of all workers, materials, equipment, and Delineation Devices.
2. Beginning on the same side of the road as the Activity Area, proceed with the flow of traffic, picking up all signs on the shoulder.
3. Make a legal turn.
4. Pick up signs on the opposite approach, beginning at the first advance warning sign and working with the flow of traffic.
5. Make a legal turn.
6. Pick up all remaining signs on the same side of the road as the Activity Area, beginning with the first advance warning sign and following the flow of traffic.

Special Instructions

- Sign truck must display either 1) a FAB set to the caution mode (recommended), or 2) a 360 degree amber light.
- A Trail Vehicle may be used in addition to the Sign Truck based upon site specific conditions such as restricted sight distances or high traffic volumes.

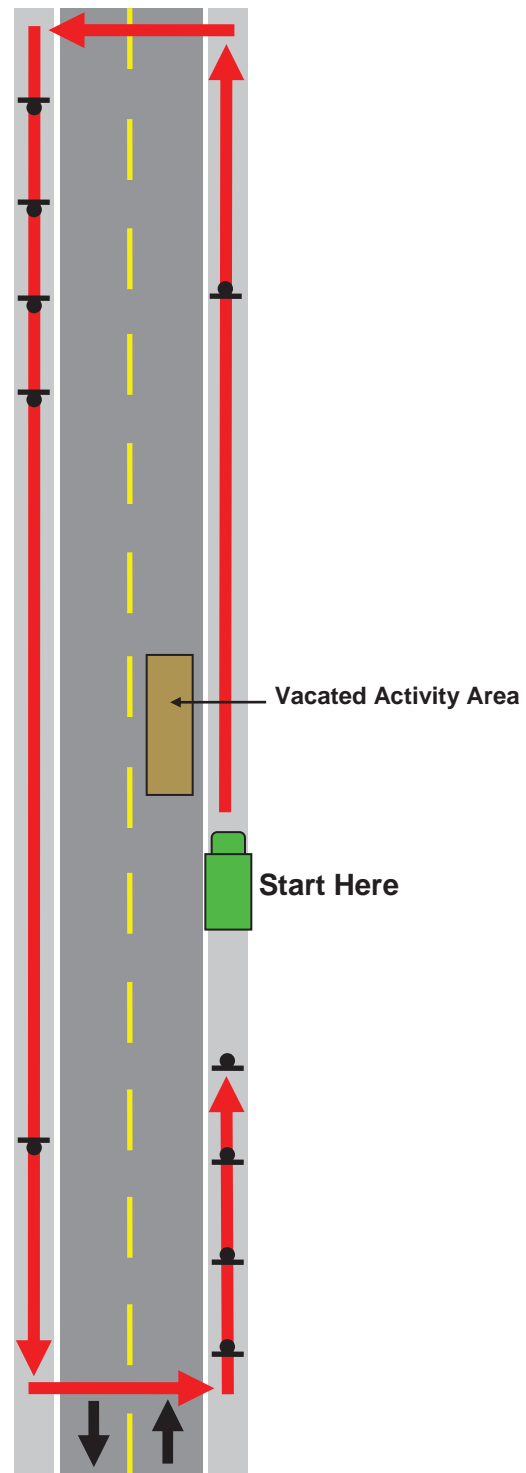


Figure 4-6: Sign Removal (Two Lane Roads)

Sequence

1. In general, begin sign placement at the first advance warning sign on the right side of the road.
2. Install the duplicate sign on the left side.
3. Proceed with the flow of traffic, installing from the right to the left.

High Traffic Volume Areas (Optional – Not Shown in Figure)

- In areas with high traffic volumes, the Traffic Control Agent may elect to install signs in the following manner:
 - Commence by installing all signs on one side of the road
 - Progress with the flow of traffic, making two legal turns
 - Recommence installing at the Advance Warning area for the opposite side.

Special Instructions

- In cases where vehicles do not encroach on the travelled lane, Buffer Vehicle may be substituted with a Trail Vehicle.
- Sign truck and Trail Vehicle / Buffer Vehicle shall display a FAB set to the appropriate directional arrow or a caution bar. In addition, Trail Vehicle / Buffer Vehicle shall remain a distance B behind the Sign Truck as per Table 2-3
- An additional Trail Vehicle / Buffer Vehicle may be used to provide advance notification of the Sign Truck based upon site specific conditions such as restricted sight distances or high traffic volumes.
- For Lane Closures, the Construction Zone Ends signs may be installed after the closure has been established.
- A Dedicated Traffic Observer shall be present during all setup activities to warn workers of potential hazards.

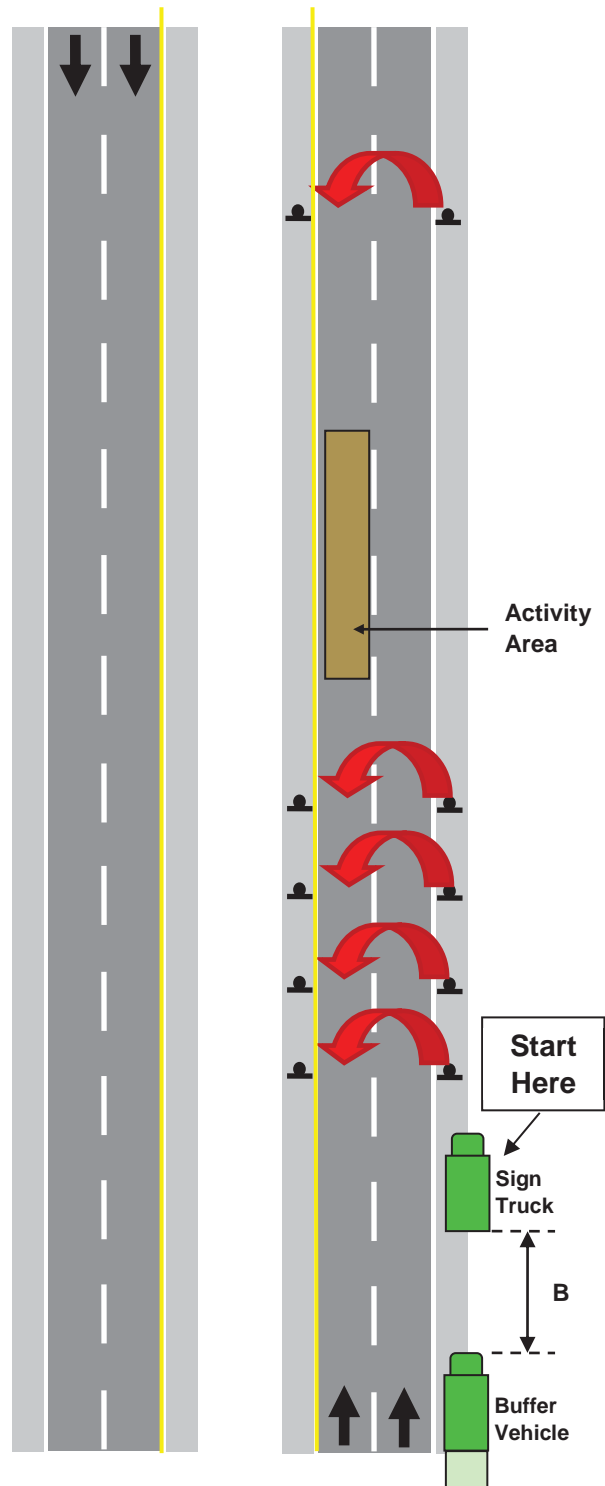


Figure 4-7: Sign Setup (Multilane Divided Roads)

Sequence

1. Ensure that the Activity Area is clear of all workers, equipment, and Delineation Devices.
2. In general, begin sign removal at the first advance warning sign on the right side of the road.
3. Remove the duplicate signs on the left side.
4. Proceed with the flow of traffic, removing all signs from left to the right

High Traffic Volume Areas (Optional – Not shown in Figure)

- In areas with high traffic volumes, the Traffic Control Agent may elect to remove signs in the following manner:
 - Commence by removing all signs on one side of the road
 - Progress with the flow of traffic making two legal turns
 - Recommence removal at the Advance Warning area for the opposite side.

Special Instructions

- Sign truck shall display a FAB set to the appropriate directional arrow or a caution bar,
- Buffer Vehicle shall be equipped with a FAB, displaying the appropriate directional arrow and remain a distance B behind the Sign Truck as per Table 2-3.
- An additional Trail Vehicle / Buffer Vehicle may be used to provide advance notification of the Sign Truck based upon site specific conditions such as restricted sight distances or high volumes.
- In cases where vehicles do not encroach on the travelled lane, Buffer Vehicle may be substituted with a Trail Vehicle.
- A Dedicated Traffic Observer shall be present during all removal activities to warn workers of potential hazards.

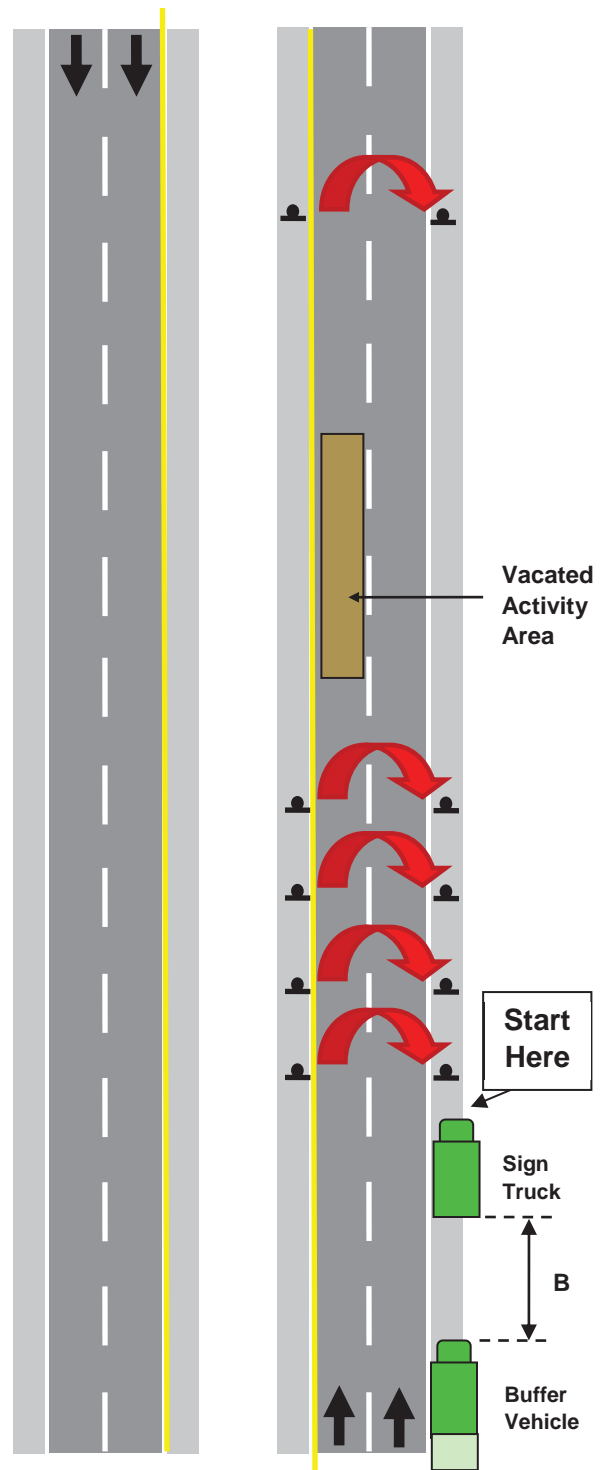


Figure 4-10: Sign Removal (Multilane Roads)

4.3 Inspection and Documentation

For every project, the Traffic Control Agent shall perform an *Initial Inspection* immediately following the setup of all devices to ensure that the Traffic Control Plan has been properly implemented. This initial inspection shall document the following information:

- The date and time of the inspection;
- Verification that all Traffic Control Devices are in their proper location, in good condition, and functioning as intended;
- A description of any changes made to the original Traffic Control Plan, including the reasons for these changes;
- Any observed driver issues (confusion, excessive speeds, etc.); and
- The signature of the Traffic Control Agent.

No work activities shall commence until after the initial inspection has been completed and documented. An initial night inspection shall also be undertaken if traffic control is to be left in place during hours of darkness.

Routine inspections of Work Areas are also necessary to ensure that all Traffic Control Devices remain in their proper location and continue to function as intended. The frequency of these inspections depend on the project size and duration, the complexity of traffic control, the nature of the work, and the number of problems observed in previous inspections. For Long Duration projects, inspections shall be conducted at the beginning and end of each work day as a minimum. Daily inspections shall also be conducted on holidays, weekends, and other times when the Work Area is not Active. Traffic control that is left in place overnight shall also be inspected during hours of darkness. Work Areas that remain Passive for an extended period (e.g. over the winter months) shall be inspected at least every two weeks.

Any issues noted during routine inspections, such as damaged or displaced signs, shall be corrected immediately. Furthermore, it is imperative that any changes to the Traffic Control Plan are reported to and documented by the Traffic Control Agent. The Traffic Control Agent shall maintain a file at all times that includes the original Traffic Control Plan, as well as all documentation from the initial and routine inspections. This file shall be maintained as part of the official contract documents upon completion of the work. Maintaining adequate documentation of traffic control is necessary in the event of litigation arising from an accident in the work zone.

If an accident does occur, appropriate assistance should be rendered to any injured persons. The Traffic Control Agent shall then ensure that the following information has been compiled:

- The location of all devices at the time of the accident (with photos if possible);
- A sketch of the accident location identifying vehicles, equipment, and Work Area personnel involved;
- Weather conditions at the time of the accident;
- A brief summary of what happened and the actions taken; and

5.2 Traffic Control Persons

Responsibilities

Traffic Control Persons (TCPs) are used in Work Areas to regulate traffic and prevent conflicts between vehicles and Work Area activities. The duties of a TCP are to:

- Direct traffic safely through the Work Area;
- Stop traffic whenever the progress of work requires, in order to provide a safe Work Area and ensure the safety of the workers; and
- Warn workers of impending danger.

Given the significant importance of these responsibilities, only individuals who have received proper training shall be used as TCPs.

Training

Traffic Control Persons shall complete training as per Occupational Health and Safety Act and the policies and procedures established by their employers.

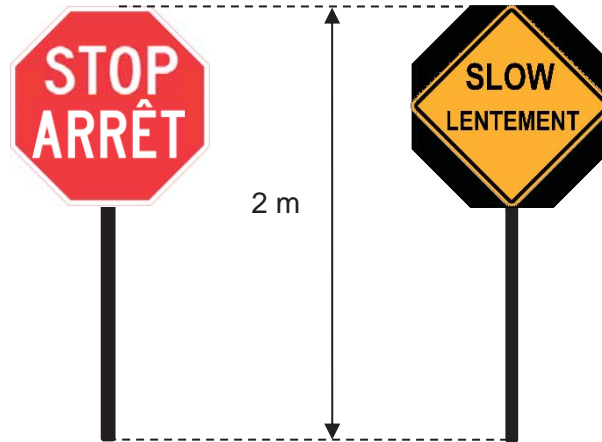
Required Signage

A Traffic Control Person Ahead sign shall always be erected in advance of the TCP to inform road users of their presence and prepare them to obey given direction. This sign shall be in place before the TCP commences signalling, at the appropriate distance as indicated in Table 5-1. When the TCP is not directing traffic, this sign shall be removed, covered, or turned away from traffic.

Table 5-1: Placement Distances for Traffic Control Person Ahead

Normal Posted Speed Limit (km/h)	Distance (m)
50	100 - 150
60 - 70	150 - 225
80 - 90	200 - 300
100 - 110	300 - 450

A *Stop/Slow Paddle* shall be used by the TCP to direct traffic. Both the stop sign and the slow sign are to be 50 cm X 50 cm, and mounted on the top of a pole such that the top of the signs is a minimum of 2 m above the roadway. Both signs shall also be retro-reflective with high intensity sheeting. At no time should the TCP use red flags to control traffic.



Position & Location

A TCP shall stand just outside the travelled lane at a location approximately 40-50 m in advance of the Activity Area or Transition Taper. In situations where the posted speed is 60 km/h or less, this distance may be reduced to 20-30 m. For patching, milling, and paving, these distances shall be relative to the Work Vehicles (i.e. asphalt truck, etc.). For all situations, the TCP must be able to see (and be seen by) approaching traffic for at least 150 m.

Once a TCP has been assigned a position, they must immediately plan an escape route (i.e. a place to move to avoid Errant Vehicles that may disregard their signals). In the event this does occur, the TCP must move out of the path of the vehicle and then immediately warn the workers.

While signalling, a TCP must:

- Be alert at all times, and aware of work activities and oncoming traffic;
- Face on-coming traffic, and never turn their back on moving traffic;
- Refrain from using cell phones or other electronic devices;
- Stand alone, and not mingle with workers or the public; and
- Not perform any other work.

If conversations with road users are unavoidable, the TCP must remain in position and keep conversation brief.

Signalling Procedures

Proper signalling methods and procedures are taught in the TCP course. These procedures shall be followed at all times to ensure that traffic is directed in a safe and consistent manner. Common procedures are described in Table 5-2.

5.3 Dedicated Traffic Observers

Responsibilities

Dedicated Traffic Observers are used to monitor oncoming traffic and warn workers of potential hazards or threats during the setup and removal of Traffic Control Devices and for other activities that require a worker to be on or near the travelled lane for only a very brief period. To do so, they must be located in a position with a clear view of traffic. The means by which the traffic observer will warn the workers shall be determined before the activity begins. Dedicated Traffic Observers shall not be engaged in other activity while monitoring traffic. An example of such an activity may include removing debris from the road.

Training

All Dedicated Traffic Observers must attend a WATCM awareness session as approved by the Department of Transportation and Infrastructure's Operations Branch.

5.4 Device Installers

Responsibilities

Sign Installers include any person(s) directly involved with the setup and removal of Traffic Control Devices in a Work Area.

Training

All device installers must attend a WATCM awareness session as approved by the Department of Transportation and Infrastructure's Operations Branch.

5.5 Other Workers

Responsibilities

Other Workers include any other person(s) on site while the work is being carried out. This includes equipment operators, general labourers, inspectors, etc.

Training

All workers must attend a WATCM awareness session as approved by the Department of Transportation and Infrastructure's Operations Branch.

6.2 Work Duration

Work duration is the length of time that an Activity Area occupies a single location or several adjacent locations that are sufficiently close to be effectively considered as one. There are four categories of work duration:

Moving Operations...	Work that is either done <i>continuously</i> , usually at slow speeds, or <i>intermittently</i> , with brief stops related to the work. Examples of Moving Operations include: line painting, mowing, sweeping, and pavement testing.
Very Short Duration...	Work that occupies a fixed location for up to 30 minutes, including the time required to setup and remove Traffic Control Devices.
Short Duration...	Work that occupies a fixed location for longer than 30 minutes, yet less than 1 day.
Long Duration...	Work that occupies a fixed location for longer than 1 day.

As work duration increases, so too does the exposure for workers. As a result, the magnitude of traffic control is typically greater for longer duration Work Areas.

6.3 Traffic Volumes

The level of traffic control required may also depend on the traffic volumes through the Work Area. Low Volume Roads typically require a less complex traffic control layout since worker exposure to traffic is reduced.

For the purposes of selecting the appropriate traffic control layout, a Low Volume Road is any road with an AADT of less than 300 vehicles per day.

6.4 Vehicle Speeds

The faster a vehicle is travelling, the more distance the driver will require to recognize, interpret, and react to any traffic control devices or personnel which they may encounter in a Work Area. For this reason, as the posted speed changes in the Work Area, so does the:

- Size of Traffic Control Devices;
- Distance for providing advance warning;
- Spacing between devices in the Approach Area; and the
- Lengths of tapers and Buffer Areas.

Each layout contained in Chapters 7 and 8 includes a table that specifies the minimum dimensions for each of these items.

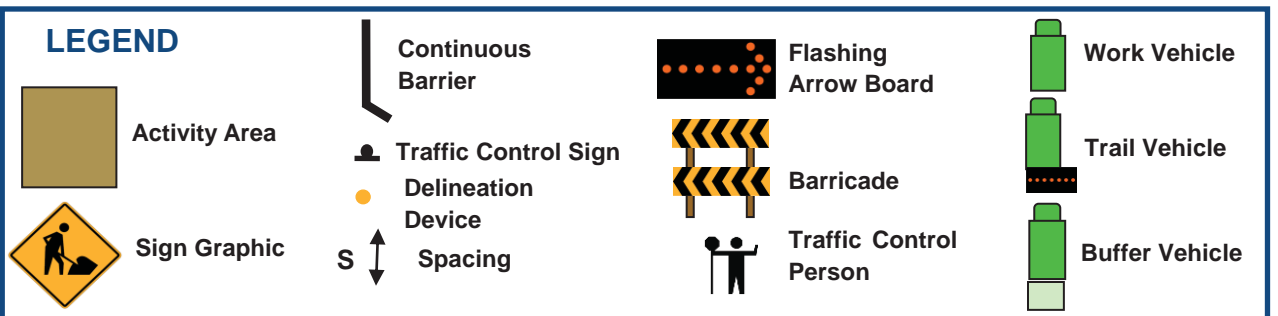
7 Typical Layouts for Two Lane Roads

GENERAL LAYOUTS

Activity	Work Location	Duration	Volume	Figure No.
Any	Roadside	Any	All	7-1
	Shoulder	Very Short	All	7-2
		Short	All	7-3
		Long	All	7-4
		Partial Lane Closure	Short	All
	Single Lane (inc. Bridges)	Short	All	7-5
		Long	AADT < 300 vpd	7-6
AADT > 300 vpd	7-7			
Shoulder Diversion	Single Lane	Short / Long	All	7-8a&b
Single Lane Diversion	Two Lanes	Long	AADT < 300 vpd	7-9
			AADT > 300 vpd	7-10
Two Lane Diversion (surfaced)	Two Lanes	Long	All	7-11
Two Lane Diversion (unsurfaced)	Two Lanes	Long	All	7-12
Detour	Two Lanes	Any	All	7-13
Climbing Lane	Uphill Right Lane	Short / Long	All	7-14
	Uphill Centre Lane	Short / Long	All	7-15
	Downhill Lane	Short / Long	All	7-16
Auxiliary Lane	Deceleration Lane	Short / Long	All	7-17
	Acceleration Lane	Short / Long	All	7-18

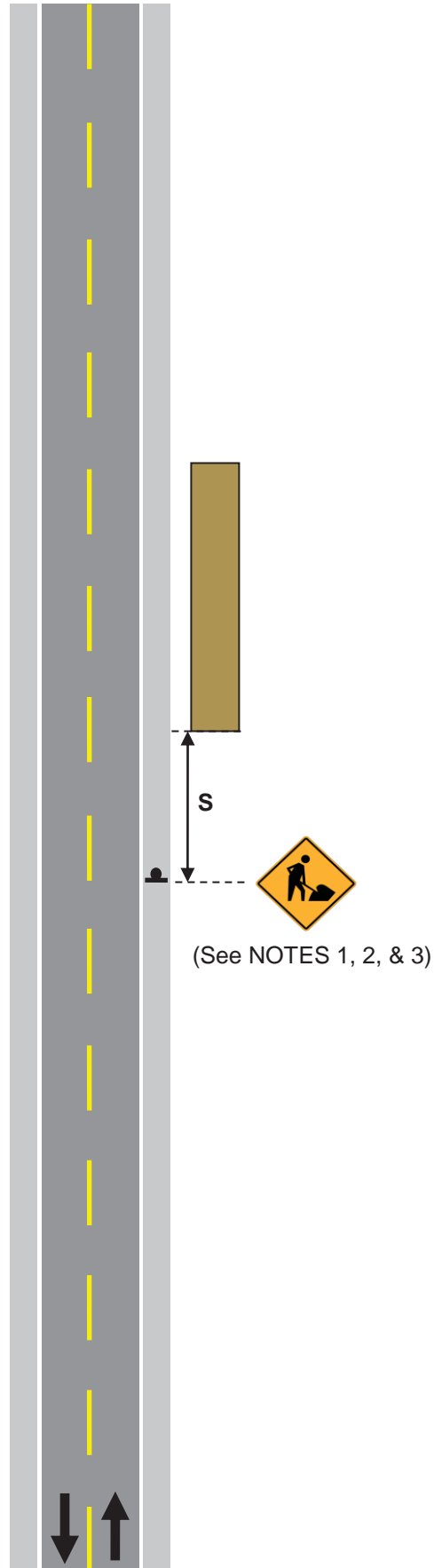
SPECIAL LAYOUTS

Activity	Work Location	Duration	Volume	Figure No.
Surveying	Shoulder	Short	All	7-19
	Single Lane	Short	All	7-20
Patching	Single Lane	Very Short	AADT < 300 vpd	7-21a
		Short / Long	All	7-21
Milling & Paving	Single Lane	Short / Long	All	7-22
After Milling or Paving				7-23
Chipsealing	Single Lane	Short / Long	All	7-24
Grading	Single Lane	Short	All	7-25
Line Painting	Single Lane	Moving	All	7-26
Blasting Area				7-27
Low Shoulder				7-28
Other Hazards				7-29
Temporary Haul Road				7-30
Advance Signing (Major Project)				7-31



NOTES:

1. No signs are required for work that occurs outside 15 m from the edge of the travelled lane.
2. No signs are required for work vehicles that are positioned off the shoulder area of the travelled lane for Very Short and Short Duration Work.
3. No signs are required for mowing operations. However, the mower shall be equipped with a 360 degree amber light and a Slow Moving Vehicle Triangle.
4. For mowing operations, the first swath adjacent to the road must be mowed following the direction of traffic.
5. Shoulder must remain clear of all workers, vehicles, and equipment while work is in progress.



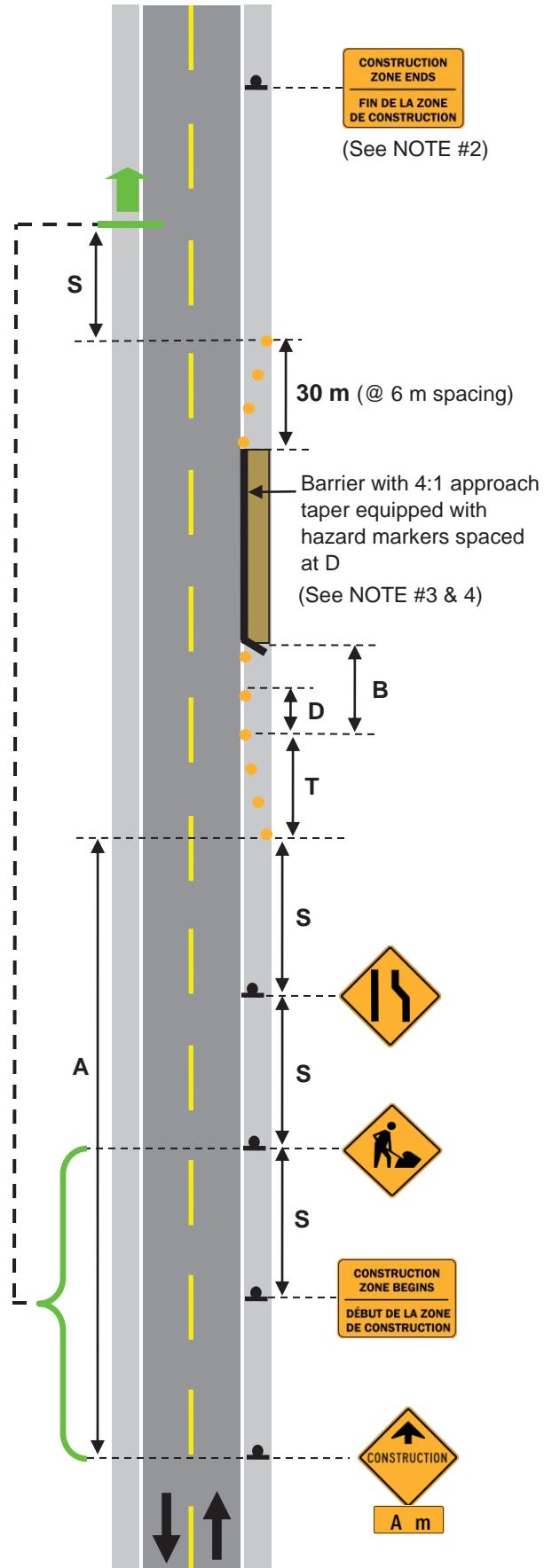
Roadside Work Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. Sign opposite approach in the same manner, without the Road Narrows sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
4. For work on bridge structures, a continuous barrier is required for all Long Duration Work.



Shoulder Work Long Duration (greater than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

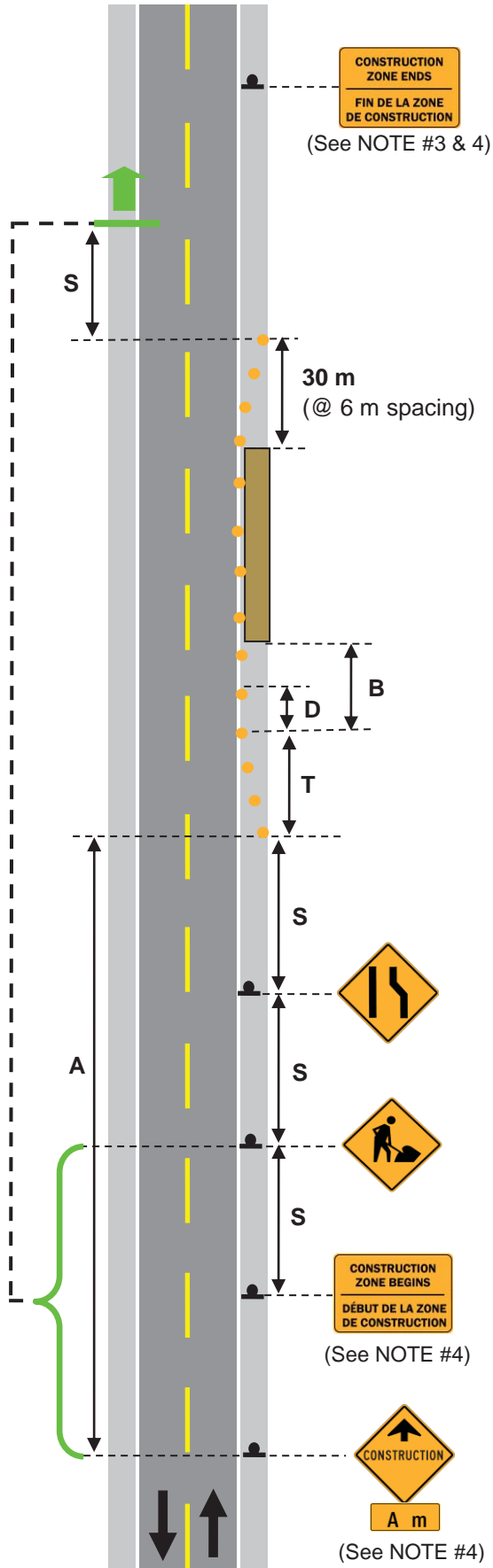
- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Must maintain a minimum 3.0m usable road width in the lane in which work is taking place.
2. Sign opposite approach in the same manner, without the Road Narrows sign.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. For Very Short Duration Partial Lane Closures on roads with AADT ≤ 300 and Existing Speed Limit ≤ 50 km/h:
 - Identified signs may be eliminated
 - T maybe reduced to T/3
 - Termination Taper may be reduced to two delineation devices.

Partial Lane Closure Short Duration All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- C – Traffic Control Person Setback (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)



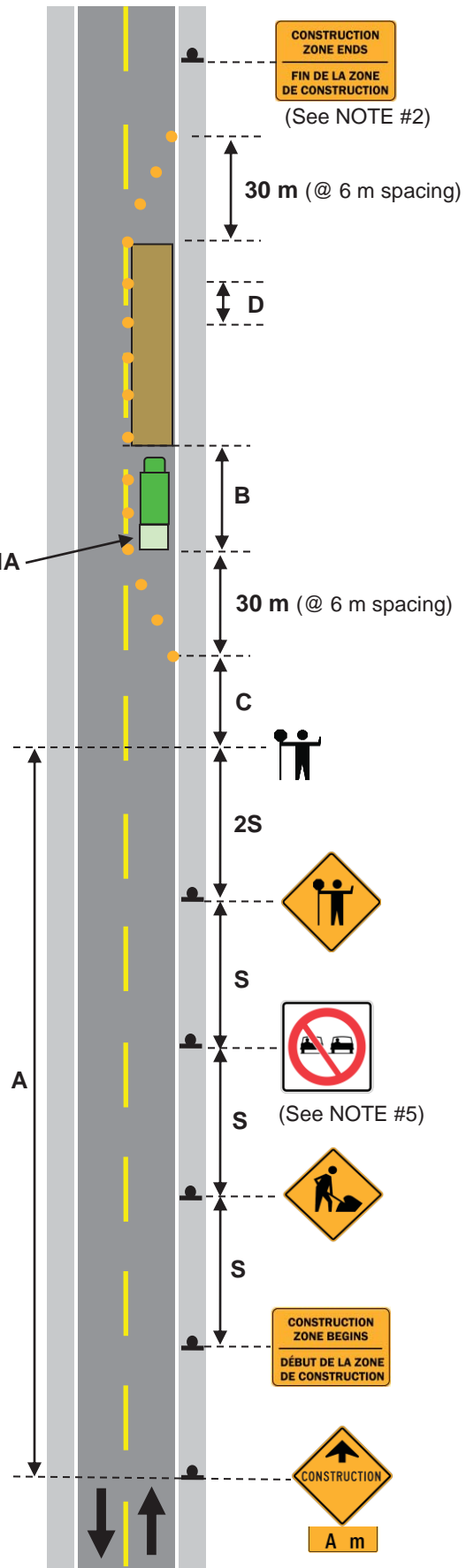
NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Buffer Vehicle with TMA only required when working on bridge structures.
4. When working on bridges, the Activity Area shall be extended such that TCPs are not located on the structure.
5. No passing sign is optional on roads with less than 300 vehicles per day or ≤ 50 km/hr.

Single Lane Closure (inc. Bridges) Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
C	30	40	50	50
D	6 / 8	6 / 10	6 / 14	6 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- C – Traffic Control Person Setback (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

Buffer Vehicle equipped with TMA
See NOTE #3



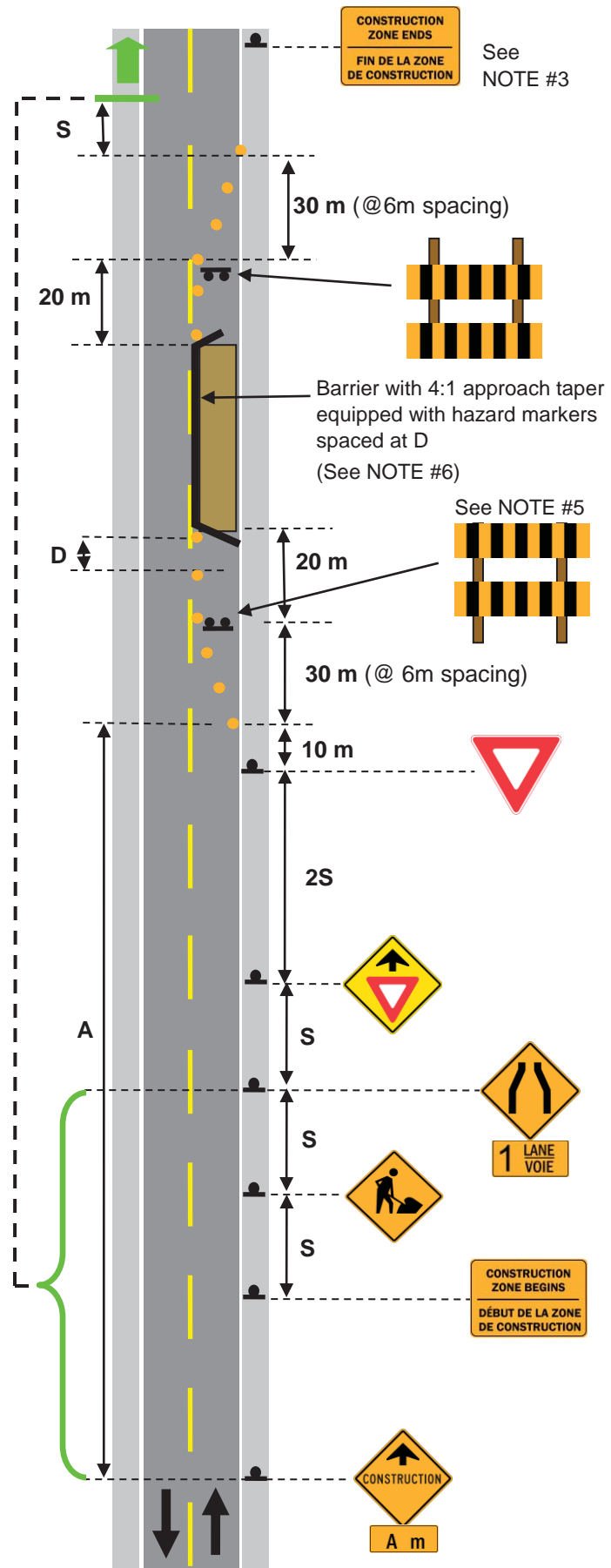
NOTES:

1. Layout requires approval from the Department of Transportation and Infrastructure's Operations Branch.
2. Sign opposite approach in the same manner, without the Yield Ahead and Yield signs.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. Tapers shall be at least 30 m in length, and have a delineator spacing of 6 m.
5. Flashing arrow boards (set to the caution mode) may be used in place of barricade boards.
6. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
7. For work on bridge structures, a continuous Barrier is required for all Long Duration Work.

See NOTE #1

Single Lane Closure (inc. Bridges) Long Duration (greater than 1 day) AADT less than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	6 / 10	6 / 14	6 / 24

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)
 D – Maximum Delineator Spacing in Taper/Tangent (m)



NOTES:

1. Layout requires approval from the Department of Transportation and Infrastructure's Operations Branch.
2. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by DTI's Operations Branch. Speed reductions are not required where the original speed is 60 km/hr or less.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. Tapers should be at least 30 m in length, and have a delineator spacing of 6 m.
5. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less (except for work on bridges).
6. For work on bridge structures, a continuous Barrier is required for all Long Duration Work.
7. Centreline markings must be removed between Traffic Signal Stop Bars.
8. Sign opposite approach in the same manner.

**Single Lane Closure
(inc. Bridges)
Long Duration (greater than 1 day)
AADT greater than
300 vehicles per day**

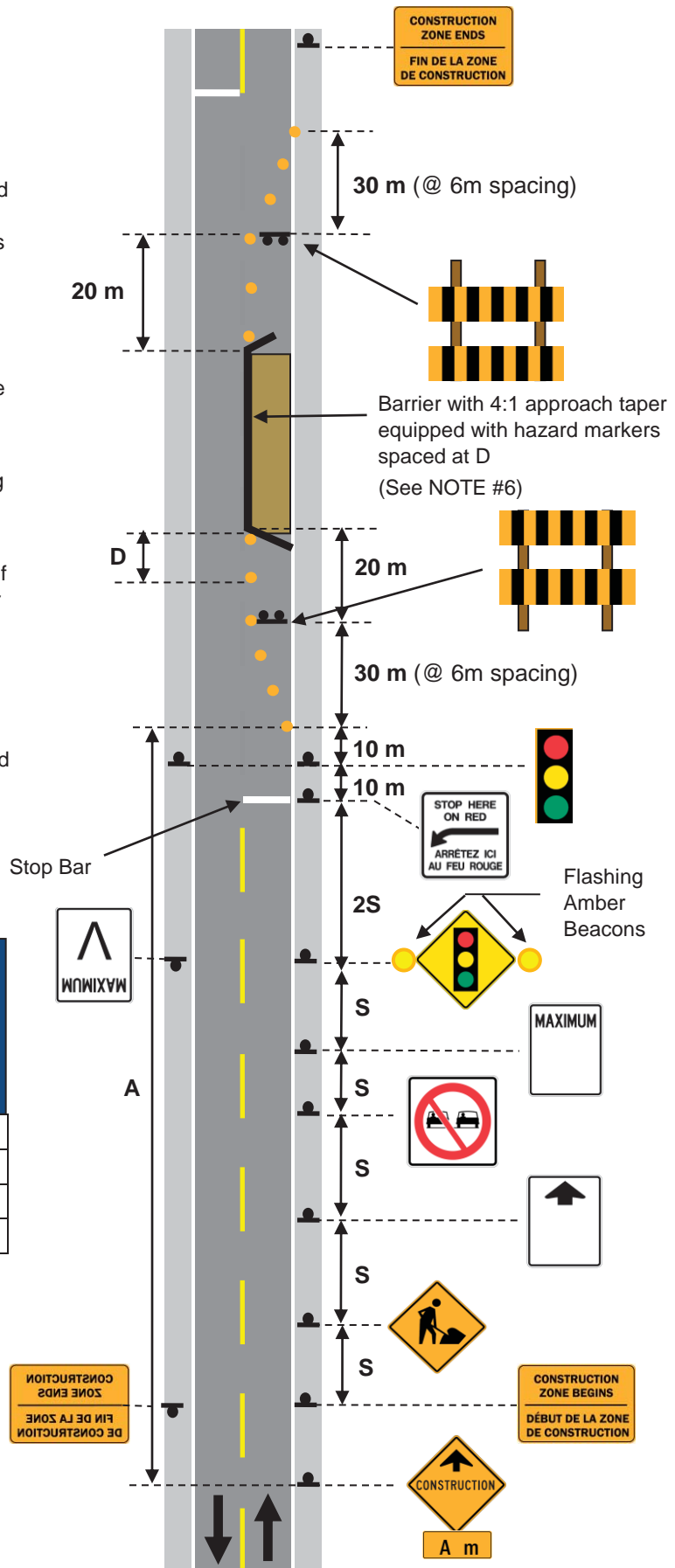
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	6 / 10	6 / 14	6 / 24

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

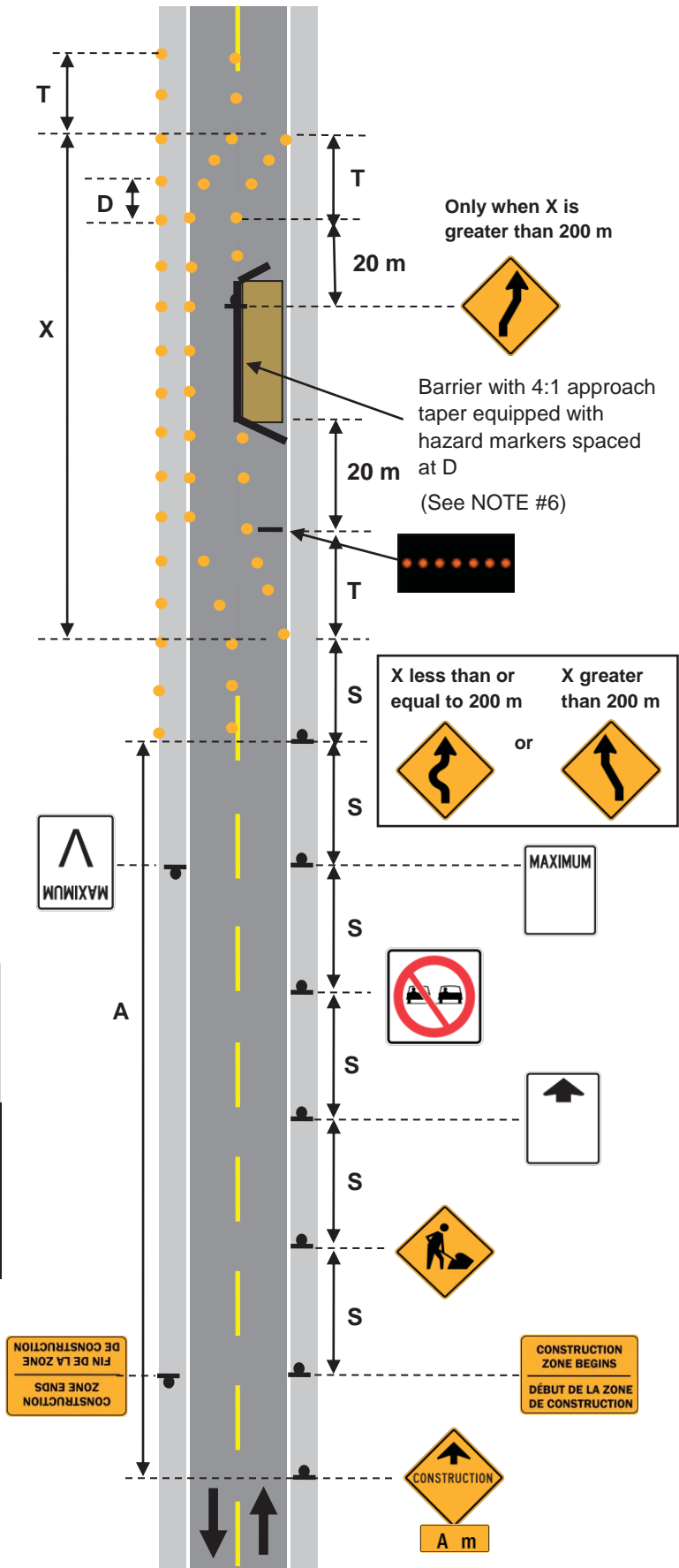
S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)



NOTES:

1. Sign opposite approach as shown in Figure 7-8b.
2. X is the length of the Diversion.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operation Branch.
4. Speed reductions are not required where the original speed limit is 80 km/hr or less.
5. A minimum shoulder width of 2.5 m is required. The shoulder shall be paved for original speeds of 80 km/h or higher.
6. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
7. Confusing pavement markings must be removed.

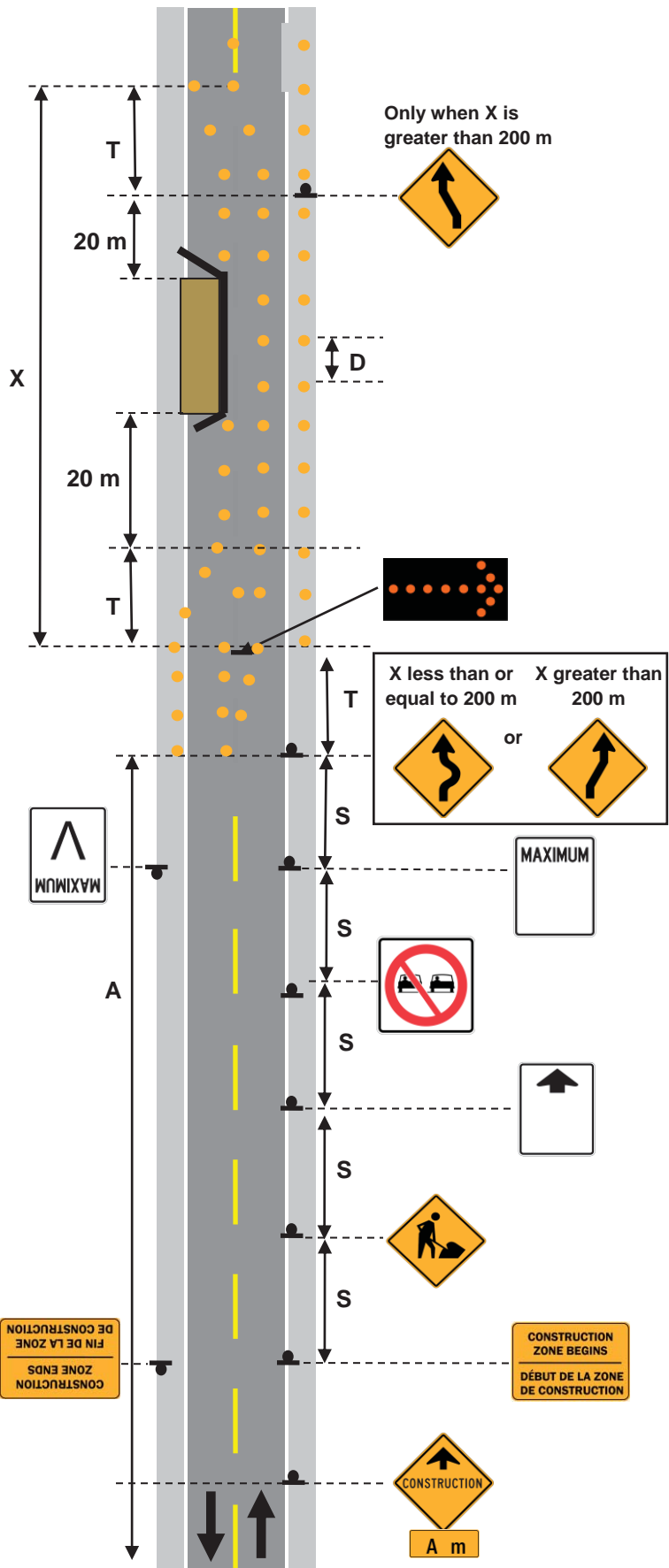


Shoulder Diversion Short or Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)
 T – Taper Length (m)
 D – Maximum Delineator Spacing in Taper/Tangent (m)

NOTES:

1. Sign opposite approach as shown in Figure 7-8a.
2. Speeds shall not be reduced more than 20 km/hr below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operation Branch.
3. Speed reductions are not required where the original speed limit is 80 km/h or less.
4. Confusing pavement markings must be removed.



Shoulder Diversion Short or Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)

NOTES:

1. Layout requires approval from the Department of Transportation and Infrastructure's Operations Branch.
2. Sign opposite approach in the same manner, without the Yield Ahead and Yield signs.
3. Other direction shall be displayed on opposite approach and shall be accompanied by Speed Advisory Tabs.
4. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
5. Flashing Arrow Boards (set to the caution mode) may be used in place of Barricade boards.
6. X is the length of the Diversion.
7. Centreline markings must be removed from the Transition Area and replaced by temporary markings.

Single Lane Diversion Long Duration (greater than 1 day) AADT less than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

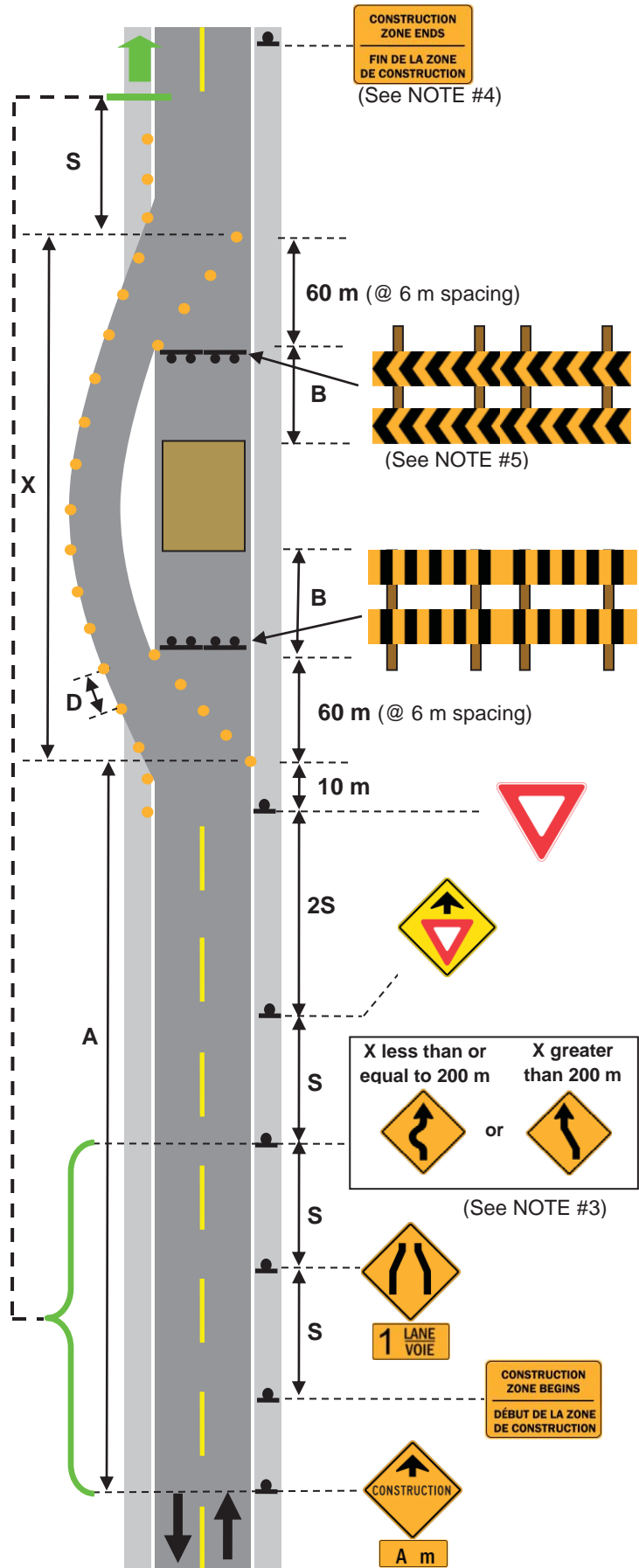
V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

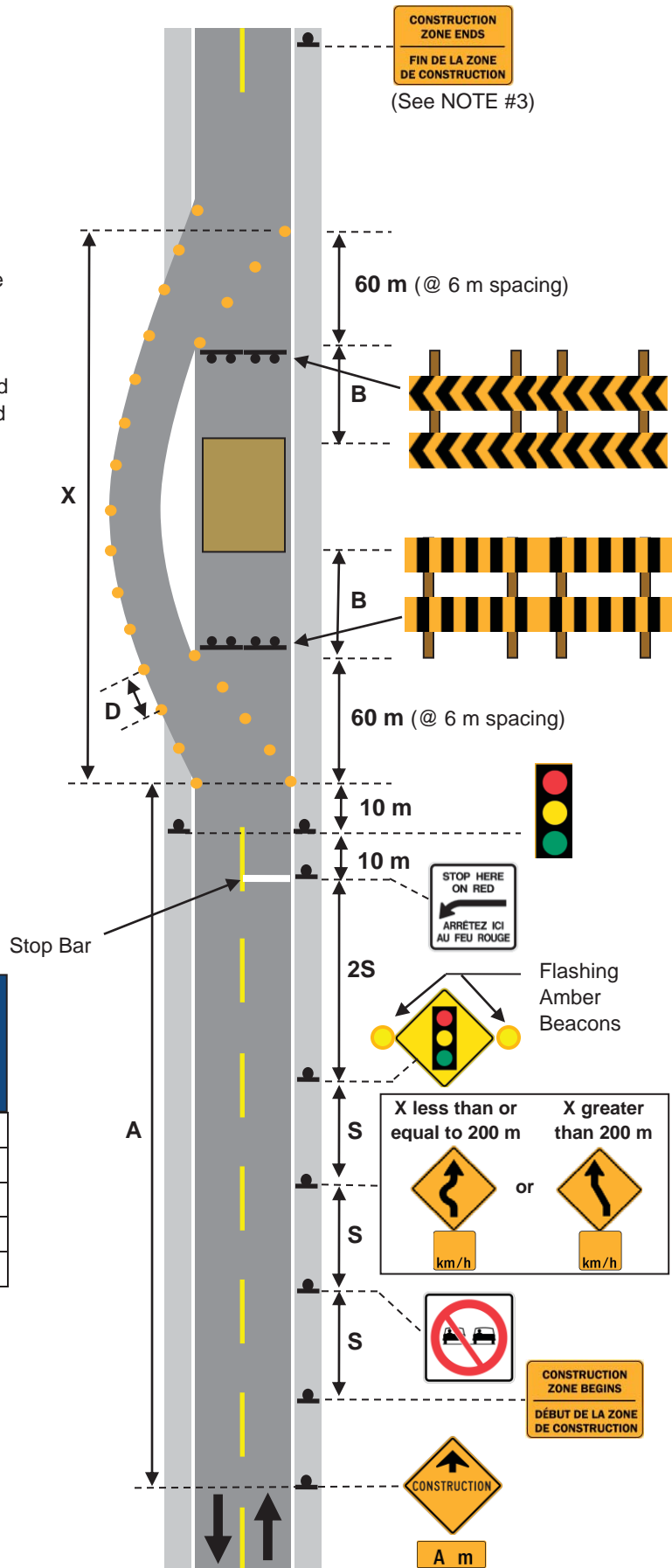
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)



NOTES:

1. Layout requires approval from the Department of Transportation and Infrastructure's Operations Branch.
2. Sign opposite approach in the same manner.
3. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
4. X is the length of the Diversion.
5. Centreline markings must be removed from the Transition Area and replaced by temporary markings.

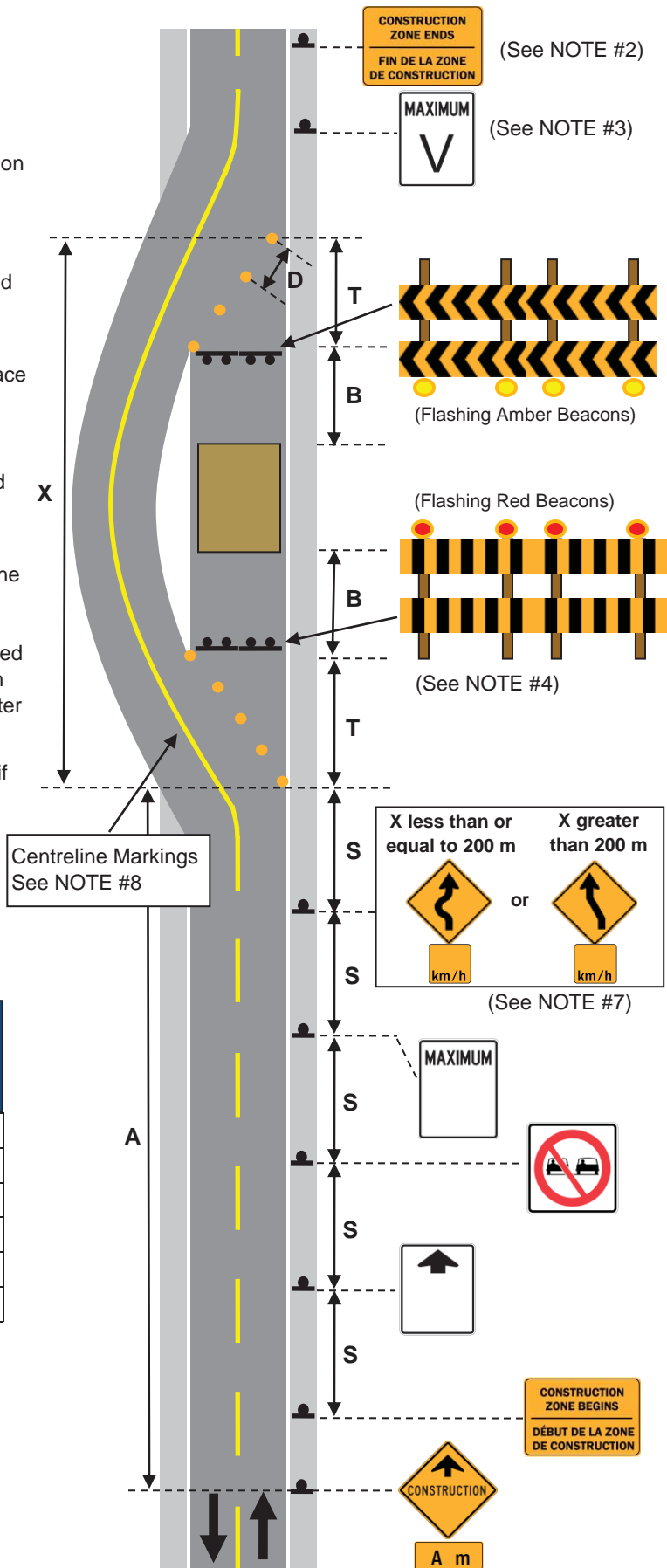


Single Lane Diversion Long Duration (greater than 1 day) AADT greater than 300 vehicles per day				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Flashing Arrow Boards (set to the appropriate mode) may be used in place of Barricade boards.
5. X is the length of the Diversion.
6. Centreline markings must be removed from Transition Area and replaced by temporary markings.
7. Advisory speed to be determined by the Department of Transportation and Infrastructure's Operations Branch. Advisory Speeds Tabs are only required if the difference between the diversion speed and the reduced speed is greater than 10 km/h.
8. Centreline markings are not required if existing road is not marked.



Two Lane Diversion (Surfaced) Long Duration (greater than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

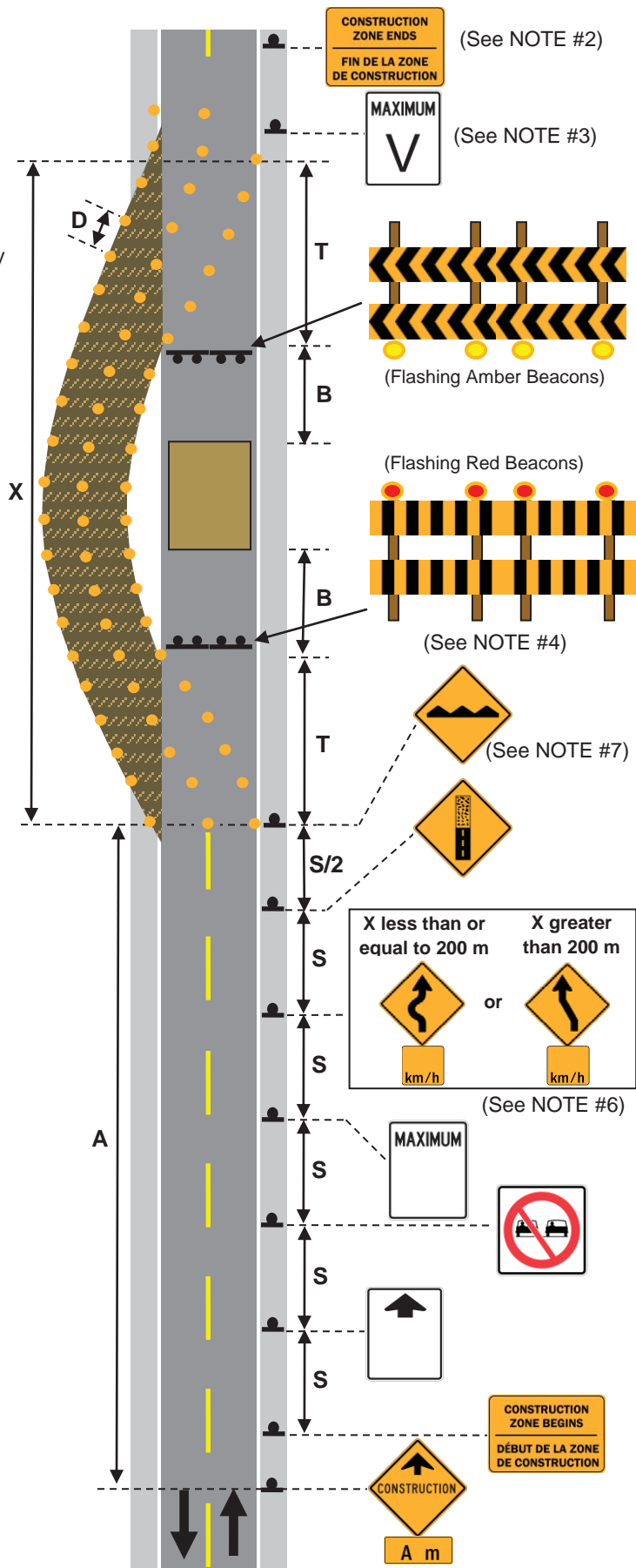
NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Flashing Arrow Boards (set to the appropriate mode) may be used in place of barricade boards.
5. X is the length of the Diversion.
6. Advisory speed to be determined by the Department of Transportation and Infrastructure's Operations Branch. Advisory Speeds Tabs are only required if the difference between the diversion speed and the reduced speed is greater than 10 km/h.
7. Bump sign to be used only if required.
8. Centreline markings must be removed from Transition Area and replaced by temporary markings.

**Two Lane Diversion (Unsurfaced)
Long Duration (greater than 1 day)
All Volumes**

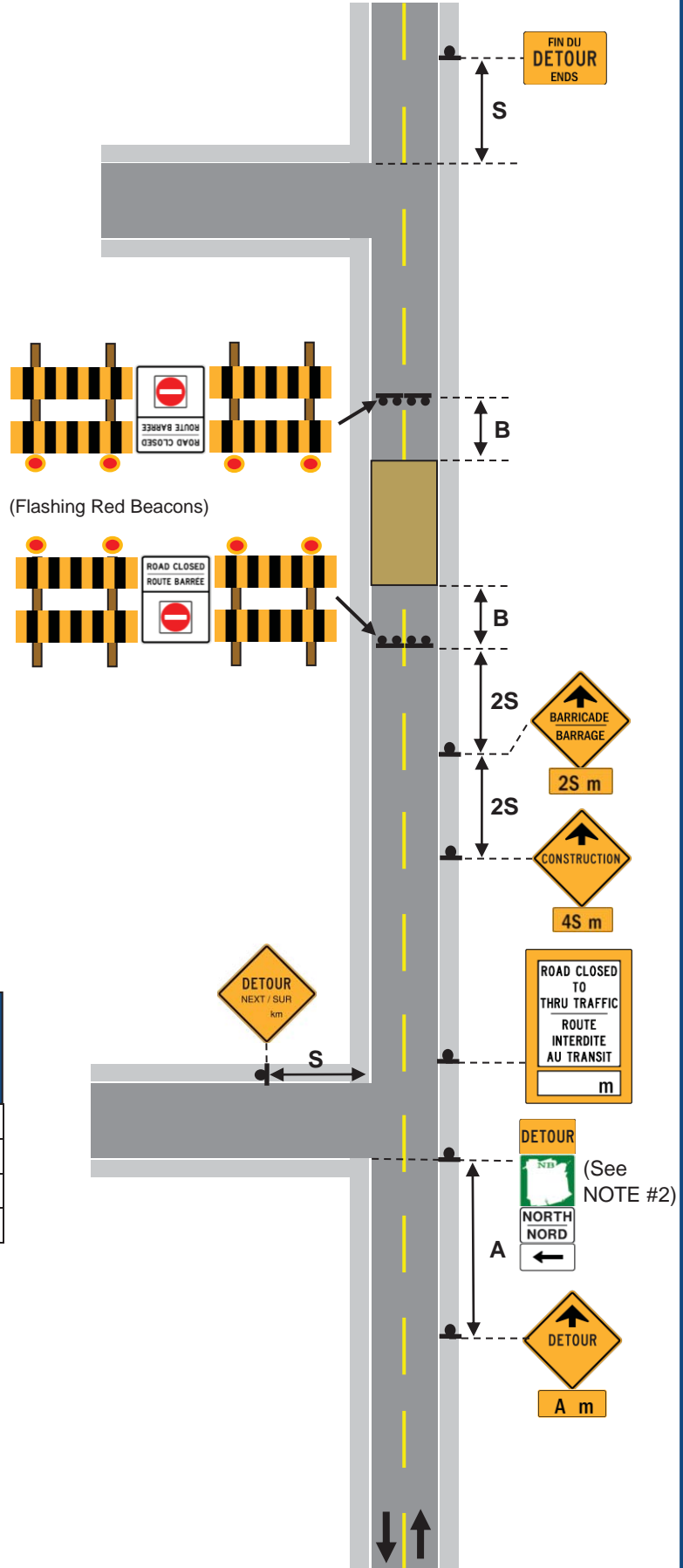
V	50	60-70	80-90	100
A	500	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)



NOTES:

1. Sign other approach in the same manner.
2. All intersections along the Detour route shall display appropriate guide signs to clearly direct drivers along the intended path.



Rural Detour Any Duration All Volumes				
V	50	60-70	80-90	100
A	300	300	500	1000
S	50	75	100	150
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

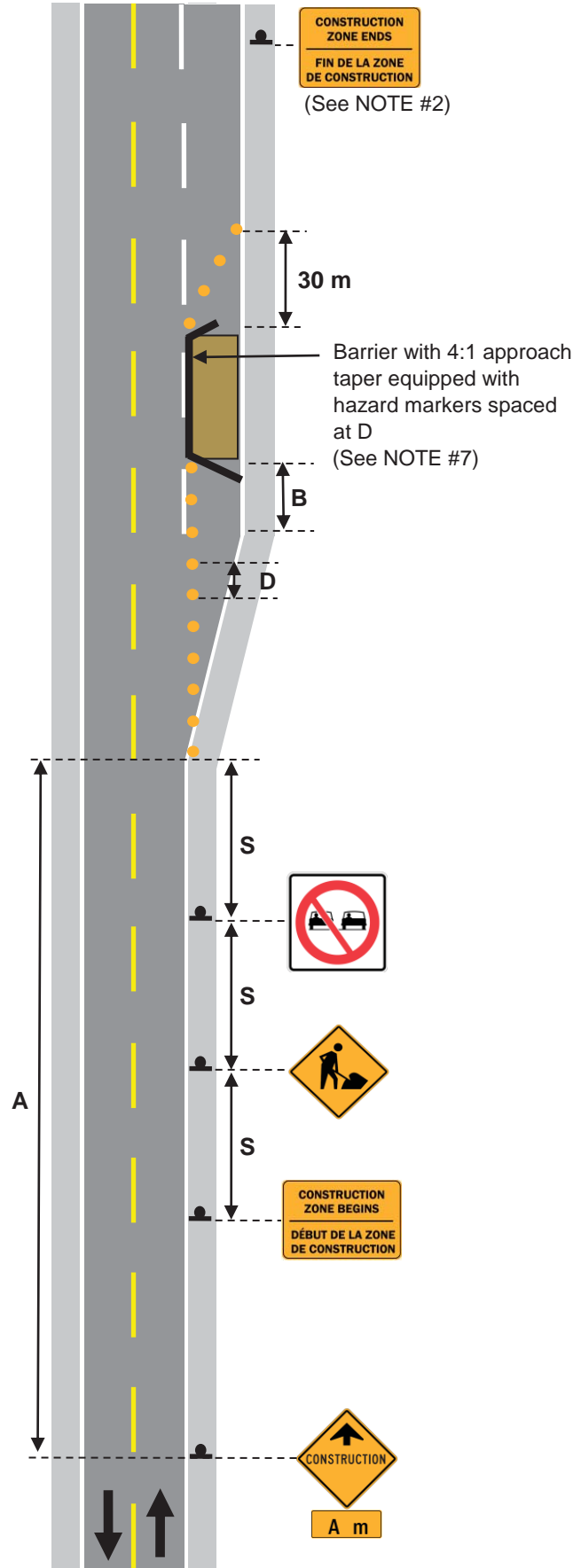
B – Buffer Area Length (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Climbing Lane 2 km signs and Keep Right Except to Pass sign must be covered.
4. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
5. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the termination taper.
6. If more than 1 km of climbing lane is available before the activity area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
7. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
8. Termination Taper shall be at least 30 m in length, and have a delineator spacing of 6 m.

Climbing Lane (Uphill Right Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

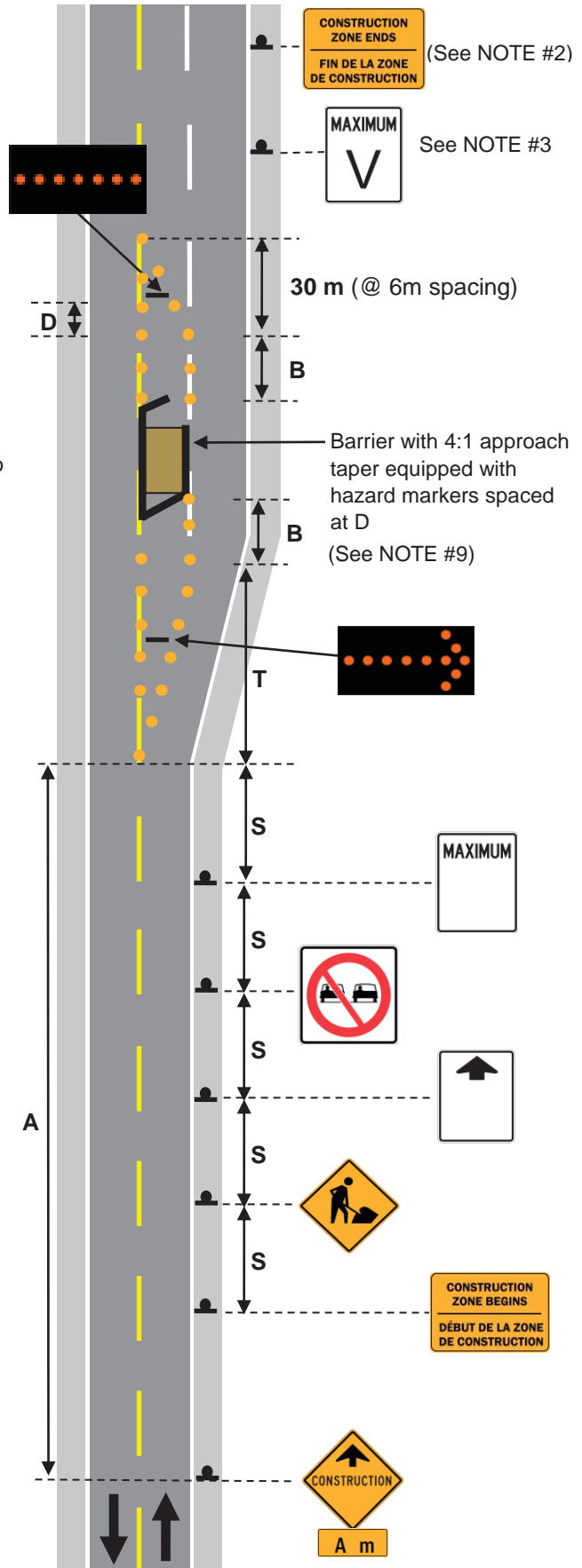


NOTES:

1. Sign opposite approach in a similar manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Climbing Lane 2 km signs and Keep Right Except to Pass sign must be covered.
5. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
6. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the termination taper.
7. If more than 1 km of climbing lane is available before the activity area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
8. Speeds shall not be reduced more than 20 km/h below the posted speed limit.
9. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.

Climbing Lane (Uphill Centre Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

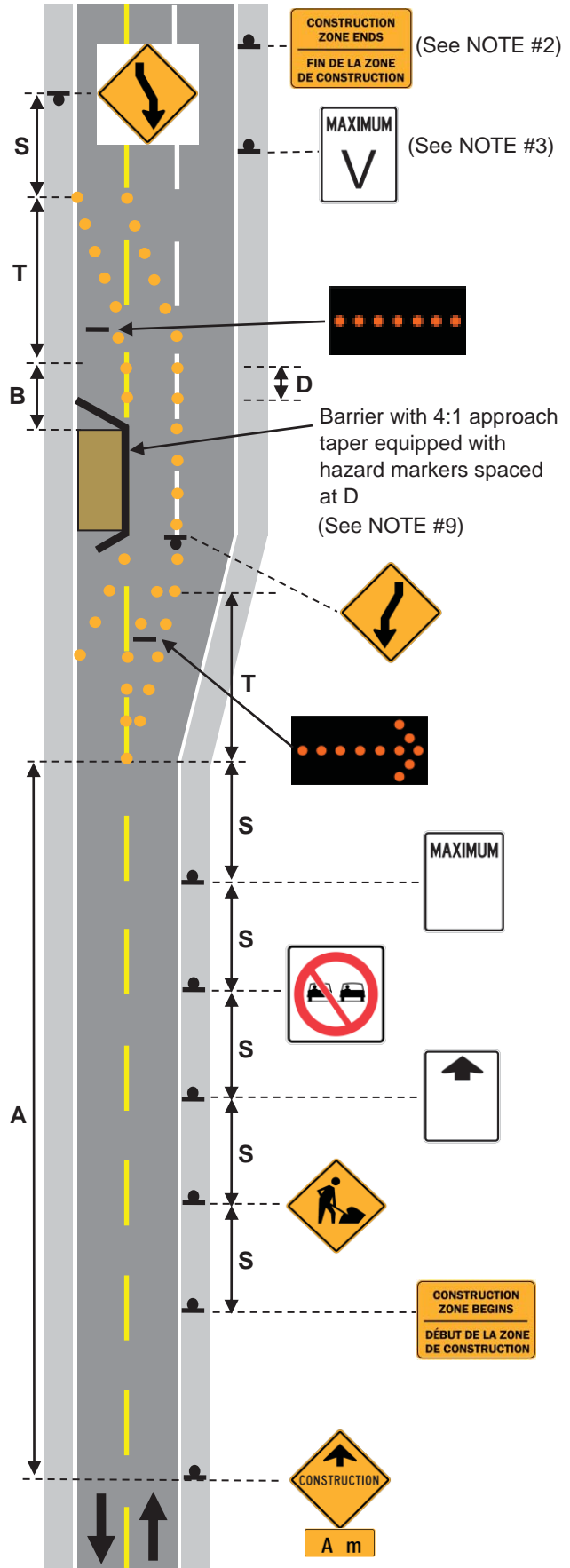


NOTES:

1. Sign opposite approach in a similar manner, beginning a distance “S” before the Road Realignment sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Climbing Lane 2 km signs and Keep Right Except to Pass signs must be covered.
5. If less than 1 km of climbing lane remains beyond the Activity Area, close the entire climbing lane.
6. If more than 1 km of climbing lane remains beyond the Activity Area, a Keep Right Except to Pass sign shall be posted immediately following the transition taper.
7. If more than 1 km of climbing lane is available before the Activity Area, the initial portion of the climbing lane may remain open until closed using Figure 8-7 (double posting required on opposite approach shoulder).
8. Speeds shall not be reduced more than 20 km/h below the posted speed limit.
9. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.

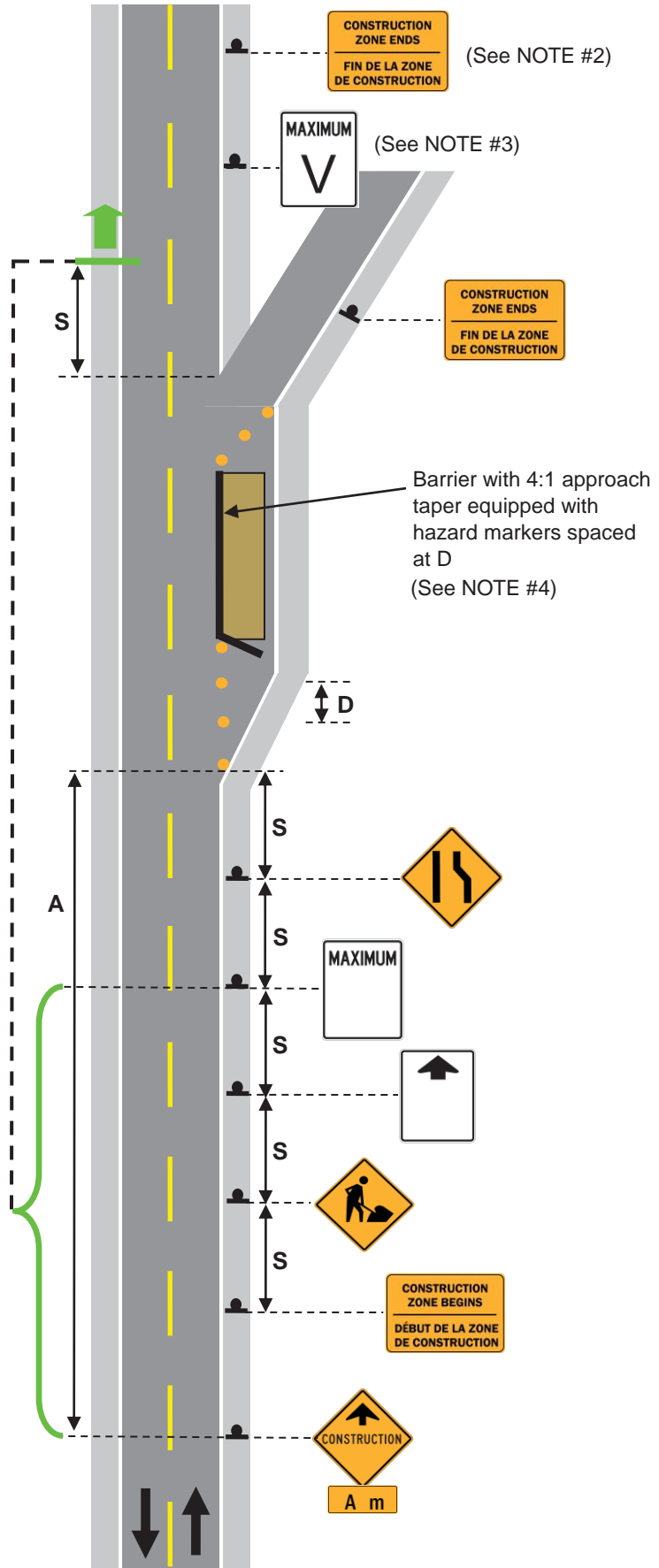
Climbing Lane (Downhill Lane) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)



NOTES:

1. Sign opposite main lane approach in the same manner, without the Road Narrows sign.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.

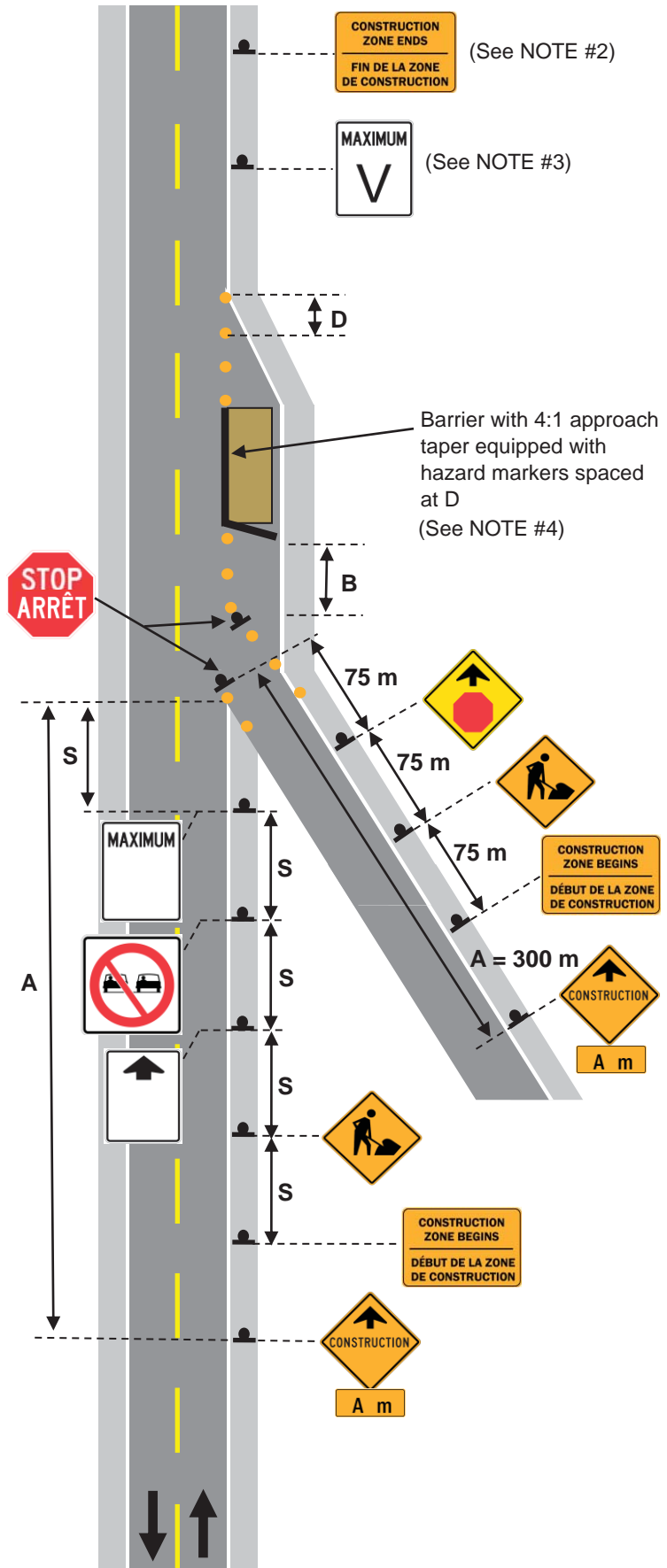


Deceleration Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- D – Maximum Delineator Spacing (m)
- B – Buffer Area Length (m)

NOTES:

1. Sign opposite main lane approach in the same manner, beginning at the end of the acceleration lane.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
4. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



Acceleration Lane Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- D – Maximum Delineator Spacing (m)
- B – Buffer Area Length (m)

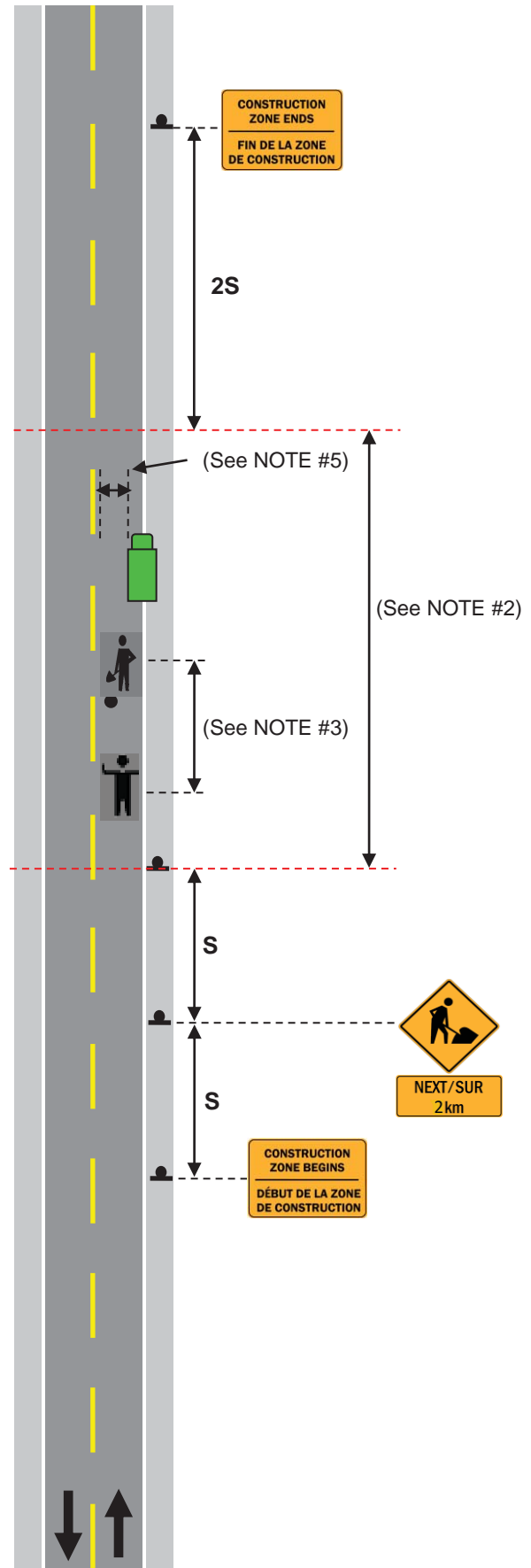
NOTES:

1. Sign opposite approach in the same manner.
2. The length of the Activity Area shall not exceed 2 km.
3. Dedicated Traffic Observer positioned within a safe distance dependent on site conditions.
4. All work equipment shall be equipped with 360° amber flashing light.
5. A minimum 3.0m useable road width must be maintained in the lane in which work is taking place.
6. Manual labor only. No compaction vehicles allowed.
7. Not for use on Climbing Lanes.

Cold Mix Patching Very Short Duration/Short Duration (≤80 km / h, < 300vpd)			
V	50	60-70	80-90
S	50	75	100

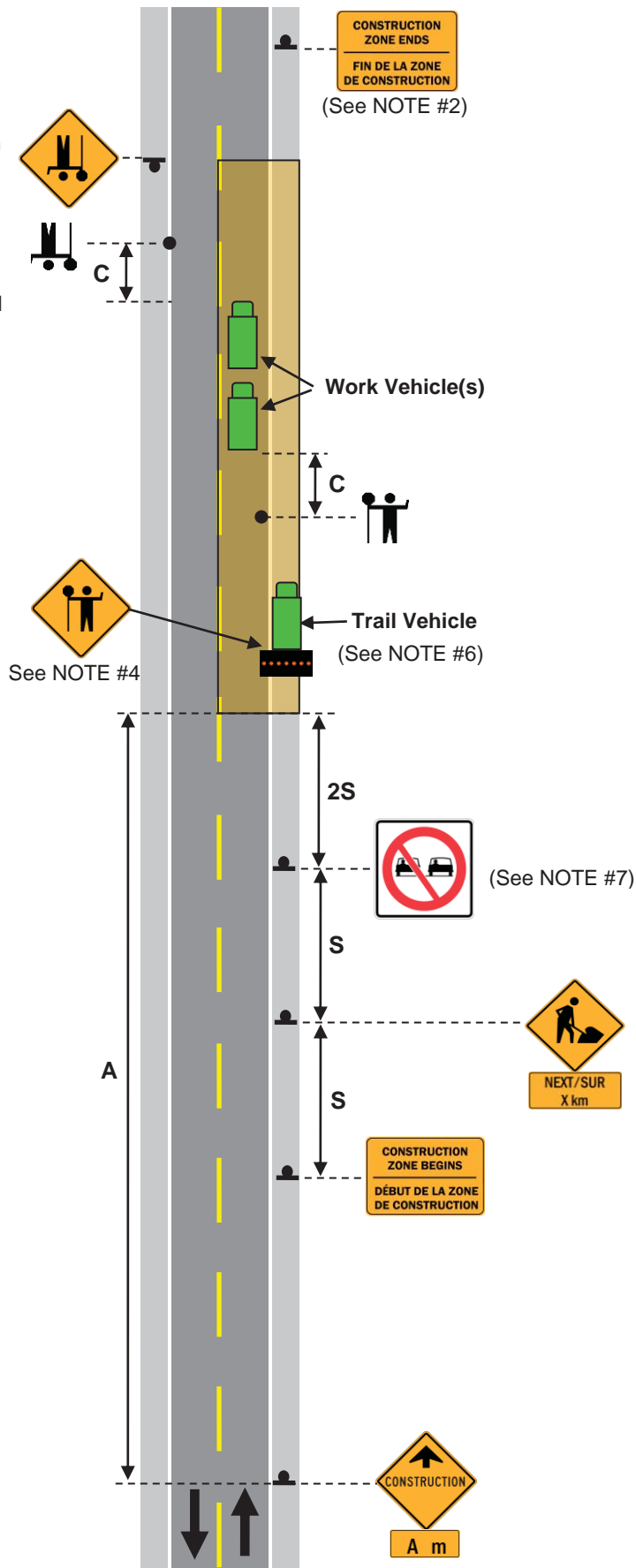
V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)



NOTES:

1. Sign opposite approach in the same manner.
2. Construction Zone Ends sign to be placed directly across from Construction Zone Begins sign on the opposite approach.
3. The length of the Activity Area shall not exceed 2 km.
4. Traffic Control Person Ahead signs shall be positioned within 2S m to 3S m of the TCP at all times (shall be mounted on Trail Vehicle where used).
5. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
6. Trail vehicle not required on roads with a speed limit of 80 km/h or less.
7. No passing sign is optional on roads with less than 300 vehicles per day.



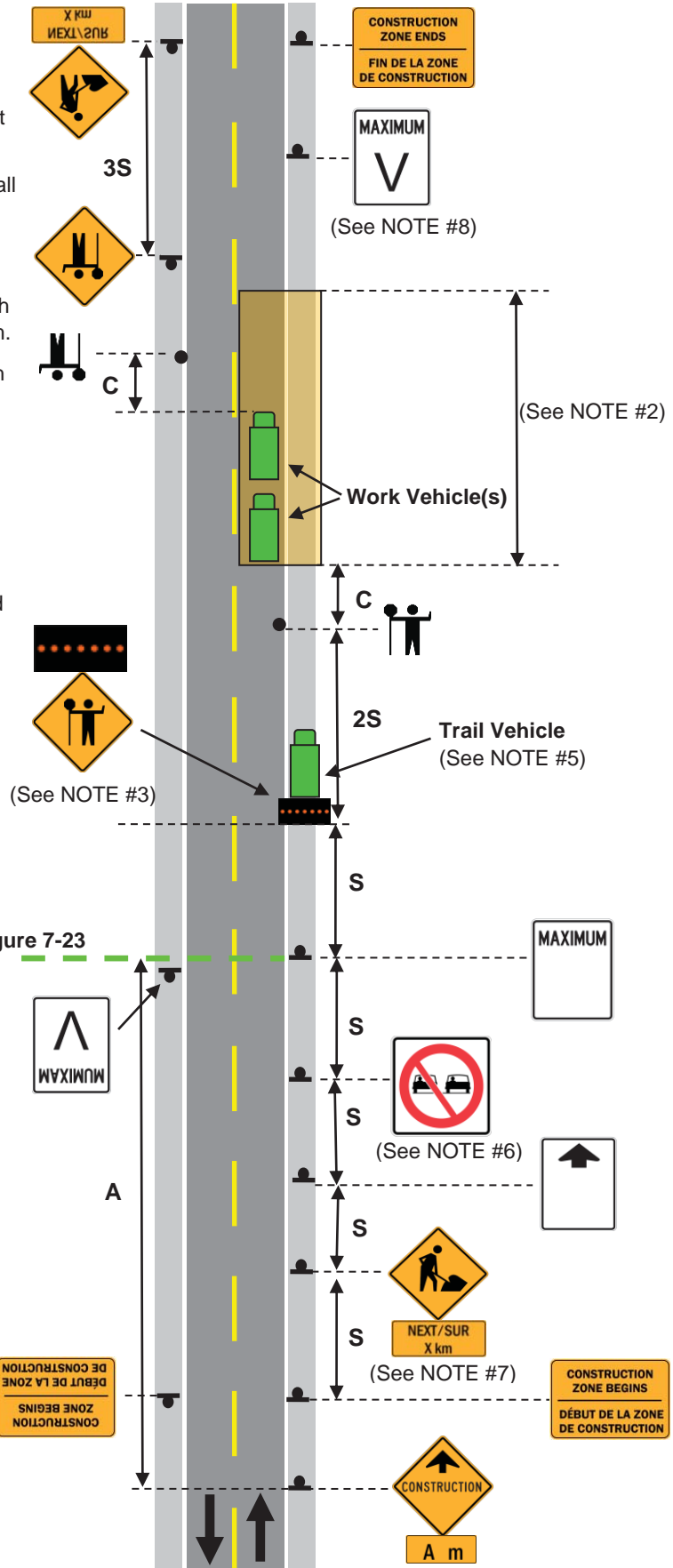
**Patching
Short Duration
(greater than 30 min, less than 1 day)
All Volumes**

V	50	60-70	80-90	100
A	350	350	500	1000
S	50	75	100	150
C	30	40	50	50

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- C – Traffic Control Person Setback (m)

NOTES:

1. Sign opposite approach in the same manner.
2. The length of the Activity Area shall not exceed 2 km.
3. Traffic Control Person Ahead signs shall be positioned within 2S m to 3S m of the TCP at all times (shall be mounted on trail vehicle where used).
4. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
5. Trail Vehicle not required on roads with a speed limit of 80 km/h or less.
6. No passing sign is optional on roads with less than 300 vehicles per day.
7. Road Work sign must follow with Activity area as work progresses.
8. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.

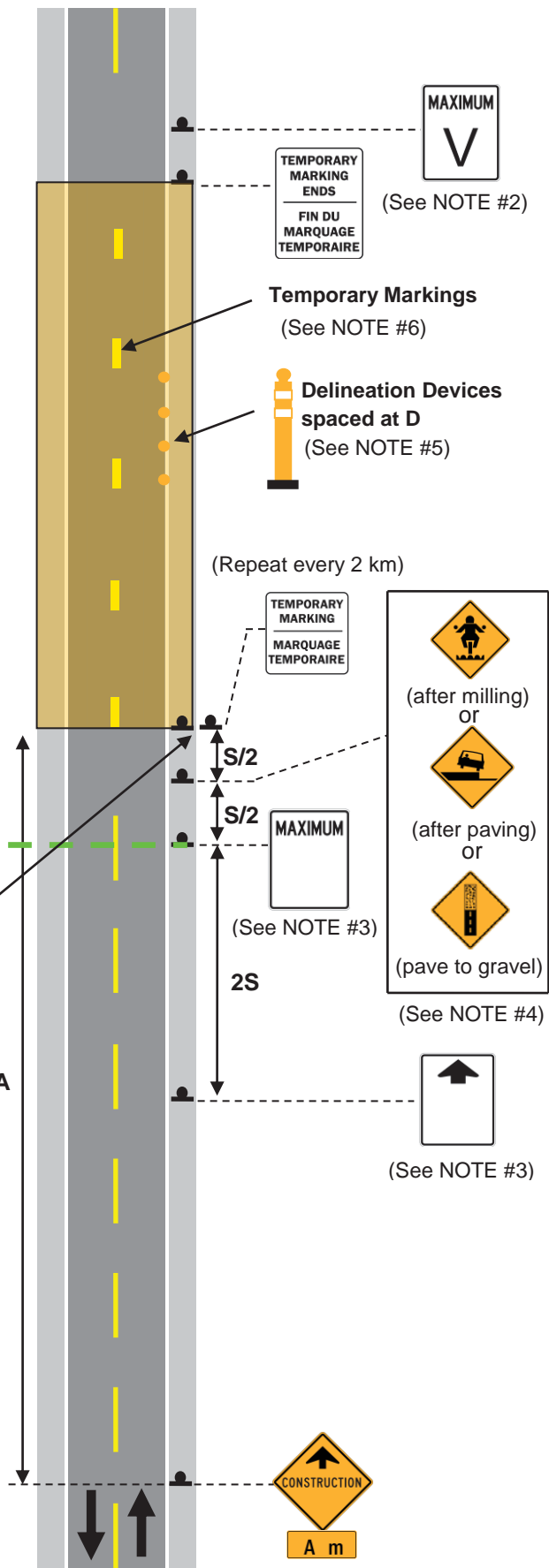


Milling or Paving All Durations All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1500
S	50	75	100	150
C	30	40	50	50

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- C – Traffic Control Person Setback (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Original speed shall be reinstated directly across from the reduced speed sign on the opposite approach.
3. Speed reductions only required with speed limits of 90km/h or greater.
4. Repeat appropriate sign every 1 km of milled or paved surface.
5. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm. Flexible drums or delineator posts may be used in place of hazard markers.
6. Pavement marking tape (or paint) shall be applied in 2 m strips and spaced at 50 m on tangents and 25 m on curves. Raised pavement markers shall be installed on milled surfaces in groupings of three within a 2 m length and be spaced the same as pavement marking tape.
7. If milling involves full depth removal, then Grooved Pavement Sign shall be replaced by Pavement Ends sign.
8. Bump signs shall be used any time there is a differential in surface thickness on the main lanes.



MATCH LINE to Figure 7-22

(See NOTE #8)

After Milling or Paving Any Duration All Volumes				
V	50	60-70	80-90	100
A	300	500	1000	1000
S	50	75	100	150
D	8	10	14	24

V – Existing Speed Limit (km/h)

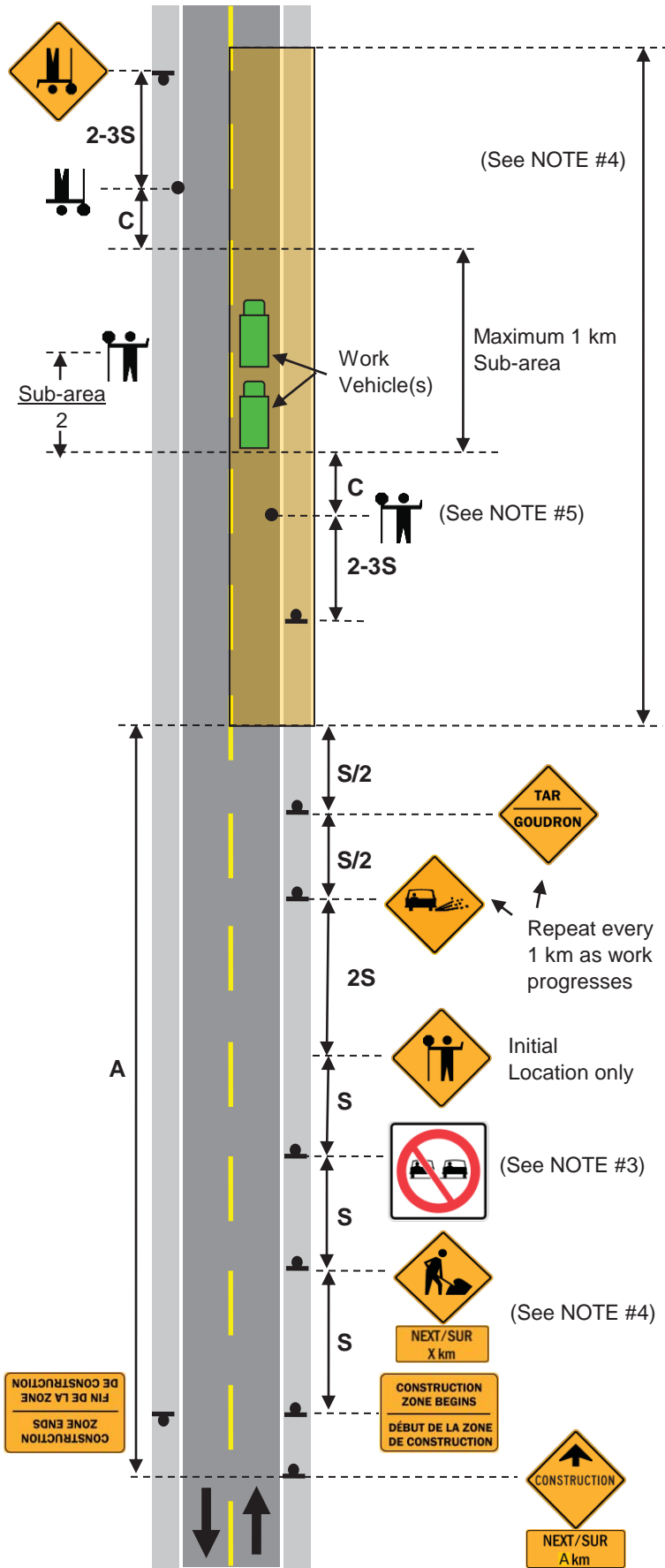
A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

NOTES:

1. Sign opposite approach in the same manner.
2. All work vehicles shall be equipped with 360 degree amber lights as a minimum.
3. No passing sign is optional on roads with less than 300 vehicles per day.
4. The Activity Area shall not exceed 4 km.
5. TCP's move with operation.
6. Follow-me vehicle may be used in lieu of third TCP.

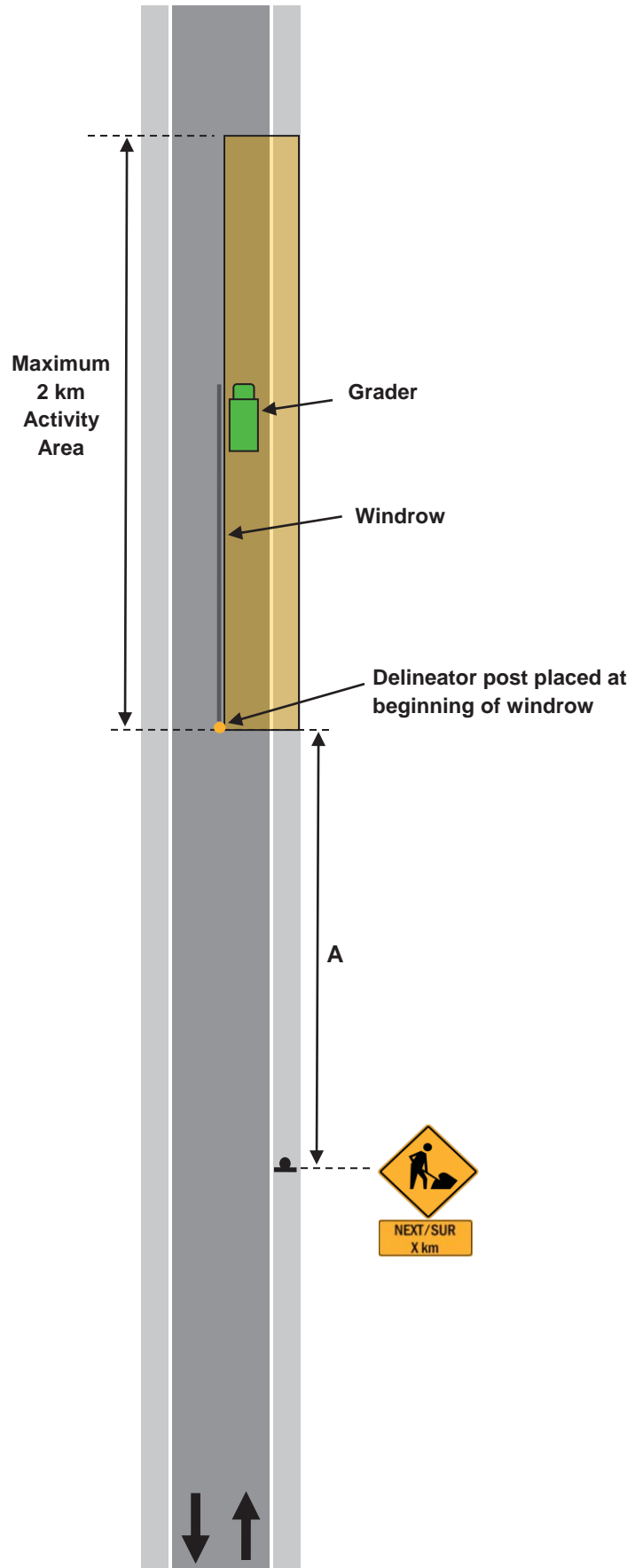


Chip Sealing Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	500	1000	1000
S	50	75	100	150
C	30	40	50	50

V – Existing Speed Limit (km/h)
A – Advance Warning Distance (m)
S – Minimum Sign Spacing (m)
C – Traffic Control Person Setback (m)

NOTES:

1. This layout shall be used for maintenance activities only.
2. Sign opposite approach in the same manner.
3. Grader shall be equipped with 360 degree amber lights as a minimum.



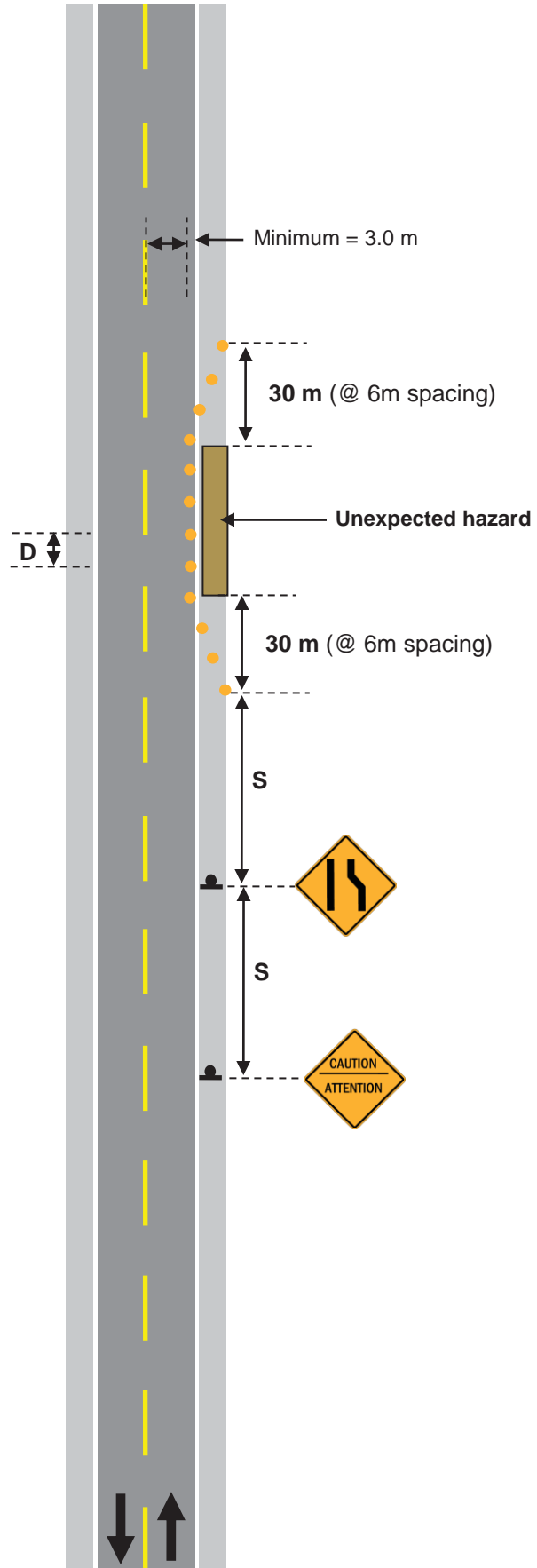
Grading Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100
A	350	350	500	1000

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

NOTES:

1. This layout shall only be used to delineate the hazard until it can be fixed, at which time an appropriate layout such as Figure 7-2, 7-3, 7-4 must be used.



Other Hazards Any Duration All Volumes				
V	50	60-70	80-90	100
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

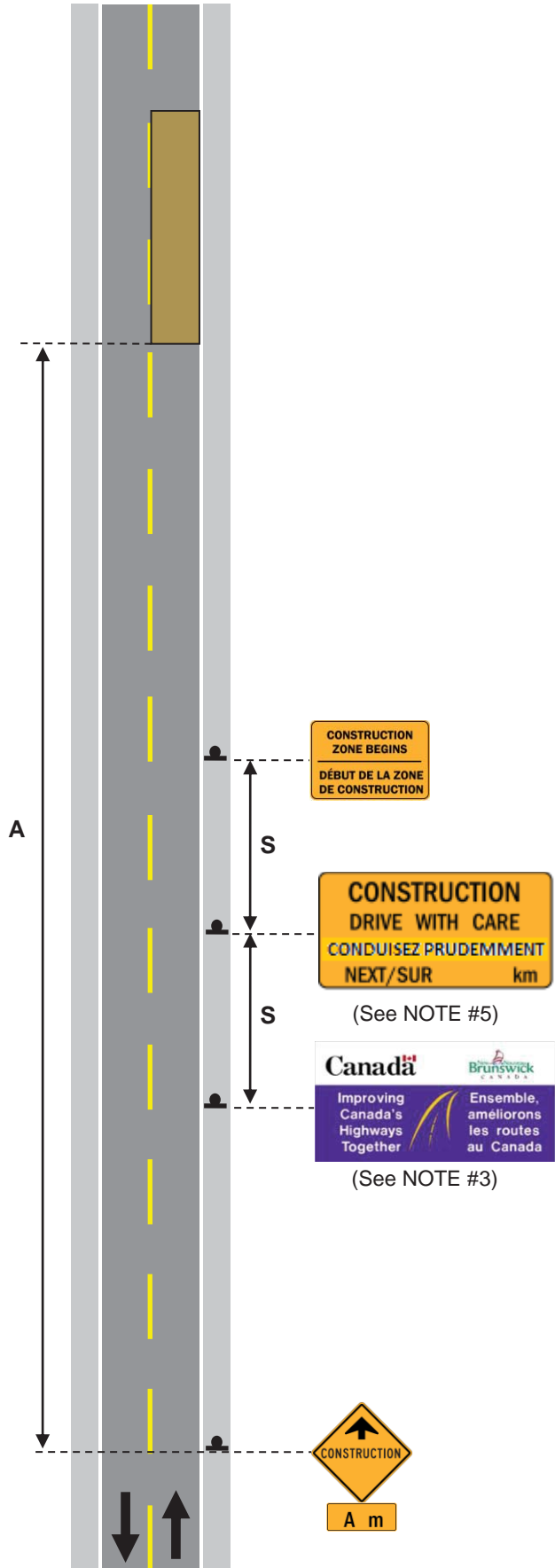
D – Maximum Delineator Spacing in Taper/Tangent (m)

NOTES:

1. Sign opposite approach in the same manner.
2. Do not repeat Construction Ahead or Construction Zone Begins.
3. Only use sign when applicable.
4. When merging Figure 7-31 with other typical layouts, the distance A shall be referenced to the same location as in the accompanying layout.
5. Used for Jobs over 3.0 km.

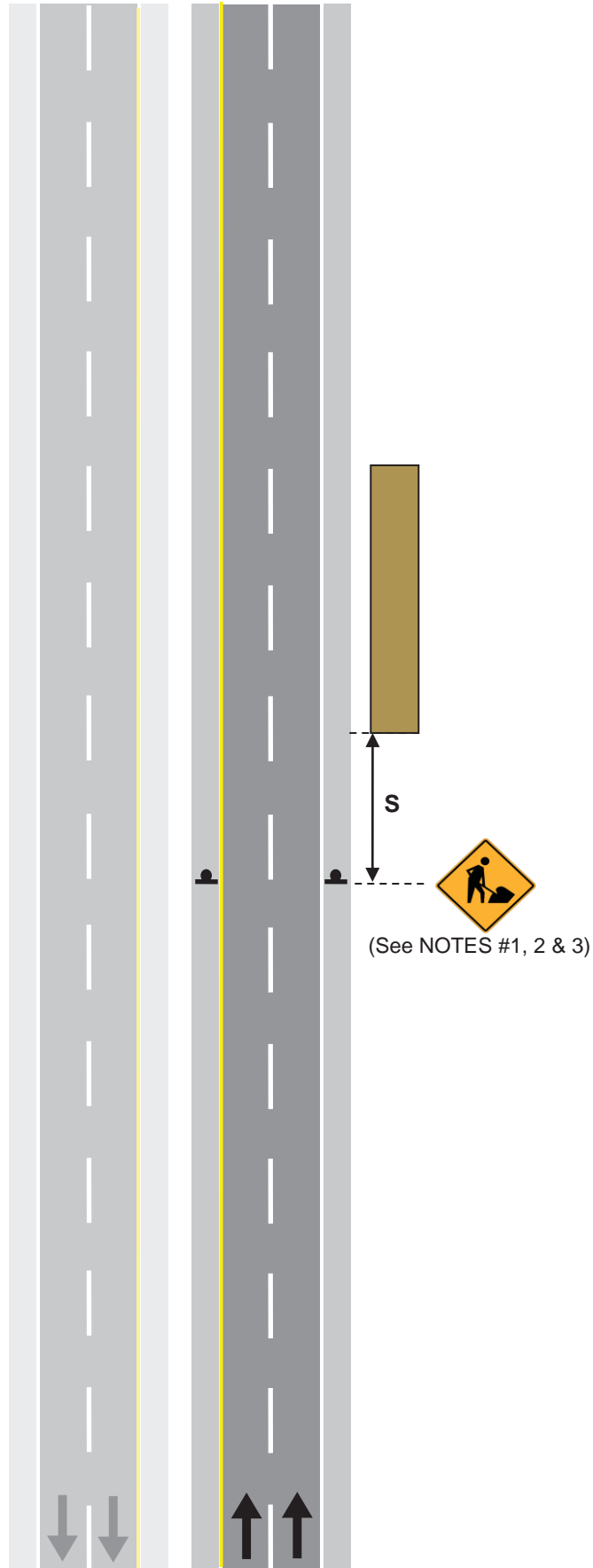
Advance Signing (Major Project) Long Duration All Volumes				
V	50	60-70	80-90	100
A	500	1000	1500	2000
S	50	75	100	150

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)



NOTES:

1. No signs are required for work that occurs outside 15 m from the edge of the travelled lane.
2. No signs are required for work vehicles that are positioned off the shoulder area of the travelled lane for Very Short and Short Duration Work.
3. No signs are required for mowing operations. However, the mower shall be equipped with a 360 degree amber light and a Slow Moving Vehicle Triangle.
4. For mowing operations, the first swath adjacent to the road must be mowed following the direction of traffic.
5. Shoulder must remain clear of all workers, vehicles, and equipment while work is in progress.
6. For work in the median, sign the other direction only if work is within 15 m of the opposing travel lane and no median barrier is present.



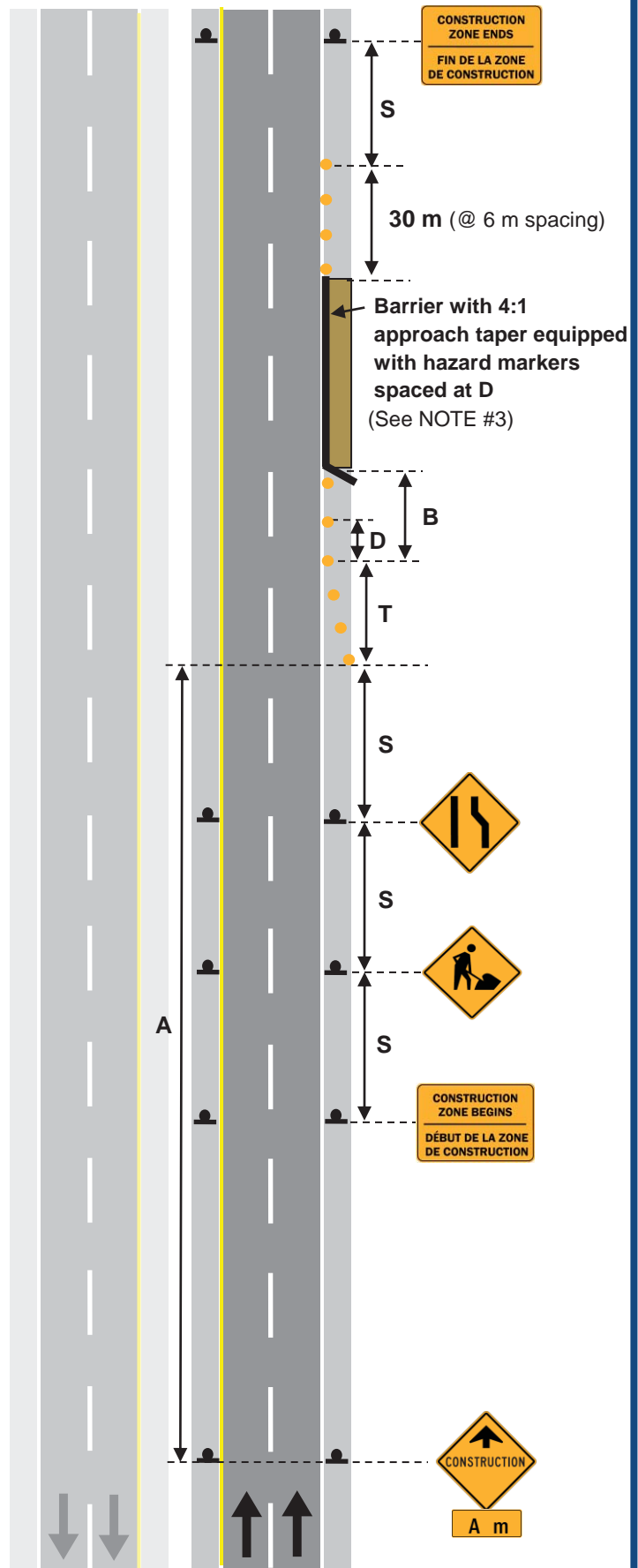
Roadside Work Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150

V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

NOTES:

1. For work on the left shoulder, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present.
2. No workers, equipment, or vehicles shall encroach on the travelled lane.
3. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
4. Figure 8-9 shall be used for long duration shoulder work on bridge structures.



Shoulder Work Long Duration (greater than 1 day) All Volumes				
V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. For work in the left lane, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present.
2. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operations Branch.
4. Road Work sign to be replaced by Survey Crew sign for surveying activities.
5. Delineators may be offset a maximum of 0.8 m from the centreline into the unclosed lane to accommodate patching activities.
6. Left Lane Closed Ahead sign shall be used if work is in the other lane.

MATCH LINE to Figure 8-20
(for Milling or Paving)

**Single Lane Closure
Short / Long Duration
(greater than 30 min)
All Volumes**

V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

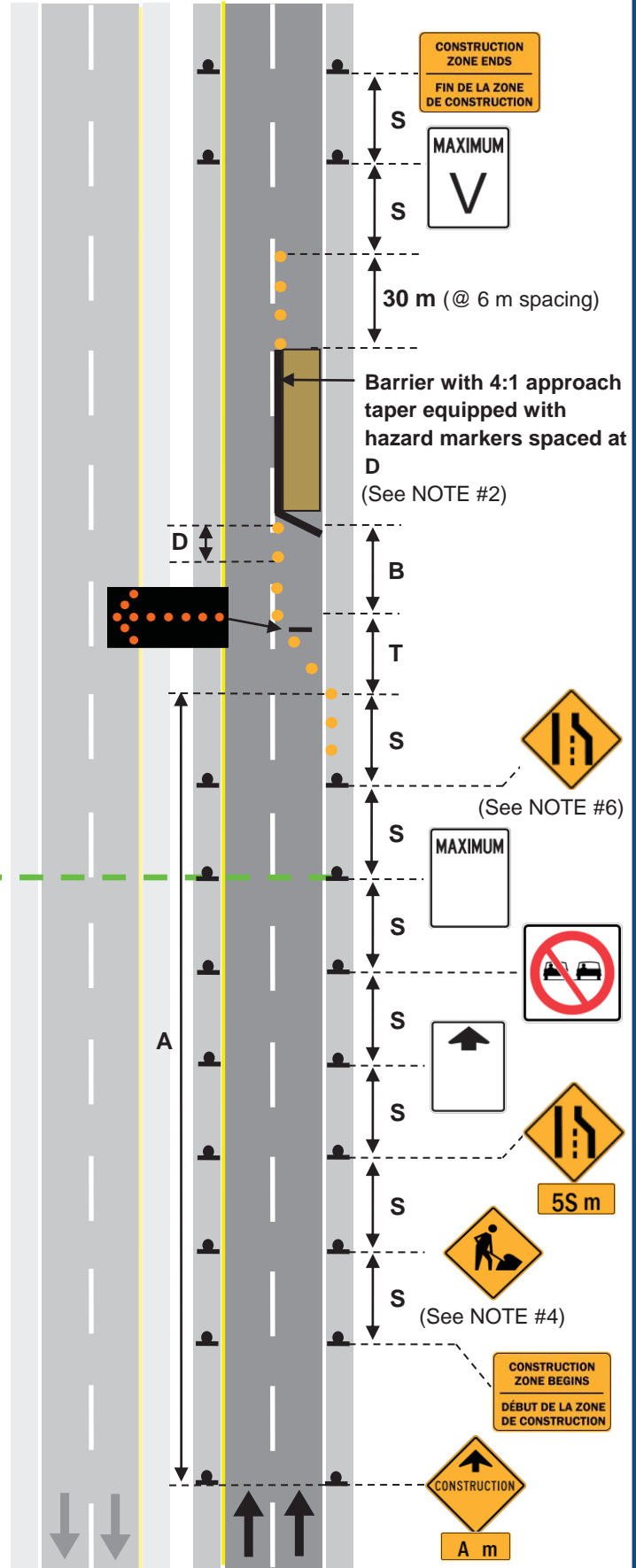
A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

T – Taper Length (m)

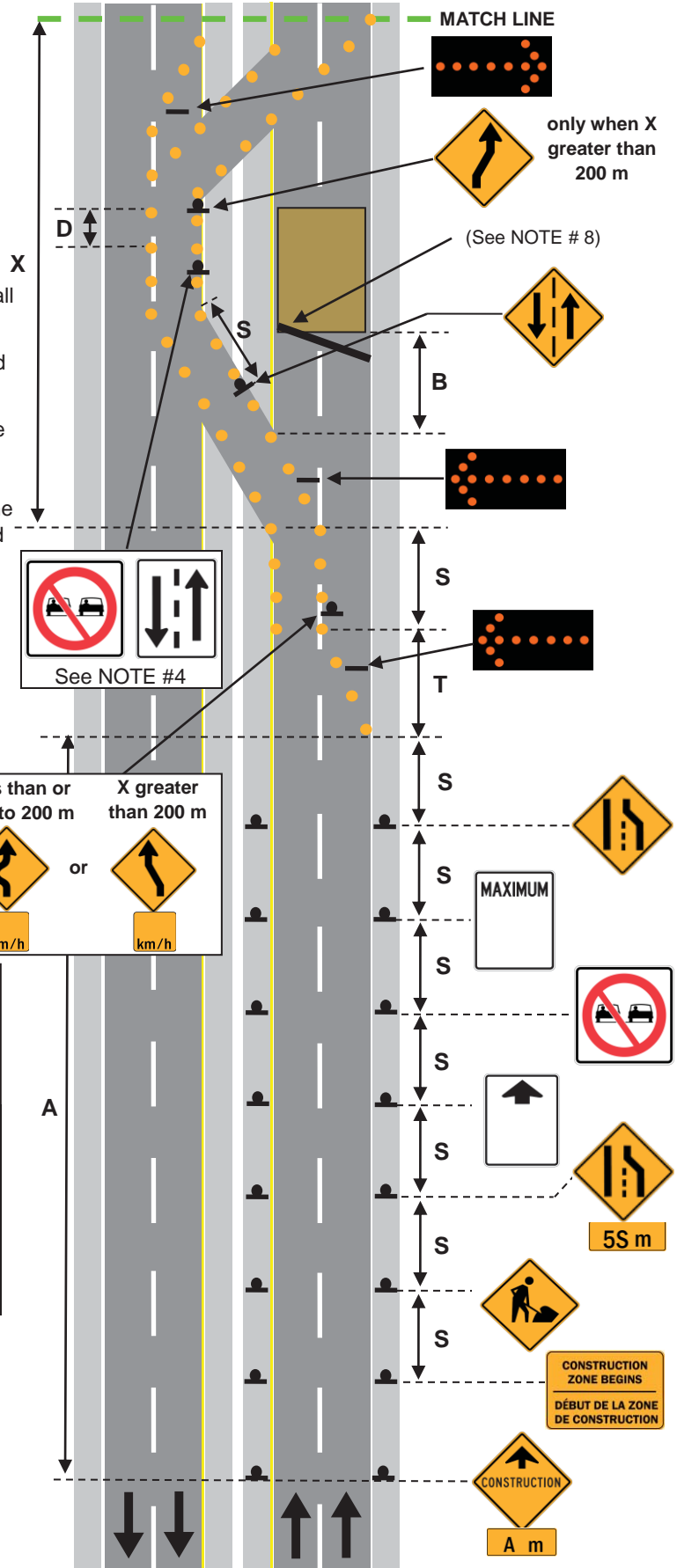
D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)



NOTES:

1. Sign opposite direction as shown in Figure 8-8b
2. X is the length of the Diversion.
3. Diversions that are planned for three days or more shall be paved.
4. Two Way Traffic sign and No Passing sign to alternate at 0.5 km intervals
5. Non-applicable pavement markings shall be removed for Long Duration Work.
6. Regulatory speeds shall not be reduced more than 20 km/h.
7. Advisory speed to be determined by the Department of Transportation and Infrastructure's Operations Branch. Advisory Speed Tabs only required if the difference between the Diversion speed and the reduced speed is greater than 10 km/hr.
8. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



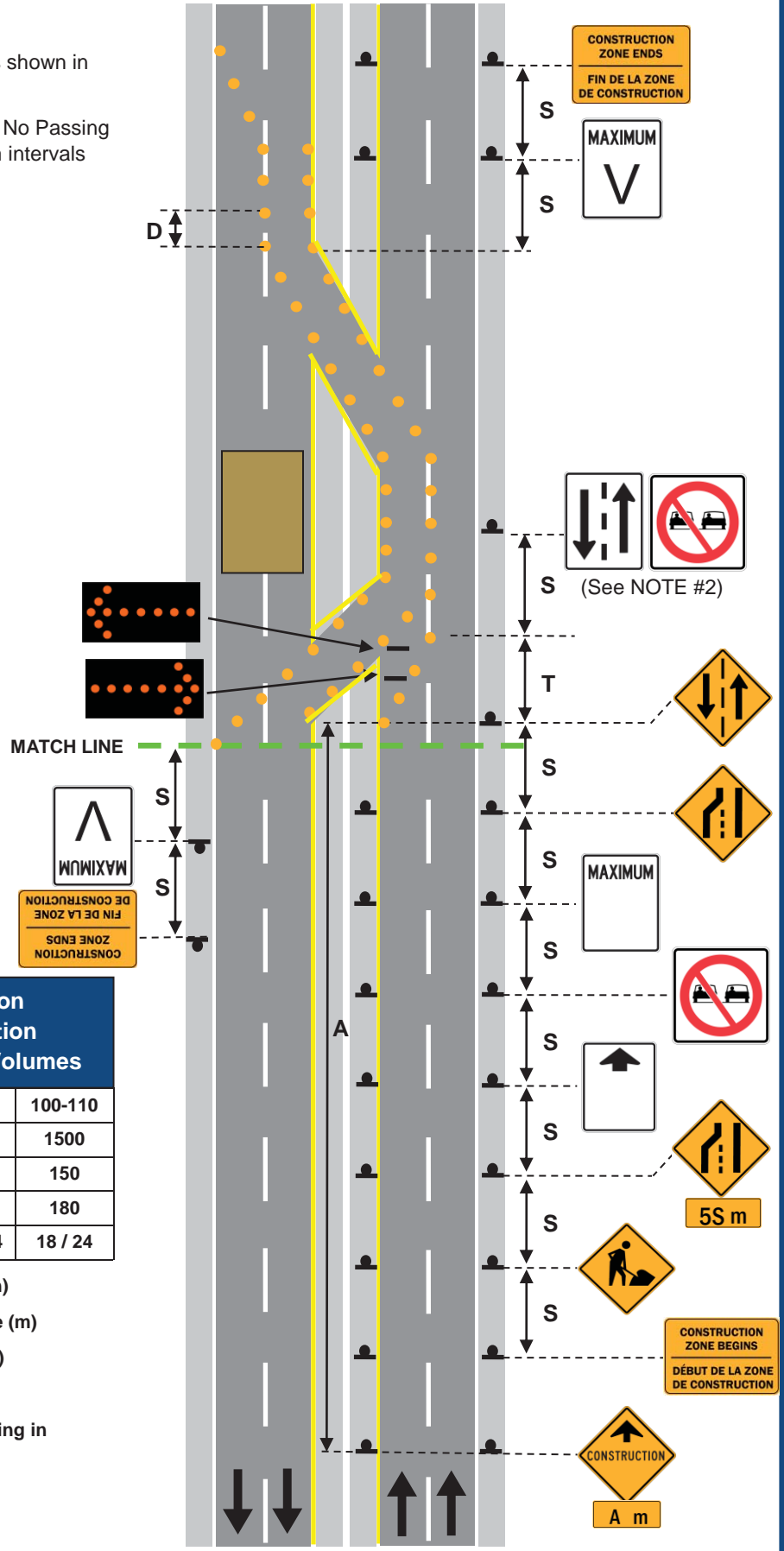
Multilane Diversion Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

Figure 8-8a

NOTES:

1. Sign opposite direction as shown in Figure 8-8a.
2. Two Way Traffic sign and No Passing sign to alternate at 0.5 km intervals

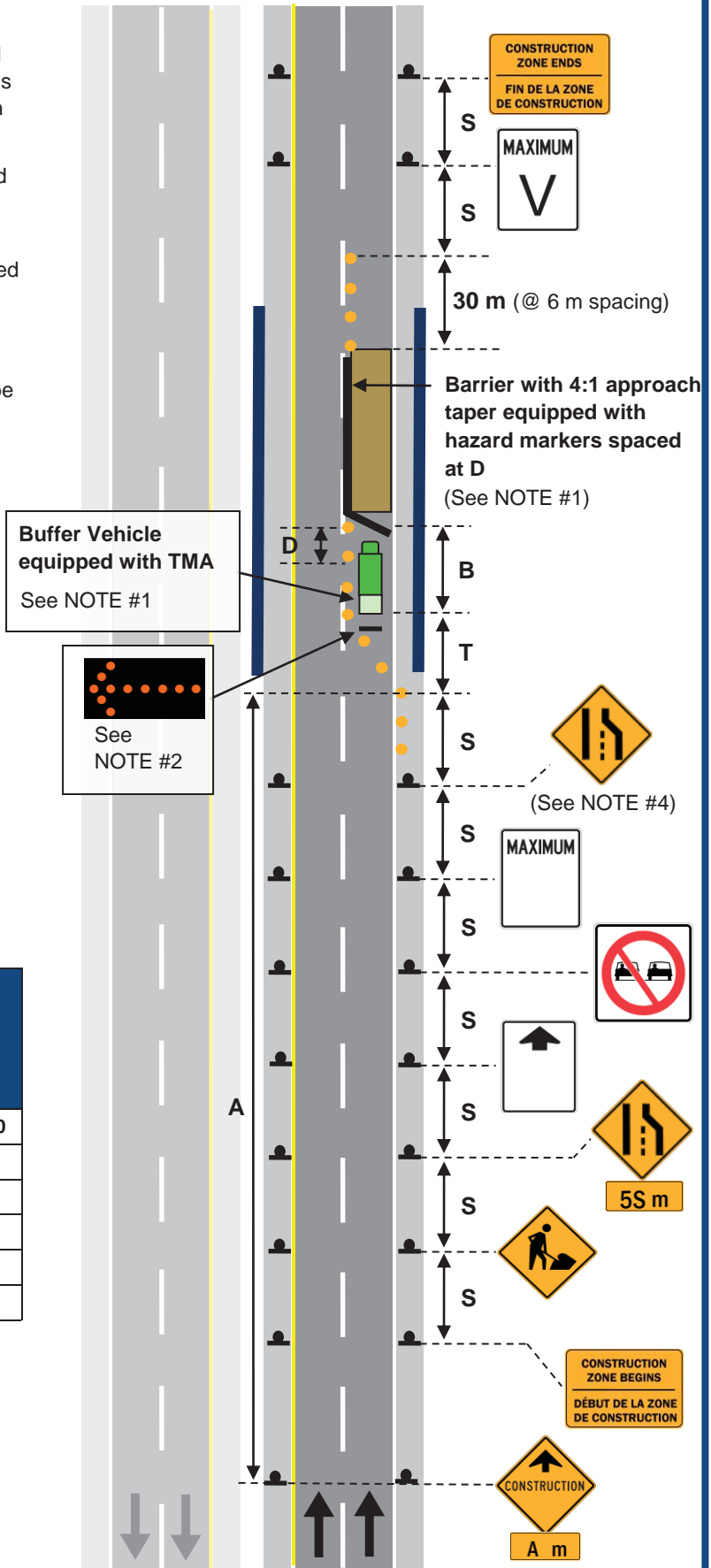


Multilane Diversion Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)
 T – Taper Length (m)
 D – Maximum Delineator Spacing in Taper/Tangent (m)

NOTES:

1. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts for short duration work.
2. Flashing Arrow Board to be mounted on buffer vehicle when used.
3. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operations Branch.
4. Left Lane Closed Ahead sign shall be used if work is in the other lane.

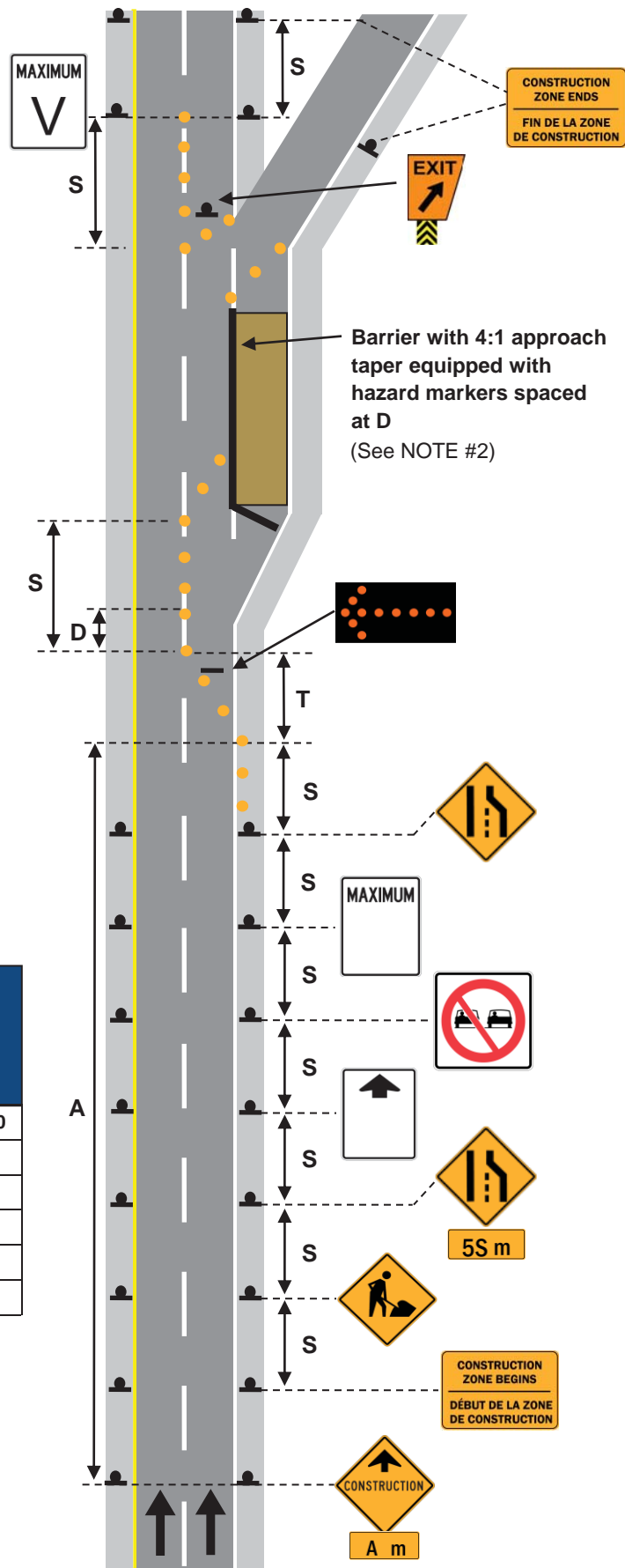


Bridge (Single Lane Closure) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operations Branch.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts if anticipated work duration is 3 days or less.

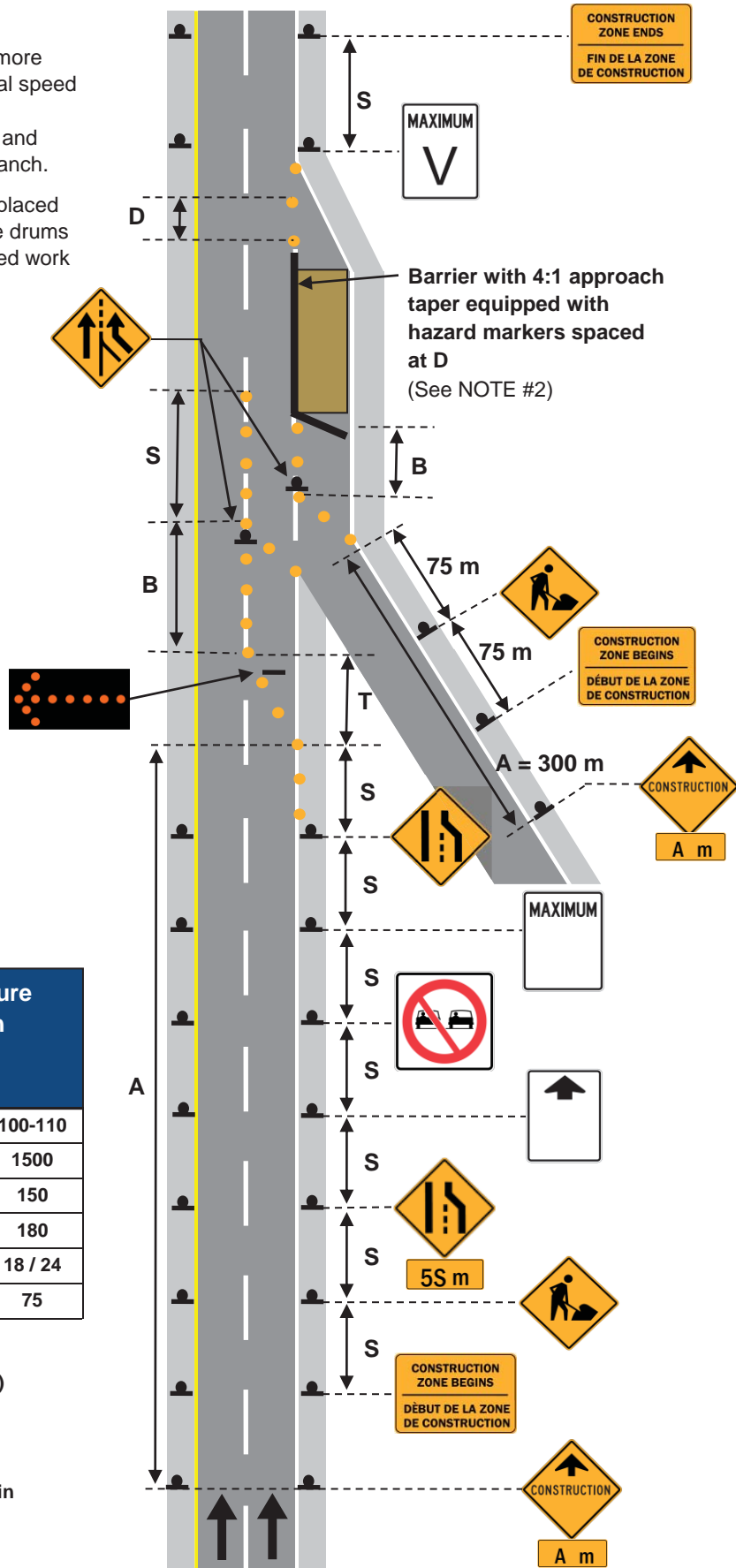


Deceleration Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operations Branch.
2. Continuous Barrier may be replaced by a buffer vehicle and flexible drums or delineator posts if anticipated work duration is 3 days or less.

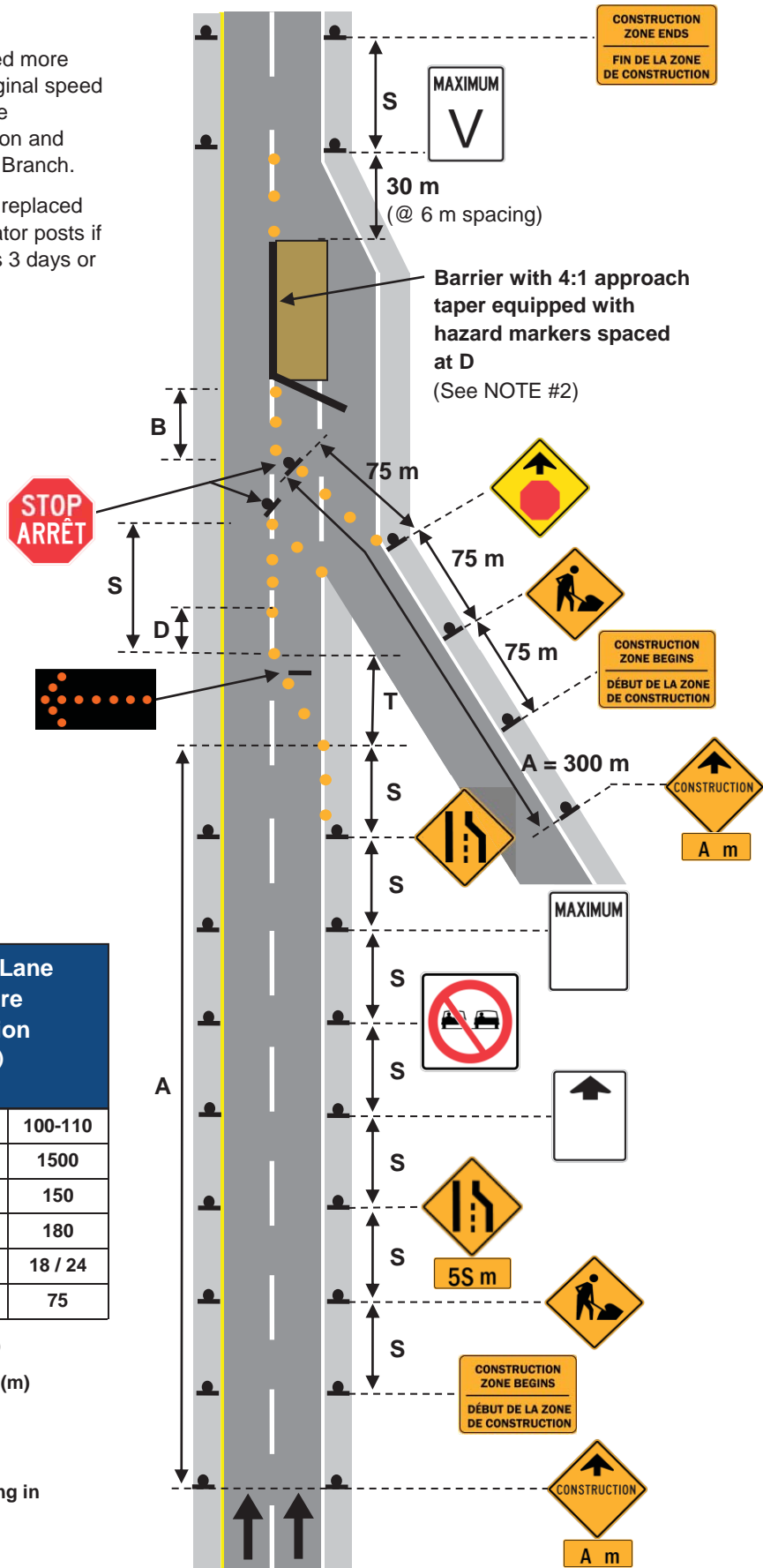


Acceleration Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Speeds shall not be reduced more than 20 km/h below the original speed limit unless approved by the Department of Transportation and Infrastructure's Operations Branch.
2. Continuous barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.



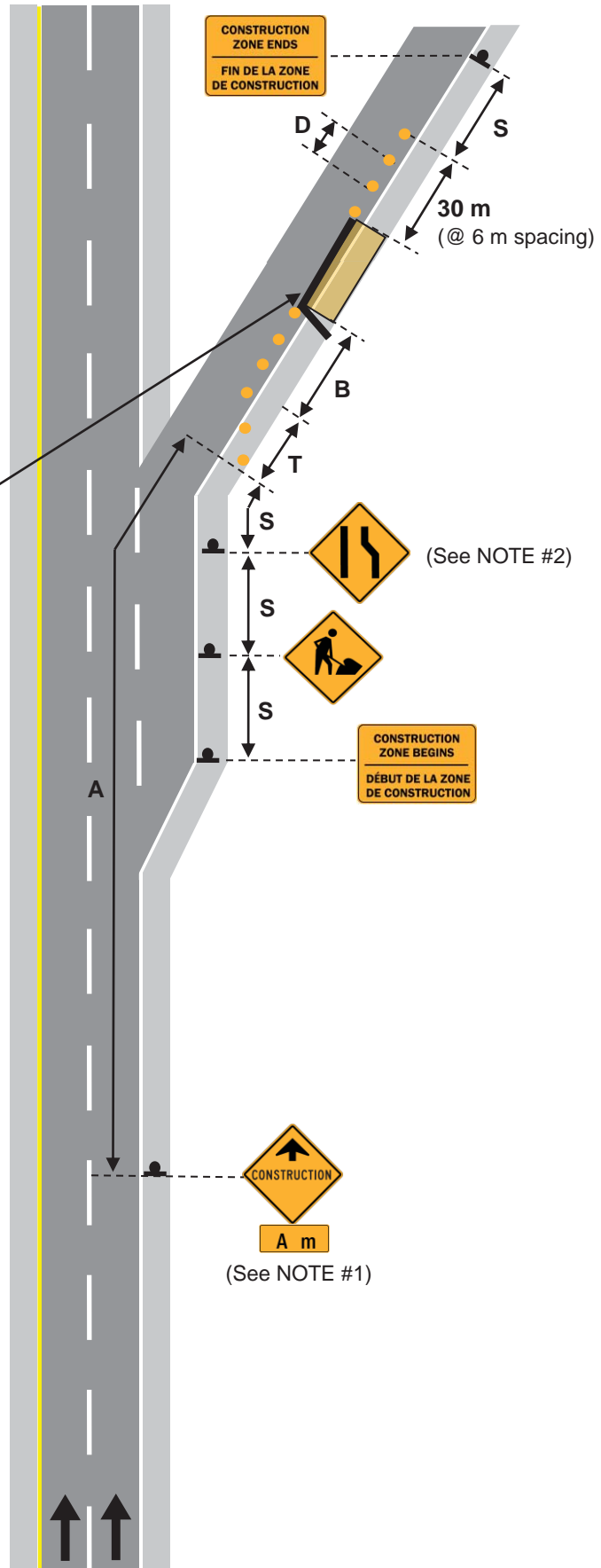
Next to Acceleration Lane Single Lane Closure Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	500	1000	1000	1500
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. Minimum lane width shall be at least 3.0 m adjacent to the activity area.
2. Advisory ramp speed shall be used for determining S, T, D and B values on the ramp. If no advisory is posted, use 60-70 km/h.
3. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
4. Existing advisory ramp speed may be reduced where deemed necessary.

Barrier with 4:1 approach taper equipped with hazard markers spaced at D
(see NOTE #3)

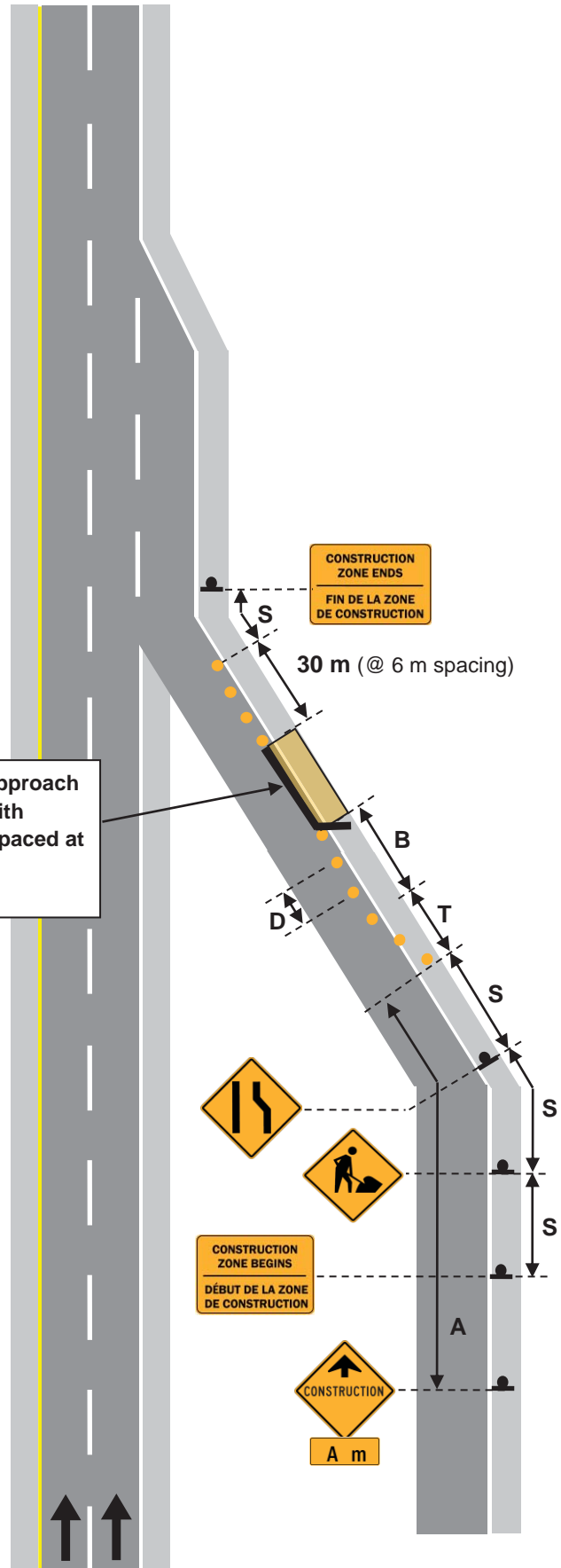


Off Ramp (Partial Lane Closure) Short / Long Duration (greater than 30 min) All Volume				
V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

- V – Existing Speed Limit (km/h)
- A – Advance Warning Distance (m)
- S – Minimum Sign Spacing (m)
- T – Taper Length (m)
- D – Maximum Delineator Spacing in Taper/Tangent (m)
- B – Buffer Area Length (m)

NOTES:

1. If the ramp is too short to provide distance "A", then Construction Ahead signs shall be placed on both approaches on the secondary road and display the appropriate directional arrows.
2. Continuous Barrier may be replaced by flexible drums or delineator posts if anticipated work duration is 3 days or less.
3. Minimum lane width shall be at least 3.0 m adjacent to the activity area.
4. If ramp speed is not posted, use 60-70 km/h for selecting A, S, T, D and B.



Barrier with 4:1 approach taper equipped with hazard markers spaced at D
(see NOTE #2)

On Ramp (Partial Lane Closure) Short / Long Duration (greater than 30 min) All Volumes				
V	50	60-70	80-90	100-110
A	300	300	500	1000
S	50	75	100	150
T	30	64	110	180
D	6 / 8	8 / 10	10 / 14	18 / 24
B	35	50	70	75

V – Existing Speed Limit (km/h)

A – Advance Warning Distance (m)

S – Minimum Sign Spacing (m)

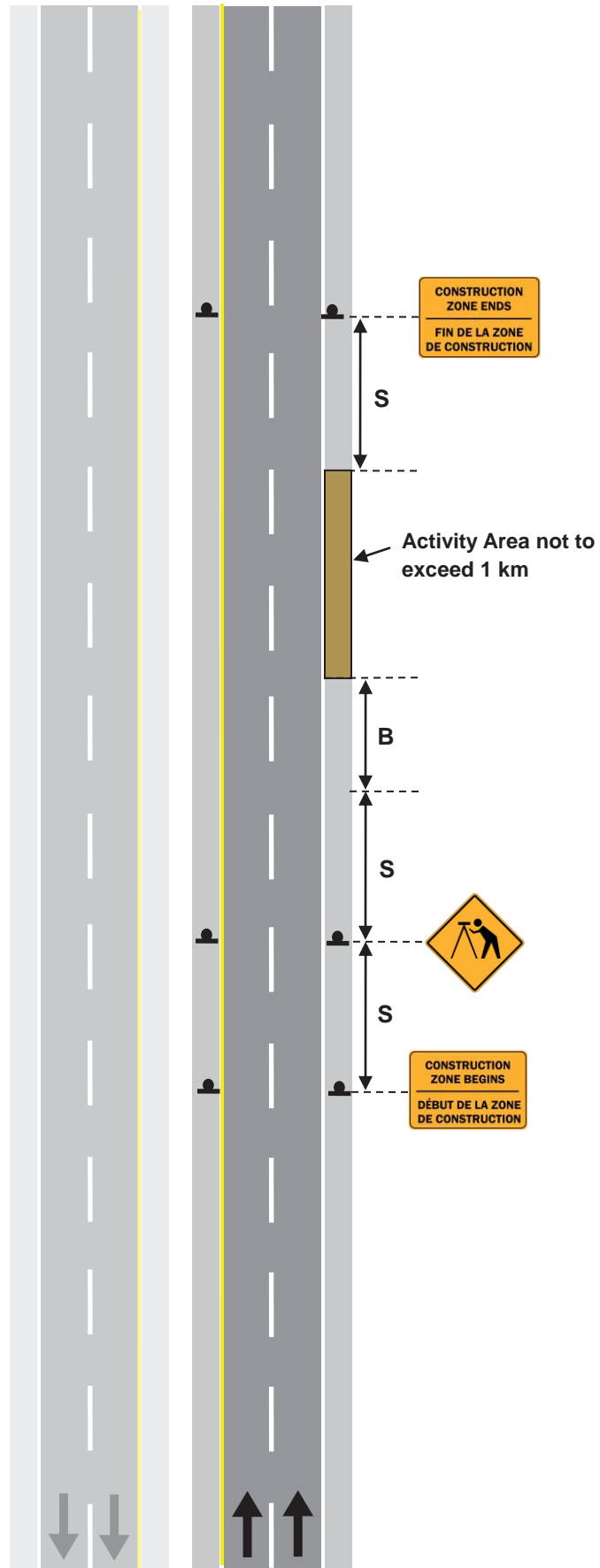
T – Taper Length (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

B – Buffer Area Length (m)

NOTES:

1. For work on the left shoulder, sign the other direction according to Figure 8-1 if work is within 15 m of the opposing travel lane and no median barrier is present (except replace road work sign with survey crew sign).
2. No workers, equipment, or vehicles shall encroach on the travelled lane.
3. A Dedicated Traffic Observer shall be used for survey activities that require occasional trips onto or across the travel lanes. Figure 8-7 shall be used for survey activities carried out primarily in the travelled lane.



Surveying (Shoulder) Short Duration (greater than 30 min, less than 1 day) All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
B	35	50	70	75

V – Existing Speed Limit (km/h)

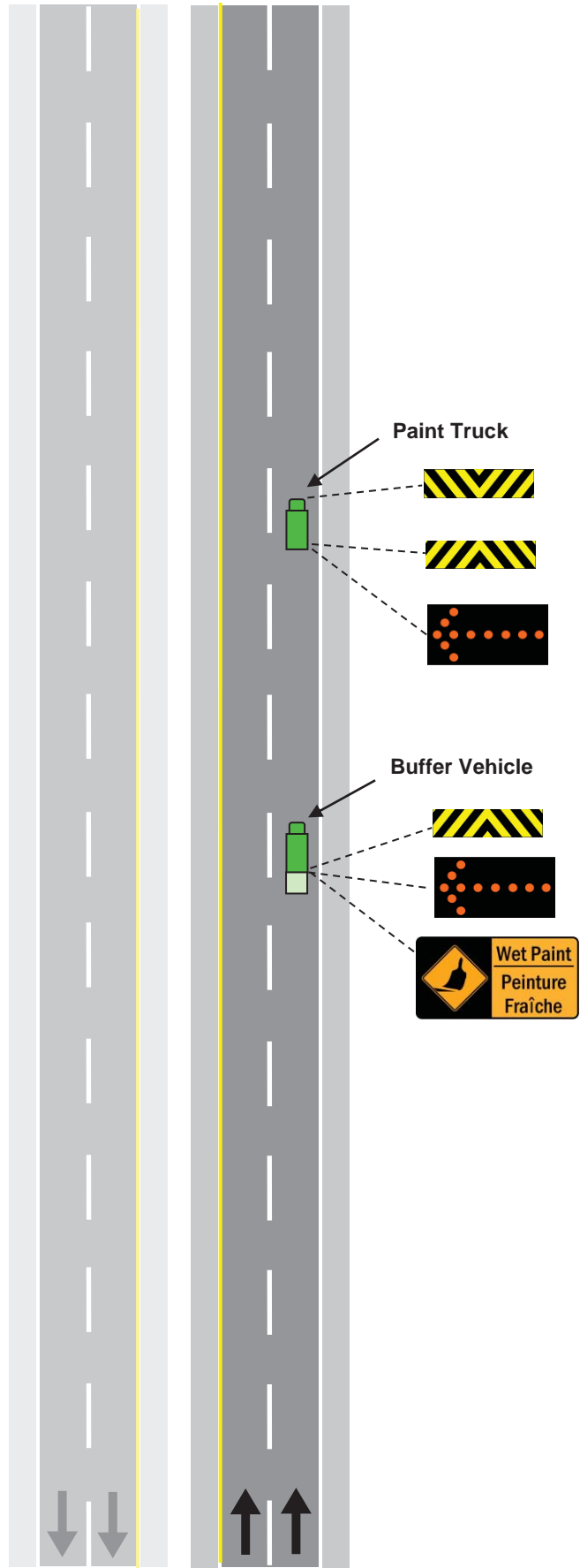
S – Minimum Sign Spacing (m)

B – Buffer Area Length (m)

NOTES:

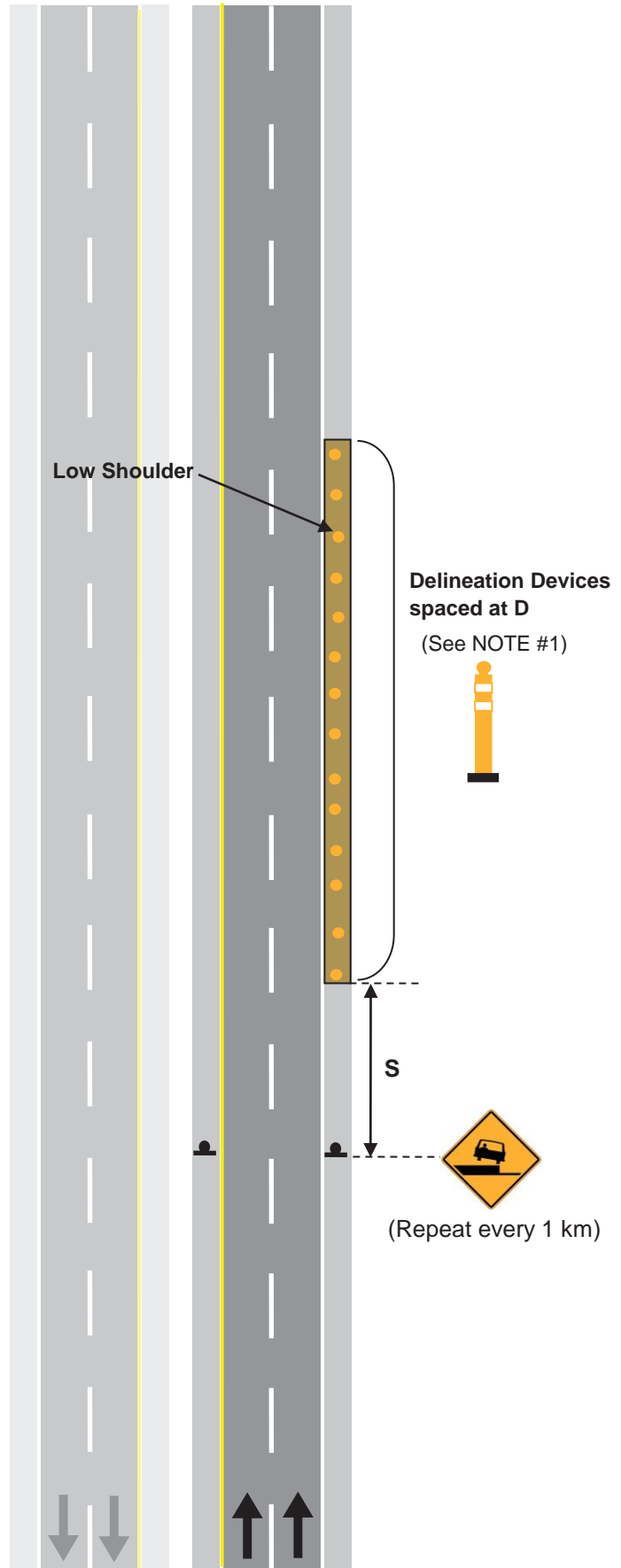
1. Paint Truck and Buffer Vehicle to display right arrow when working in the right travelled lane.
2. An additional trail vehicle may be utilized to control tracking.

**Line Painting
Moving Operation
All Volumes**



NOTES:

1. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm.



Low Shoulder Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
D	8	10	14	24

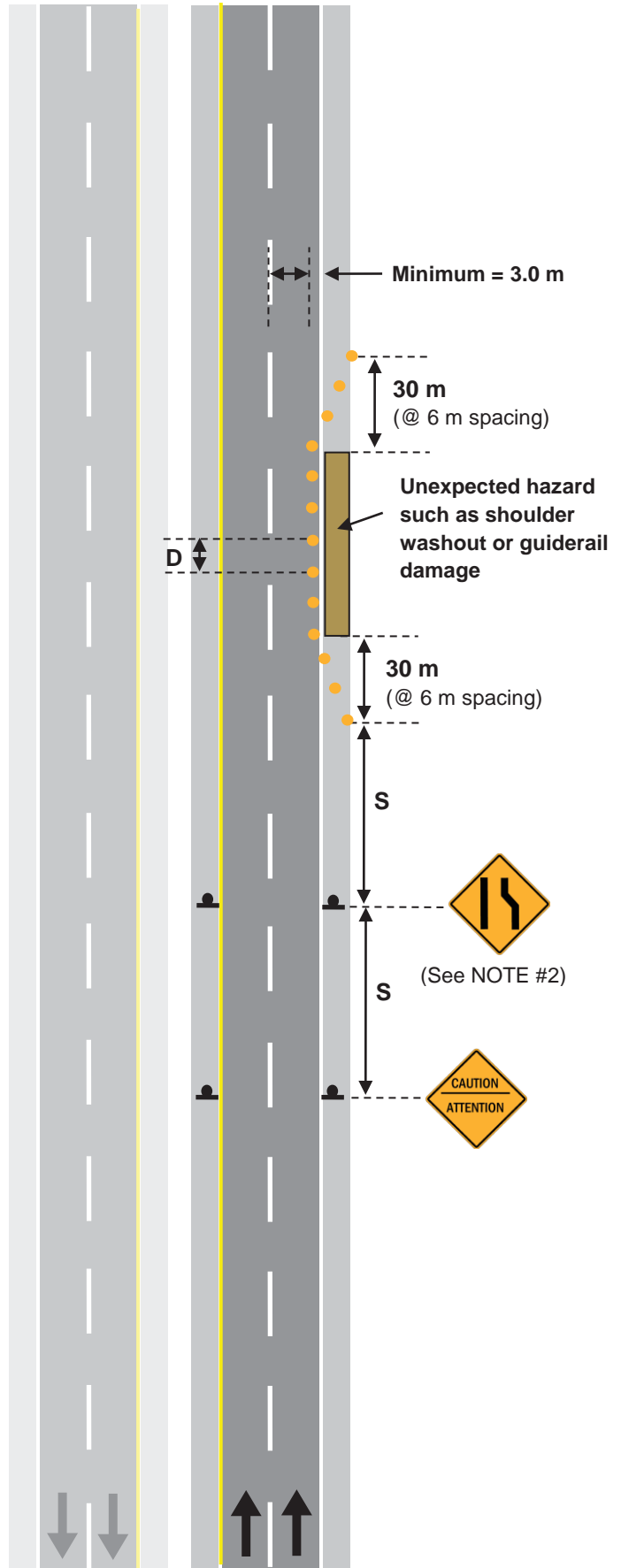
V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing (m)

NOTES:

1. This layout shall only be used to delineate the hazard until it can be fixed, at which time an appropriate layout such as Figure 8-3, 8-4, or 8-5 must be used.
2. Use Left Road Narrows sign if hazard is on the left shoulder.



Other Hazards Any Duration All Volumes				
V	50	60-70	80-90	100-110
S	50	75	100	150
D	6 / 8	8 / 10	10 / 14	18 / 24

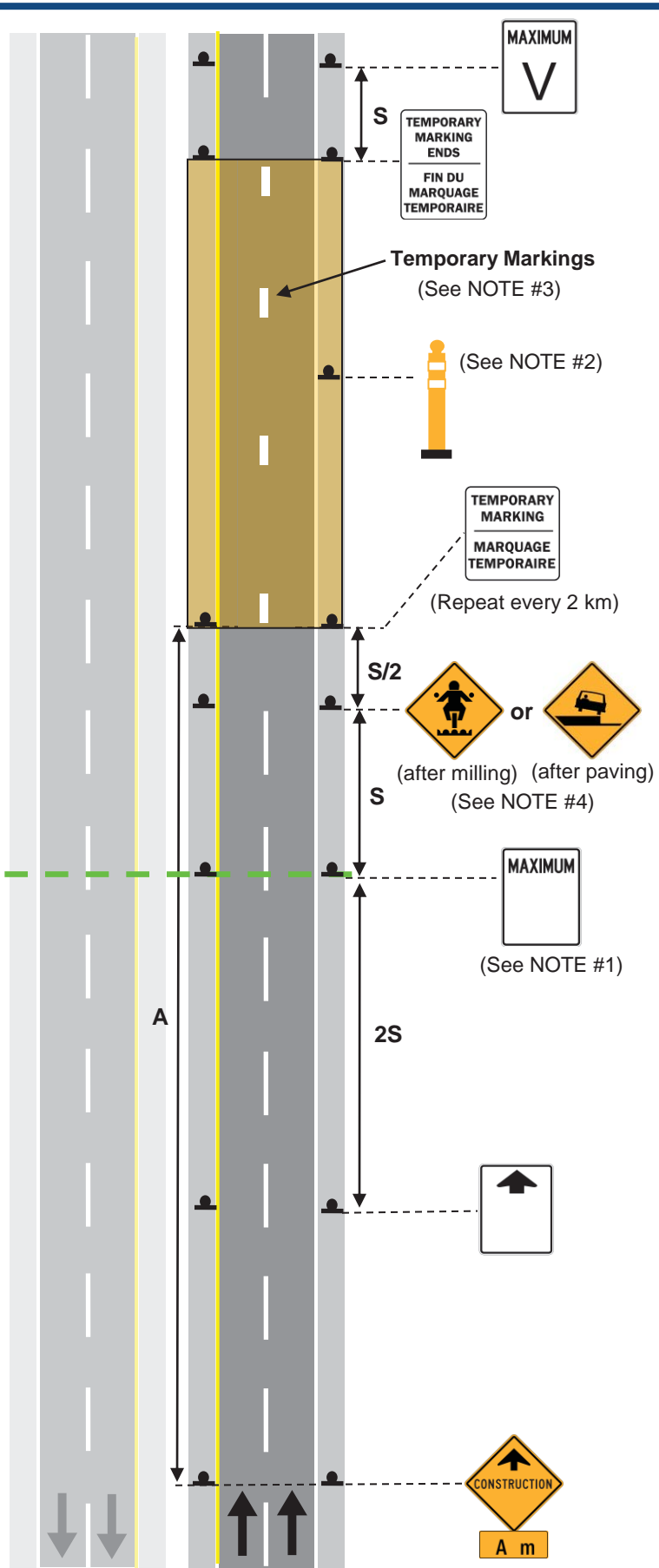
V – Existing Speed Limit (km/h)

S – Minimum Sign Spacing (m)

D – Maximum Delineator Spacing in Taper/Tangent (m)

NOTES:

1. Speeds shall be reduced to a maximum of 80 km/h on all milled surfaces with normal speed limits of 90 km/h or greater.
2. Delineation Devices only required where the difference in elevation between the travelled lane and the shoulder is greater than 75 mm.
3. Pavement marking tape (or paint) shall be applied in 2 m strips and spaced at 50 m on tangents and 25 m or curves. Raised pavement markers shall be installed in groupings of three within a 2 m length and be spaced the same as pavement marking tape.
4. Repeat appropriate sign every 1 km of milled or paved surface.
5. If milling involves full depth removal, then Grooved Pavement sign shall be replaced by Pavement Ends sign.
6. Bump signs shall be used any time there is a differential in surface thickness on the main lanes.

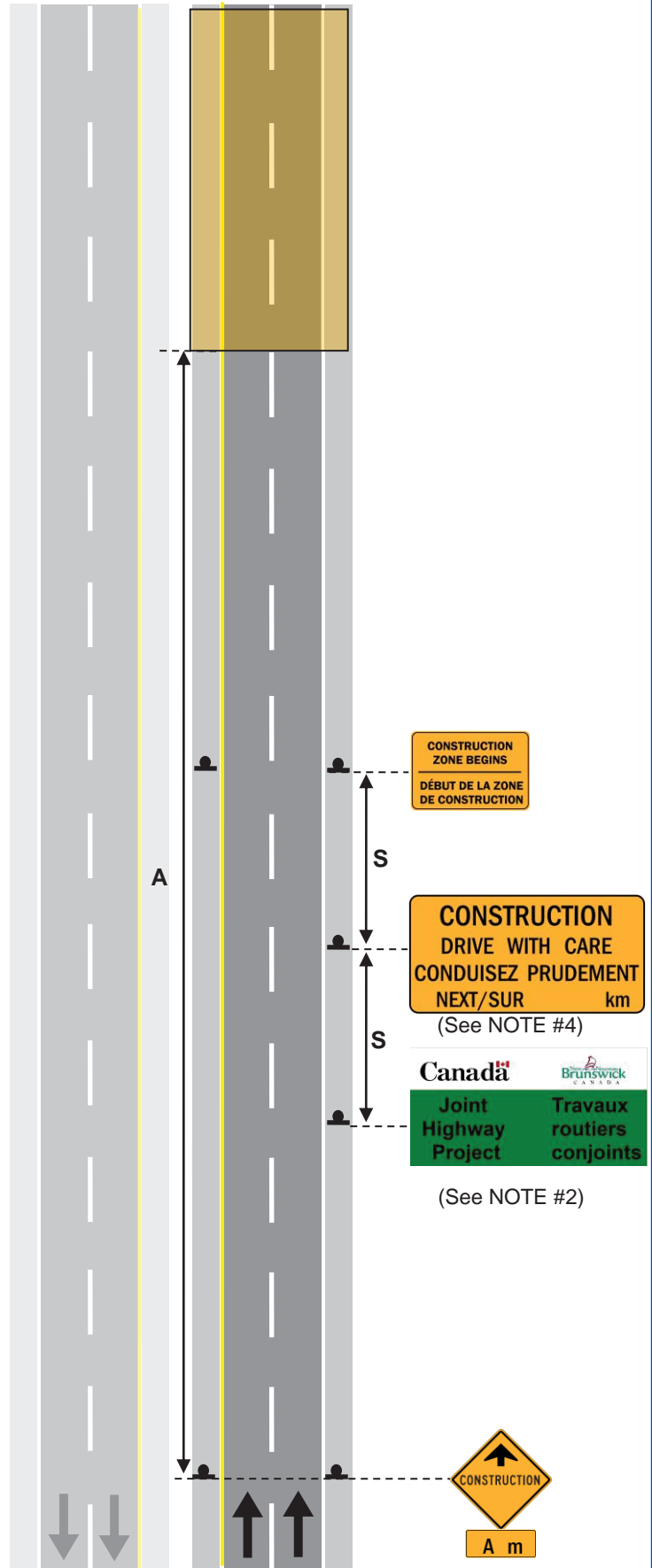


After Milling or Paving Any Duration All Volumes				
V	50	60-70	80-90	100-110
A	300	500	1000	1000
S	50	75	100	150

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)

NOTES:

1. Do not repeat Construction Ahead or Construction Zone Begins.
2. Only use sign when applicable.
3. When merging Figure 8-21 with other typical layouts, the distance A shall be referenced to the same location as in the accompanying layout.
4. Used for Jobs over 3.0 km.



Advance Signing (Major Project) Long Duration All Volumes				
V	50	60-70	80-90	100
A	500	1000	1500	2000
S	50	75	100	150

V – Existing Speed Limit (km/h)
 A – Advance Warning Distance (m)
 S – Minimum Sign Spacing (m)