Developing Supplemental Urban Guidelines for New Brunswick's Work Area Traffic Control Manual

Karen Robichaud, P.Eng., Manager Transportation Engineering, Opus International Consultants (Canada) Ltd., Fredericton, NB
(Presenter)

Darren Charters, P.Eng., Traffic Engineer, City of Fredericton, Engineering and Operations Department

Paper prepared for presentation
at the Better, Faster, Safer Road Maintenance Session

of the 2013 Conference of the
Transportation Association of Canada
Winnipeg, Manitoba

ABSTRACT

This paper presents the findings of a 2012 study to develop new temporary traffic control guidelines for work on urban streets within New Brunswick municipalities. The study was completed by Opus International Consultants (Canada) Ltd. for a joint Steering Committee representing the municipalities of Fredericton, Moncton, Miramichi, and Rothesay.

The new urban traffic control guide is intended to be a supplemental chapter to the provincial Work Area Traffic Control Manual (WATCM) [1], which was released in 2009. The WATCM contains temporary traffic control guidelines exclusively for work on the provincial road network, which is primarily made up of more rural and higher speed facilities.

It has been the experience of several municipalities since the current WATCM was introduced, that many of its guidelines cannot be practically implemented on urban streets due to factors such as:

- Space limitations caused by more frequent driveways, intersections, and existing roadside signage;
- The presence of additional road cross section features such as turning lanes, curbs, gutters, bicycle lanes, and sidewalks (as opposed to shoulders and ditches); and
- Higher volumes of pedestrians, cyclists, and other road users.

Furthermore, the WATCM contains very limited guidance for work in the vicinity of intersections, bike lanes, and sidewalks.

The new document provides specific guidance for implementing temporary traffic control on urban streets with posted speed limits of 50 and 60km/h, while taking the above constraints into account. It also includes 31 typical layouts developed based on the Transportation Association of Canada's (TAC's) Manual of Uniform Traffic Control Devices for Canada (MUTCDC) [2], New Brunswick's WATCM, and manuals from other North American jurisdictions.

Finally, the study identified several gaps in the MUTCDC, as well as inconsistencies with guides from other jurisdictions, which TAC may wish to address in future versions of the MUTCDC.

It is envisioned that the new guide will result in a greater level of consistency for temporary traffic control amongst New Brunswick urban municipalities. Furthermore, it will ensure that consistent practices are implemented on both the provincial and municipal road networks.

1. INTRODUCTION

This paper presents the findings of a 2012 study to develop new temporary traffic control guidelines for work on urban streets within New Brunswick municipalities. The study was completed by Opus International Consultants (Canada) Ltd. for a joint Steering Committee representing the municipalities of Fredericton, Moncton, Miramichi, and Rothesay.

The new urban traffic control guide is intended to be a supplemental chapter to the provincial Work Area Traffic Control Manual (WATCM) [1], which was released in 2009. It is applicable to urban roads with speed limits of 60 km/h or less. The WATCM contains traffic control guidelines exclusively for work on the provincial road network, which consists primarily of rural roadways with speeds of 70 km per hour or higher. It was developed as a supplement to the Manual of Uniform Traffic Control Devices for Canada (MUTCDC) [2].

2. BACKGROUND

It has been the experience of several municipalities since the current WATCM was introduced, that many of its guidelines cannot be practically implemented on urban streets due to factors such as:

- Space limitations caused by more frequent driveways, intersections, and existing roadside signage;
- The presence of additional road cross section features such as turning lanes, curbs, gutters, bicycle lanes, and sidewalks (as opposed to shoulders and ditches); and
- Higher volumes of pedestrians, cyclists, and other road users.

Furthermore, both the WATCM and the MUTCDC contain very limited guidance for work in the vicinity of intersections, bike lanes, and sidewalks.

3. APPROACH

The urban manual was developed as a supplemental chapter to the current WATCM. It contains 13 sections, as shown in Table 1, including 31 figures showing typical layouts for work zones in two and four lane roadway segments, intersections, bicycle lanes, and sidewalks.

The MUTCDC was the primary source of information. However, there were several types of work areas that were not adequately addressed, or not included at all, in the MUTCDC. Manuals from 14 other jurisdictions were reviewed along with typical layouts currently being used by members of the Steering Committee to develop guidelines for these work areas. The 14 jurisdictions reviewed are listed below:

- Edmundston, New Brunswick [3]
- Province of Nova Scotia [4]
- Province of Prince Edward Island [5]
- Province of Newfoundland and Labrador [6]
- Province of Québec [7]
- Winnipeg, Manitoba [8]
- Brandon, Manitoba [9]
- Regina, Saskatchewan [10]
- Province of Alberta [11]
- US Department of Transportation Federal Highway Administration [12]
- State of Oregon [13]
- State of Washington [14]
- New Zealand [15]
- United Kingdom [16]

The gaps in the MUTCDC are presented in this paper along with a brief description of how they were addressed in the New Brunswick manual. The remainder of the paper has been structured as follows:

- Section 4 describes urban work area issues that the study team believes are not adequately addressed by the MUTCDC;
- Inconsistencies within the MUTCDC are identified in Section 5;
- Section 6 presents several unique aspects of the New Brunswick urban manual;
- Next steps for implementing the manual are discussed in Section 7; and
- Section 8 contains conclusions and recommendations for improving the MUTCDC.

4. SITUATIONS NOT ADEQUATELY ADDRESSED BY THE MUTCDC

There were six topics identified by the Steering Committee for which there was little information in the MUTCDC: i) lateral sign placement on urban streets, ii) work areas in roundabouts iii) work areas in bike lanes, iv) very short term operations, v) work areas in the centre of a road and vi) intersections. Each of these is further described below.

Lateral Sign Placement on Urban Streets.

The presence of additional roadside constraints often makes it difficult (if not impossible) to adhere to the guidelines for lateral placement of signs in New Brunswick's current WATCM. The MUTCDC and other guides reviewed contain only general guidelines on lateral placement on urban streets. Specific guidelines were provided in the urban guide for three cross sections:

- Signs at the roadway edge between the curb and travel lane;
- Signs in the boulevard between the curb and sidewalk; and
- Signs on the sidewalk.

The guidelines also address sign size, parking, bike lanes, and pedestrian considerations for lateral placement. The more detailed lateral placement guidelines from the New Brunswick manual are shown in Figure 1.

Work Areas in Roundabouts

Roundabouts present unique challenges for implementing temporary traffic control because they are not designed to accommodate stopped or waiting traffic. None of the Canadian manuals reviewed contained guidelines on work zones in roundabouts. A typical diagram for a work area in the circulatory road of a roundabout was included in the manuals for the states of Washington and Oregon. However, the diagrams were very complex requiring traffic flow in both directions in the circulatory road which may not be desired, or even possible in some situations, due to the geometry of entry lanes.

In New Zealand and the United Kingdom, where roundabouts are more common, agencies require custom traffic control plans for work areas in roundabouts because of the wide range of factors that must be considered. The manuals for these jurisdictions do not contain typical diagrams for roundabouts. The UK manual [16], however, does provide general guidelines and diagrams to assist in preparing a custom plan. This was the approach adopted for the New Brunswick manual. The diagrams in Figure 2 showing options for maintaining flow within the circulatory road were included in the urban guide along with general guidelines on minimum lane widths, trucks, and detours.

Work Areas in Bike Lanes

The MUTCDC includes two figures showing traffic control layouts for detouring pedestrians around urban work areas. However, there are no typical layouts provided for bike lanes and little guidance was available in the other Canadian manuals reviewed. The Steering Committee identified this as a growing issue and requested a typical diagram be included in the urban manual for work areas in bike lanes. Two figures were developed for the manual – one for a bike lane closure and one for a bike lane detour. They are shown in Figure 3.

Very Short Term Operations

Very short term operations such as roadway patching, manhole flushing, and pre-marking are an issue because the work vehicle and crew often block a lane for a very short period (less than 15 minutes) and a traffic control person is required to stop traffic in advance of the work area. The setup for a full lane closure is not warranted because of the very short duration of the work. However, the work vehicle and patching crew do stop intermittently so the operation cannot be considered a moving one either.

A typical layout was developed for very short operations including patching. It is shown in Figure 4 and consists of a road work sign, traffic control person ahead sign, and a traffic control person. The traffic control person's role is to stop traffic briefly while the road is patched, not to direct traffic into the other lane around the work vehicle.

Work Areas in the Centre of an Urban Roadway

Members of the Steering Committee requested a typical diagram for work areas in the centre of an urban roadway. This situation is not covered by the MUTCDC for 2-lane roads but is included in the US MUTCD [12] and the manual for the Province of Alberta [11]. A diagram was developed for very short and short duration work areas based on the US manual. It is shown in Figure 5.

Intersections

The urban manual for New Brunswick contains 11 typical diagrams for work areas in intersections plus a section on general guidelines as well. They are based on the 14 intersection diagrams in the MUTCDC with the following revisions:

- Sign layouts are included for all intersection approaches, not just the two approaches on the road where the work area is located;
- A traffic control person is required on each approach to the intersection rather than just two on the approaches to the work zone;
- The work areas on the near sides of the intersection approaches contain buffer areas;
- The diagrams including traffic control persons (i.e. single lane approaches with no turning lanes) do not apply to long duration work areas where a traffic control person would be required at night. A customized plan using signals or signs is required for work areas lasting more than one day;
- Light barricades are shown rather than heavy barricades for work areas with a duration of less than one day;

Guidelines are also provided for the following situations not covered in the MUTCDC:

- Single lane approaches to signalized intersections (rather than stop-controlled intersections);
- Intersection approaches with a single through lane and one or more turning lanes; and
- Work areas in two lanes on the near or far side of an intersection of a four lane road.

In summary, the MUTCDC guidelines for temporary traffic control could be improved by adding new figures for facilities such as bike lanes and intersection approaches, and additional guidelines to assist users for preparing plans for non-typical situations such as roundabouts and constrained road cross-sections.

5. INCONSISTENCIES WITHIN THE MUTCDC

Two inconsistencies in the layouts for temporary traffic control in the MUTCDC were noted over the course of the project:

- Buffer areas were not included in the work areas on single lane approaches to intersections but were included in the areas on multilane approaches. Examples from the MUTCDC are provided in Figure 6.

- Two times the minimum spacing (2A) was specified between the warning signs for traffic control and the traffic control device (or person) on roadway sections while the minimum spacing was specified between the warning sign and device on intersection approaches (see Figure 7).

Buffer areas were included in work areas on the approaches to all intersections in the New Brunswick manual. A range of 50 to 100 m was specified as the spacing between warning signs and traffic control devices (included Traffic Control Persons) in recognition that longitudinal space is often constrained in urban environments.

6. MADE IN NEW BRUNSWICK SOLUTIONS

This section describes several revisions that were made to the typical diagrams in the MUTCDC to simplify the work area plans in the urban guide and remain consistent with the other chapters of the New Brunswick WATCM.

Work Area Lengths and Delineator Spacings

Minimum lengths for various work area components, sign spacings, and delineator spacings were established for both 50 and 60 km/h posted speed limits. The lengths and spacings do not vary with the two speed limits to simplify the diagrams and set-up procedures. The values from the urban manual are presented in Table 2.

Minimum Spacing between Signs

All of the diagrams in the MUTCDC have a minimum spacing between signs of 50 m or more. However, Section D2.3.1 of the manual does allow for adjustment of the spacings shown in the diagrams based on actual or anticipated field conditions. The US MUTCD [12] allows a minimum spacing of 30 m in urban low speed environments as does the City of Brandon, MB [9]. The Province of Alberta [11] allows 25 m spacing between signs. The diagrams in the NB urban manual show a minimum spacing of 50 m between signs consistent with the MUTCDC. However, the general guidelines in

Sections 6 and 11 allow the spacing to be reduced to 30 m if longitudinal space is restricted provided the first warning sign is located at least 100 m from the Activity Area. A minimum distance of 100 m was specified to ensure drivers have sufficient stopping sight distance between the first sign and the Activity Area.

Road Class

Typical diagrams are provided for local roads and major roads in the NB manual. The manual, however, does not provide guidance on designating roads as local or major. It is each municipality's responsibility to identify the major and local roads in their network. This approach was taken to further simplify the manual.

Work Location

The MUTCDC specifies three locations for work areas – on the shoulder, encroaching on a lane, and within a full lane. It was found that the diagrams in the MUTCDC were very similar for work areas on the shoulder, and for work areas that encroached on a lane. These two locations were combined into one location called Roadway Edge to reduce the number of diagrams and simplify the selection procedure in the NB manual.

Lane Closure Taper Sign

The lane closure taper sign is not used in New Brunswick for rural work areas. This same approach was taken for the urban manual to remain consistent with the other chapters of WATCM and to minimize the number of signs required for controlling traffic in a work area. The rationale is that the Lane Closed Ahead sign, Lane Closure Arrow sign, and delineators are sufficient to warn drivers and inform them of the required action in 50 and 60 km/h speed zones.

Construction Ends Warning Sign

The diamond shaped Construction Ends Warning sign for long duration projects was replaced with a rectangular Construction Zone Ends information sign used in New Brunswick to enforce speeding legislation. It was assumed that contractors would be more likely to have the rectangular sign rather than the warning sign.

7. NEXT STEPS FOR NEW BRUNSWICK

The urban manual was completed in January and will be implemented this year by the four municipalities on the Steering Committee. The Steering Committee has asked the New Brunswick Department of Transportation and Infrastructure (NBDTI) to adopt the manual as a new chapter in the existing WATCM [1]. If this happens, then NBDTI will:

- Assume responsibility for translating the manual into French;

- Make it publicly available on the government website;
- Provide training, and
- Update the content based on feedback from the users.

It is anticipated that there will be a fairly high volume of feedback as the manual is tested in the field this summer and revisions to the current version will be required next year.

8. CONCLUSIONS AND RECOMMENDATIONS

There are several gaps in the Transportation Association of Canada's (TAC) Manual of Uniform Traffic Control Devices for Canada (MUTCDC) [2] regarding urban work areas including:

- No information on work areas in roundabouts or bike lanes;
- Limited guidance on lateral placement of temporary signs on urban roads; and
- Limited guidance on traffic control for very short duration operations and on work areas in the centre of the road, and at intersections.

There are also inconsistencies in the MUTCDC on the provision of buffer areas at intersections and minimum spacings between traffic control devices and warning signs. Inconsistencies were noted as well on sign spacing in general and traffic control at intersections between manuals used in other Canadian jurisdictions and the MUTCDC.

Providing more detail in the MUTCDC on urban work areas will result in a greater level of consistency for temporary traffic control between municipalities across the country. Recommended issues for review in future revisions of the manual include:

- Minimum Sign Spacing;
  - In general, and
  - In advance of traffic control devices.

- More detailed guidelines on;
  - Lateral placement of signs in urban areas, and
  - Roundabouts.

- Revising figures for intersection layouts to;
  - Ensure consistent use of buffers, and
  - Show traffic control on all approaches, e.g. total number of traffic control persons required

- Including additional figures showing typical layouts for:
  - Work Areas in the centre urban roadways,
  - Patching operations,

- Bike lanes,
- Single lane approaches to intersections that are signalized (rather than stop-controlled),
- Intersection approaches with a single through lane and one or more turning lanes; and
- Work areas in two lanes on the near or far side of an intersection of a four lane road.

9. REFERENCES

1. (2009). Work Area Traffic Control Manual. New Brunswick Department of Transportation.
2. (1998). Manual of Uniform Traffic Control Devices for Canada. Prepared by the National Committee on Uniform Traffic Control, Transportation Association of Canada, Ottawa, On.
3. (2005). Guide Municipal de la signalisation lors de travaux ou d'activités sur l'emprise des rues municpales. City of Edmundston.
4. (2012). Temporary Workplace Traffic Control Manual 2009. Nova Scotia Department of Transportation and Infrastructure Renewal.
5. (2005). Temporary Workplace Traffic Control Manual 2005. Prince Edward Island Transportation and Public Works.
6. (2011). Traffic Control Manual. Newfoundland and Labrador Department of Transportation and Works.
7. (2005). Standardized Drawings. Transport Québec
8. (2011). Manual of Temporary Traffic Control in Work Areas on City Streets. City of Winnipeg Public Works Department.
9. (2006). Temporary Traffic Control Manual. City of Brandon Engineering Department
10. (2010). Temporary Traffic Control Manual. City of Regina Public Works Division.
11. (2003). Traffic Accommodation in Work Zones Urban Area. Alberta Transportation.
12. (2012). Manual on Uniform Traffic Control Device for Streets and Highways, 2009 Edition. U.S. Department of Transportation, Federal Highway Administration.
13. (2011). Temporary Traffic Control Handbook for Operations of Three Days or Less. Oregon Department of Transportation
14. (2012). Work Zone Traffic Control Guidelines. Washington State Department of Transportation
15. (2004). Code of Practice for Temporary Traffic Management. Transit New Zealand.
16. (2009). Traffic Signs Manual 2009. UK Department for Transport.

TABLE 1: Table of Contents for New Brunswick Urban Work Area Traffic Control Manual

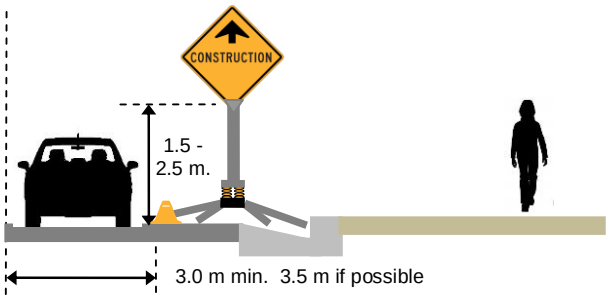
TABLE 2: Minimum Work Area Component Measurements for Urban Roads

Work Area Component	Minimum Length (m)
Advanced Warning Distance[1]	100 m
Transition Taper Length • Lane Closure Taper • Shifting Taper • Traffic Controlled Taper	 40 m 20 m 15 m
Buffer Area	40 m
Delineator Spacing	5 m

1. Advanced Warning Distance is measured from the first Traffic Control Sign to the start of the Activity Area.

FIGURE 1: Lateral Placement Guidelines for Urban Cross Sections

ROADWAY EDGE

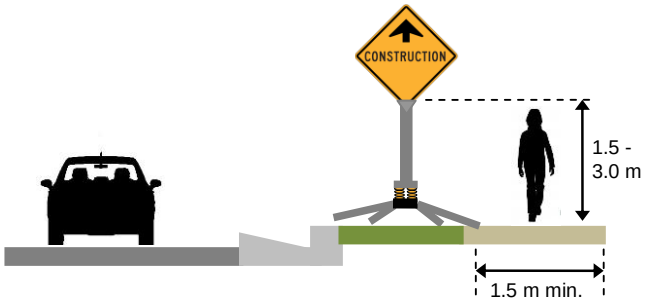


A lane width of at least 3.0 m shall be maintained. An additional 0.5 m should be provided as clearance to the sign where space permits.

Signs shall not be placed on the roadway edge where bike lanes are present unless a delineated bicycle diversion or detour is provided.

Signs shall not be placed on the roadway edge where on-street parking is permitted unless parking has been temporarily prohibited by the municipality.

BOULEVARD



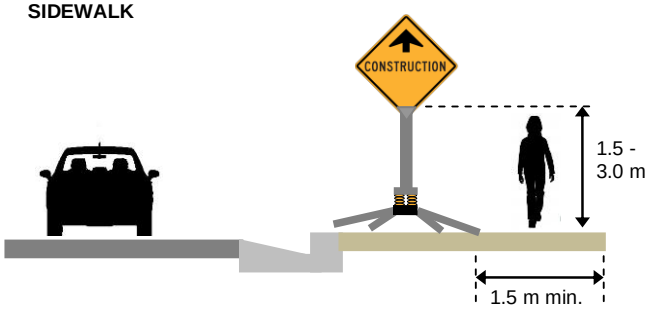
75 cm x 75 cm signs shall be used to minimize any obstruction to pedestrians and cyclists.

Signs may partially encroach onto the sidewalk provided that an unobstructed path of at least 1.5 m is maintained. Otherwise, an alternate pedestrian path shall be specified (e.g. detour or diversion).

Signs on portable stands shall be mounted at a height of between 1.5 and 3.0 m to minimize obstruction to pedestrians and ensure sign visibility.

Signs on fixed posts shall be mounted at a height of 2.0 m.

SIDEWALK



75 cm x 75 cm signs shall be used to minimize any obstruction to pedestrians and cyclists.

Signs may be placed on the sidewalk provided at least 1.5 m of unobstructed path is available. Otherwise, an alternate pedestrian path shall be specified (e.g. detour or diversion).

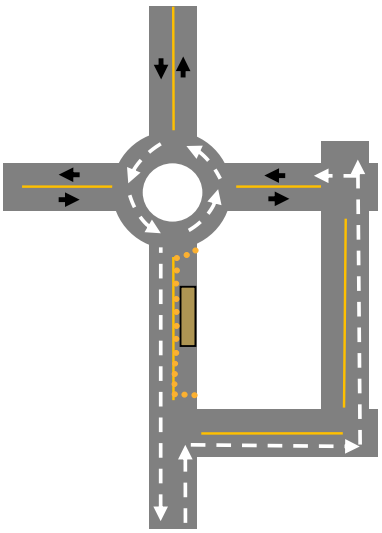
Signs on portable stands shall be mounted at a height of between 1.5 and 3.0 m to minimize obstruction to pedestrians and ensure sign visibility.

Signs may be mounted on existing supports used for other purposes (e.g. utility poles) to minimize sidewalk obstruction.

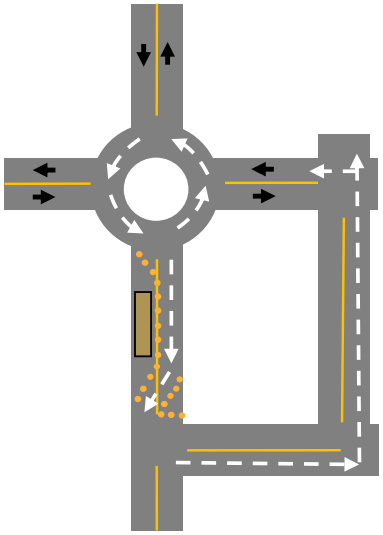
Signs on fixed posts shall be mounted at a height of 2.0 m.

Signs may be placed behind the sidewalk provided they are within 4.0 m of the curb.

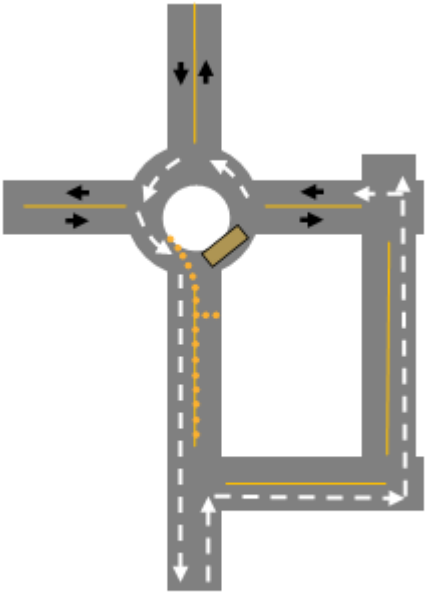
FIGURE 2: Diagrams Showing Recommended Traffic Flows for Work Areas in Roundabouts



Work area in approach lane, detour approaching traffic



Work area in departure lane, detour approaching traffic



Work area in circulatory road, detour approaching traffic

FIGURE 3: Typical Layouts for Bike Lanes

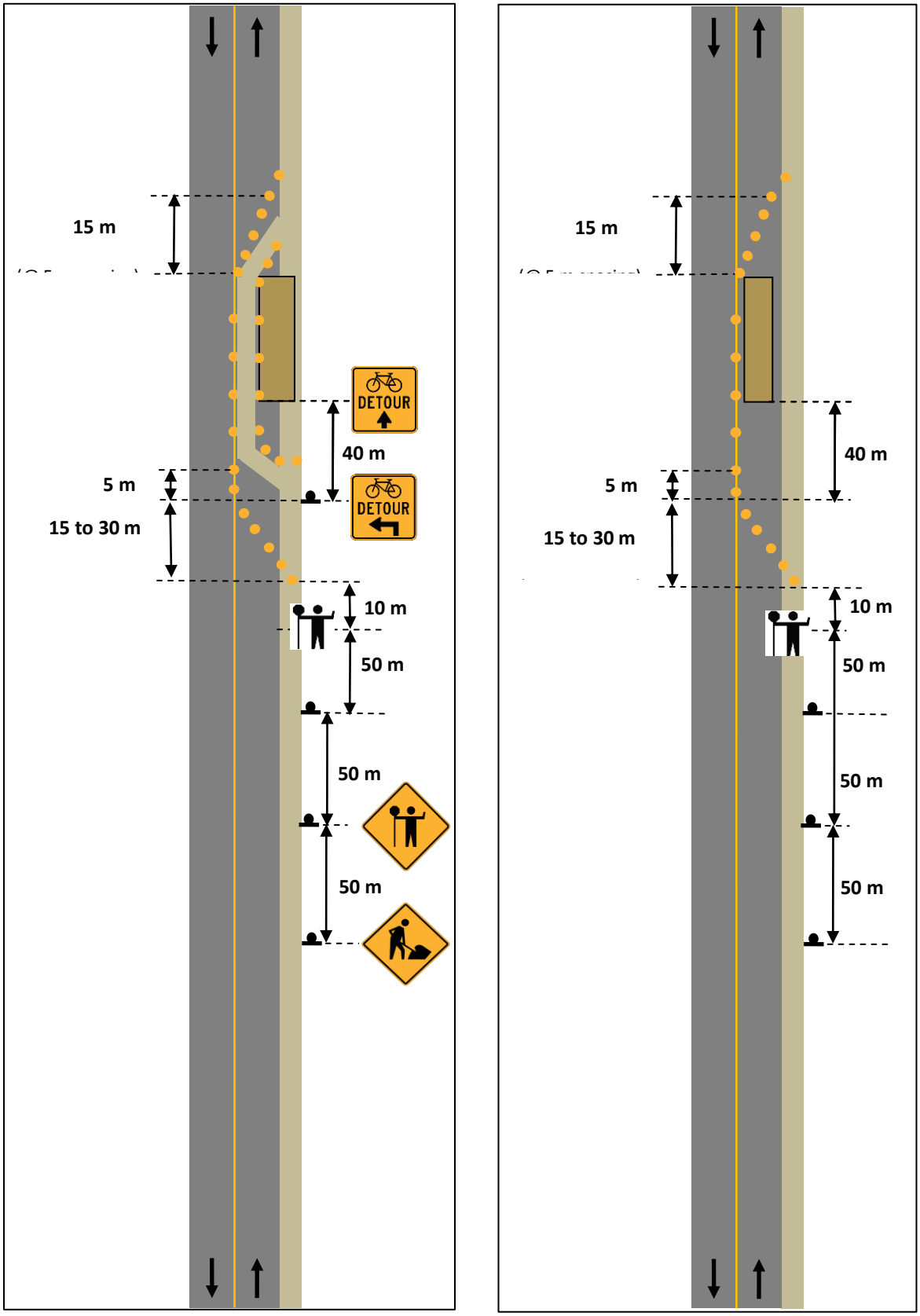


FIGURE 4: Typical Layout for Very Short Duration Operations

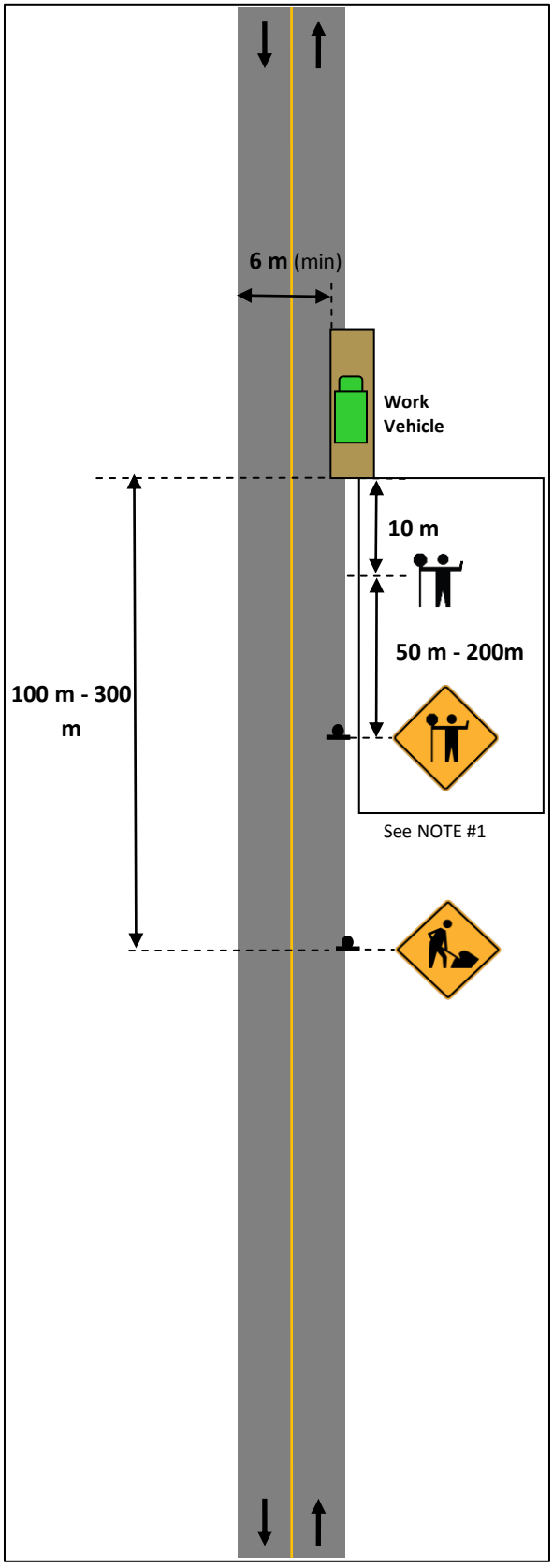


FIGURE 5: Typical Layout for Work Area in the Centre of a Road

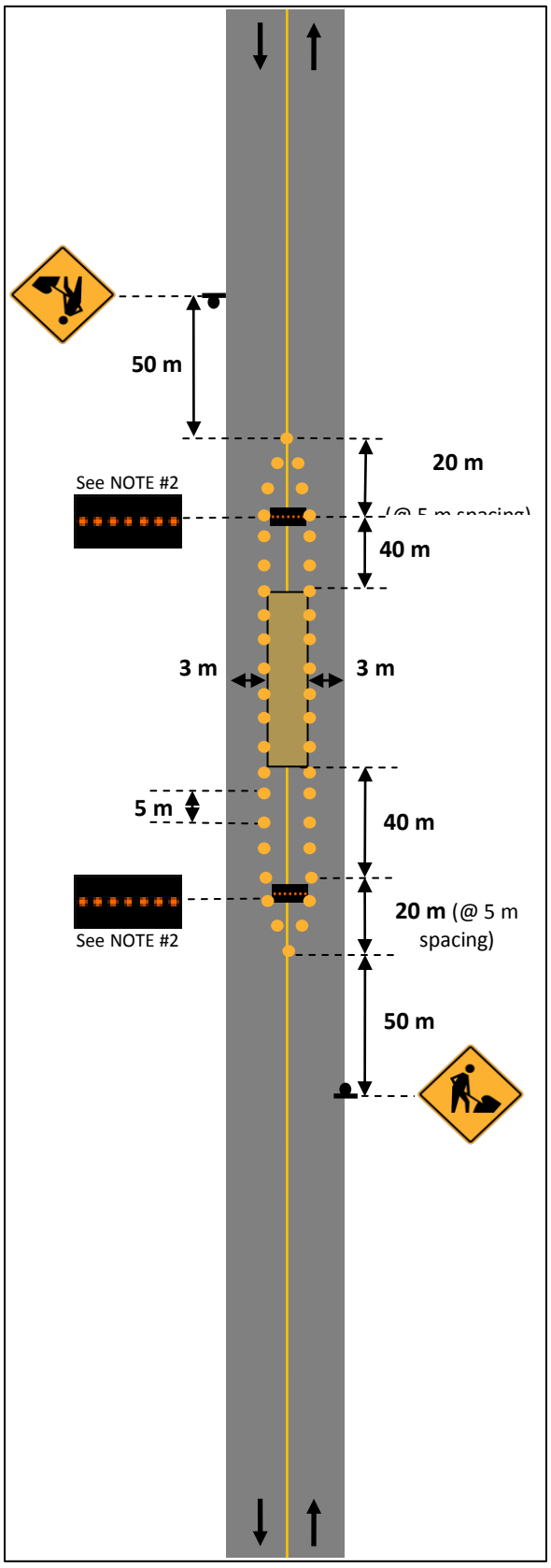
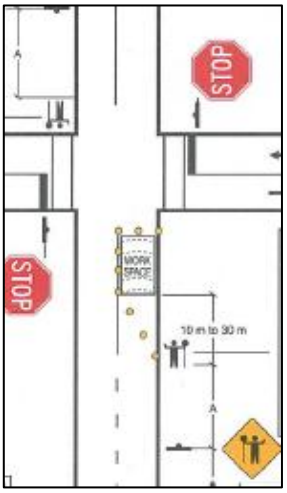
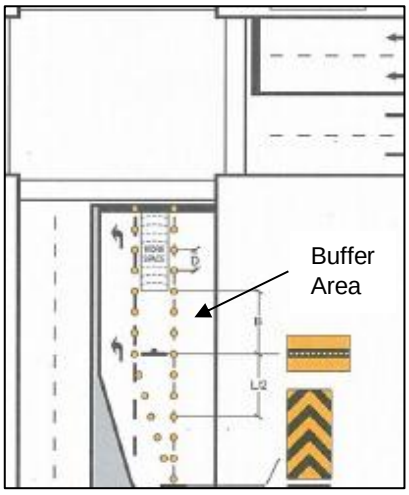


FIGURE 6: Example of Inconsistency in Buffer Areas at Intersections

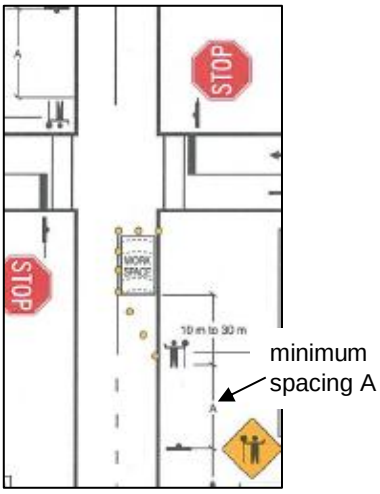


Single Lane Intersection Approach

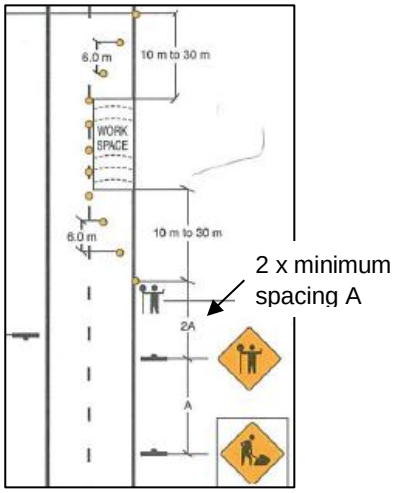


Multi-lane Intersection Approach

FIGURE 7: Example of Inconsistency in Minimum Sign Spacing between Work Area Locations



Intersection Approach



2-Lane Road Section