Traffic Control Planning and Layout

Participant Guide
Acknowledgements:

The BC Municipal Safety Association acknowledges the contributions of its member municipalities and their staff who participated in the development of these training materials.

Disclaimer:

Many resources have been used to develop this Guide. The authors have been careful to include the most up-to-date and correct information. However, it is the user’s responsibility to check with WorkSafeBC and other legislators and their employer to ascertain safety requirements, and to determine their best course of action in any situation. This publication is not a substitute for review of the applicable government regulations and standards, and should not be construed as legal advice or opinion. Readers with specific questions should refer to the cited regulation.

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Course Introduction
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Welcome

Welcome to the B.C. Municipal Safety Association’s *Traffic Control Planning and Layout* training course.

Successful completion of this course will provide you with increased knowledge in planning and laying out traffic control for work zones in municipalities.

The course covers the knowledge and practical skills you will need to plan, lay out and maintain safe work zones on or near roads, according to WorkSafeBC’s *Occupational Health and Safety Regulation*, Ministry of Transportation (MOT) standards and other regulatory requirements.

Good planning and layout will help keep workers and the public safe.

The B.C. Municipal Safety Association (BCMSA) is striving to provide you with user-friendly, accurate and useful training materials. We value your feedback, and will use it to improve future versions of these materials. If you would like to see changes to the BCMSA Traffic Control Planning and Layout course, give your comments to your instructor.
How to Use This Guide

This Guide is designed as your workbook as you complete the *Traffic Control Planning and Layout Course*. It will also be used as a reference during the classroom session.

You will see the following icons to refer you to the correct source materials:

*Worker’s Compensation Act* or
*Occupational Health and Safety (OHS) Regulation*

*Traffic Control Manual for Work on Roadways* (the *Traffic Control Manual*)

*Motor Vehicle Act*
Learning Objectives

By the end of the course, the participant will be able to:

- Use the OHS Reg. and Traffic Control Manual for Work on Roadways to make planning and layout decisions
- Identify, use and maintain traffic control devices
- Conduct a Job Task Analysis to assess traffic control risk
- Create a Traffic Control Plan for any work on roadways
- Lay out a work zone where Traffic Control Persons are required
- Lay out a work zone where Traffic Control Persons are not required
- Adapt a Traffic Control Plan based on actual situation
- Monitor traffic control in a work zone to ensure optimal safety
- Work with the site superintendent, contractors or other municipal representatives to ensure traffic control is understood and site safety is optimized

Assessment

To complete this course, you will need to:

- Attend the classroom session
- Complete Exercises 1 and 2 and 3
- Complete the Theory Quiz at the end of the course with a score of 100%

Course Evaluation

At the end of the course, you will be asked to fill in an evaluation form. Your comments and suggestions regarding the course will help your instructor to be even better next time. Your feedback will also be used make changes to the course where required.
Unit 1

Complying with Regulations and Standards
1.1 About This Unit

This unit introduces the regulations, standards and procedures you must comply with when you are planning and laying out a work zone on a road.


Other regulations that govern traffic control include the Motor Vehicle Act and Regulations.

These regulations and standards have been developed to protect you, other workers and the public while they are on or near roads anywhere in British Columbia.

Traffic control is challenging because the regulations and standards often leave part of the decision making up to you. You do need to base your decisions on the regulations and standards, but there is still flexibility to adjust your traffic control layout to the circumstances.

1.1.1 Learning Objectives

When you have successfully completed this unit you will be able to:

- Use the OHS Reg. and Traffic Control Manual for Work on Roadways to make planning and layout decisions

1.2 WorkSafeBC’s Authority and Jurisdiction

WorkSafeBC operates under the authority of the Workers’ Compensation Act. WorkSafeBC is dedicated to the safety and good health of workers.

1.2.1 The Occupational Health and Safety Regulation

You are probably already familiar with WorkSafeBC’s Occupational Health and Safety Regulation (often referred to as “the Regs”). Employers and workers must follow the Regulation, and related standards and guidelines where they exist.
If your employer has health and safety policies or practices that exceed the WorkSafeBC requirements, you will also be required to follow them.

In this Guide, when you see this icon, it means you should refer to the Regulation:

Some key sections of the OHS Regulation are included here:

**Part 1 Definitions:**

“**supervisor**” means a person who instructs, directs, controls workers in the performance of their duties

**18.1 Definitions:**

“**traffic control**” means the use of signs, flashing arrow boards, sign boards, buffer or shadow vehicles, barricades, cones, barriers, detours, traffic lights, traffic control persons (TCPs) or other techniques and devices to manage the flow of traffic;

“**traffic control person**” or “**TCP**” means any person designated or assigned by the employer to direct traffic.

**18.2 Responsibility**

The employer must ensure that effective traffic control is provided and used whenever traffic could be hazardous to a worker.

**18.3 Standards for traffic control**

Traffic control equipment, arrangements and procedures must meet the requirements of the latest edition of the Traffic Control Manual for Work on Roadways (the “Traffic Control Manual”) issued by the Ministry of Transportation, unless otherwise specified by this Regulation.

Note that if there is a conflict between the provisions of the Traffic Control Manual and a specific provision in the Occupational Health and Safety Regulation, the requirement in the Regulation takes precedence.
1.3 Traffic Control Supervision

Part 18.4 of the OHS Regulation states that a supervisor must be designated to ensure traffic control arrangements and procedures are implemented when needed and removed when it is not. Management and supervisory personnel have responsibility for ensuring work arrangements required to provide for a safe workplace are effectively implemented, and this includes traffic control.

All supervisory management persons need to understand the traffic control arrangements for the work and ensure persons under their control are aware of the traffic control arrangements and work within the protection provided by it. If traffic control is not effective, any supervisor needs to be able to recognize this and react promptly to correct the problem.

In addition, everyone involved in the work must be able to recognize when traffic control signs, devices and/or procedures are not in place or are not working and must initiate corrective action.

1.4 Motor Vehicle Act and Regulations

The Motor Vehicle Act regulates the movement of traffic such as motor vehicles, pedestrians and bicycles on all public roads. This includes rural highways, municipal streets and other places such as shopping centre parking lots.

Municipalities get their authority to direct traffic under the Motor Vehicle Act.

1.4.1 Authority and Jurisdiction

The Motor Vehicle Act and Act Regulations give authority for the placement of traffic control devices to the Ministry of Transportation for provincial highways and unorganized areas, and to cities and municipalities for streets in their local areas.
1.5 Traffic Control Standards

Traffic control is required whenever traffic must be moved through or around work on or next to a roadway.

The Ministry of Transportation has developed standards for traffic control on highways and roads in British Columbia. These standards are located in the Traffic Control Manual for Work on Roadways. (“the Traffic Control Manual”)

As mentioned above, WorkSafeBC has adopted the standards in the Traffic Control Manual as part of the OHS Regulation and WorkSafeBC field officers will expect compliance with it at work sites.

It is important that you are able to locate and use these standards because they say how work zones must be laid out.


Employers must make sure a copy of the Field Edition is available at the work site. You will need it as a reference when you are setting up or adjusting a work zone.

Although the Traffic Control Manual for Work on Roadways (the Traffic Control Manual) is focused on highways and freeways outside of municipalities, because the Regulation points to it for safety, municipalities must follow it.

This symbol means to refer to the Traffic Control Manual.

The Traffic Control Manual (Office Edition) is broken down into Chapters as follows:

Frontispiece: Includes Acknowledgements, Table of Contents and instructions on using the manual

Chapter 1: General Instructions
General Application of Traffic Control
Traffic Control Devices
Traffic Control (Work) Zones
Installation, Maintenance and Inspection of Traffic Control
Chapter 2: Traffic Control Devices
Traffic Signs
Other Devices
Traffic Control Persons (TCPs)

Chapter 3: Typical Traffic Control Layouts for Short Duration Work Zones
Legend
Table A - Positioning of Devices on Conventional Roadways for Various Speed Limits
Shoulder Work
Moving Work
Roadside Work without Lane Closures
Lane Closure
Lane Closures at Intersections
Work on Sidewalks
Pavement Marking
Surveying
Utility Work

Chapter 4: Typical Traffic Control Layouts for Long Duration Work Zones
Legend
Table A - Positioning of Devices on Conventional Roadways for Various Speed Zones
Construction Speed Zones
Lane Closures Between Intersections
Lane Closures at Intersections
Detours
Sidewalks
Chapter 5: Typical Traffic Control Layouts for Freeway Work Zones

Legend
Table B - Positioning of Devices on Freeways
Advance Warning Area Signs
Not Assigned
Shoulder Work
Slow Moving Work - Open Lane
Stationary and Intermittent Moving Work - Lane Closed
Median Cross Over
Two Lanes Closed
Lane Closure at Exit Ramp
Lane Closure at Entrance Ramp
Closure of Exit Ramp

Appendices: Traffic Control for Specialized Ministry Works on High Speed Rural Highways

Legend
Table A Positioning of Devices on Conventional Roadways for Various Speed Limits
Road Closures for Snow Avalanche Control
Pavement Marking
Falling Weight Deflectometer
Paving and Sealcoating
Highway Improvement Project Signs

Chapters 1, 2, and 3 of the current Office Edition of the Manual are the sections that municipal workers use most often.
2.1 About This Unit

Traffic is controlled by either Traffic Control Devices or a combination of Traffic control Devices and Traffic control Persons (TCPs).

It is important to become familiar with the devices you or other workers will use on the job. You need to know all the acceptable devices and their uses so you can select the correct devices when planning or revising traffic control. Devices are signs, cones, barriers and other things you can use to direct traffic in a work zone.

It is also important to know when to use TCPs and when not to.

2.1.1 Learning Objectives

When you have successfully completed this unit you will be able to:

- Identify traffic control devices
- Select the correct traffic control device for each situation
- Describe the maintenance of traffic control devices
- Determine when TCPs are and are not required
- Conduct a Job Task Analysis to determine traffic control risk

Refer to Section 2 of the Traffic Control Manual.

2.2 Traffic Control Devices

You can only use the devices that are described in the Motor Vehicle Act and the Traffic Control Manual for Work on Roadways.

Work zone traffic control devices may include:

- Signs
- Channelizing devices
- Lighting devices
- Buffer and shadow vehicles
- High level warning devices
- Flags

The devices may be used in any combination to achieve the desired control of traffic provided they meet the standards given in the Traffic Control Manual for Work on Roadways.

Refer to section 1.3 of the Traffic Control Manual.
This section tells us that:

To be effective, all traffic control devices must meet five basic requirements. These are to:

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Provide adequate time for a proper response
- Command respect of road users

The placement, size and sign messages should be such that attention is drawn to them, that they are legible, their meaning is clear, the regulation is reasonable and there is adequate time for response.

Consistent application should ensure that appropriate devices are installed in a standard fashion to meet the traffic control requirements at any given location. Furthermore, devices must be placed in a uniform and consistent manner to ensure that vehicle operators can be expected to respond properly to the devices based on their previous exposure to similar traffic control situations.

Always treat similar situations in the same way. Drivers are familiar with certain devices and combinations of devices, and will respect the correct use of devices. Using the wrong devices, being inconsistent or unclear will result in confused, angry or disinterested drivers.

### 2.2.1 Signs

Signs are classified as:

- Construction and Maintenance (C),
- Temporary Warning (TW), or
- Regulatory (R) Signs.

These signs are described in the *Motor Vehicle Act Regulation*. The *Manual for Work on Roadways* expands on the signs set out in the *Motor Vehicle Act Regulation* by including more C and TW signs and describing their use and placement.

**Reference: Manual Section 2.1**
2.2.2 Channelizing Devices

Channelizing devices are used to guide motorists and pedestrians safely away from, around, or though the work zone. They may also be used to separate traffic travelling in opposite directions. Channelizing devices include:

- Flexible drums
- Cones
- Temporary delineator posts
- Barricades
- Barriers
- Tubular markers

Reference: Manual Section 2.2.2

2.2.3 Lighting devices

Warning lighting devices draw attention to traffic control devices and work vehicles. Lighting devices include:

- Flashing yellow warning lights
- Flashing vehicle lights
- Flashing arrow boards
- Floodlights
- Steady burn warning lights

Reference: Manual, Section 2.2.3

2.2.4 Buffer and shadow vehicles

Buffer vehicles equipped with the appropriate warning devices can be used to help protect workers. Shadow vehicles, with an appropriate sign on the rear, are used as advanced warning devices in moving operations.

Reference: Manual, Section 2.2.4 and 2.2.5.
2.2.5  High level warning devices

These devices are used mostly in areas where the normal advance warning distances are not available or where regularly mounted temporary signs might be concealed by parked vehicles.

Reference: Manual, Section 2.2.7

2.2.6  Flags

Fluorescent red or orange flags may be used with any signs mounted on temporary supports.

They are required in speed zones of 70 km/h or higher for temporary signs which give warning of people working on or adjacent to a roadway. These signs include:

- C-4 CREW WORKING AHEAD
- C-36 SURVEY CREW AHEAD
- C-58 ACCIDENT SCENE AHEAD

Reference: Manual Section 2.2.9
2.3 Maintaining Traffic Control Devices

Traffic control devices must be constantly checked and maintained to provide good visibility and perform the function that they are designed for.

Before placing any traffic control device, check it carefully for damage and condition. Don’t use devices that are:

- faded, dirty or marred
- out of date and no longer up to standard
- dented or damaged
- worn or are deteriorating in any way.

Check flashing lights and rotating beacons for operation and brightness. Check the equipment frequently to be sure that the safety of the work zone is maintained.

*Clean, legible and properly mounted devices, in good condition, command the respect of vehicle operators, cyclists and pedestrians.*

Replace any traffic control devices that are damaged. Extra devices should be on hand to replace any that are likely to be damaged while the work is in progress.

Reflectorized devices need extra care when handling and transporting to ensure that the reflectorizing elements are not damaged.

Do not use rocks or other hard objects to weigh down signs or devices. Use sandbags or flexible collars where necessary.

Devices that are no longer necessary should be removed.

When the job is completed and the control devices are collected for storage, make sure that they are in good condition.
2.4 When are TCPs Required?

Traffic Control Persons are required in some situations.

2.4.1 Use of a Traffic Control Person

Section 18.6 of the OHS Regulation establishes that traffic control arrangements for a workplace may use a traffic control person (TCP) only when the use of signs, devices and/or procedures is not sufficient to provide effective traffic control. A person should not be assigned or allowed to take on the role of a TCP, and thus be exposed to the hazards of traffic, unless it is necessary for the effective functioning of the traffic control plan.

A TCP may also be used during emergency or brief duration work, when it is not practicable to control traffic with signs and other devices, providing sight lines and traffic speed allow oncoming traffic adequate warning of the work activity taking place.

One or more TCP(s) must be used if:

- **a)** it is necessary to institute a one-way traffic system by or through a work zone and the circumstances do not allow self-regulating single lane traffic controlled by signs and other devices as specified in the Traffic Control Manual, and a traffic signal system is not used,
- **b)** work-related traffic cannot safely self-regulate to move in or out of the work area or safely coordinate with other traffic,
- **c)** an existing traffic control system, or an existing traffic signal light system, is not adequate to regulate traffic,
- **d)** the work encroaches into an intersection so as to interfere with regular traffic movement,
- **e)** traffic speed or volume is a hazard to workers while setting up or removing other traffic control devices, or
- **f)** other traffic control devices are not available in an emergency situation

OHS Regulation 18.6 means that you will need to assess each situation to determine when you need or do not need Traffic Control
Persons. You must try to find a way to provide adequate protection for workers and the public by using other traffic control devices without Traffic Control Persons.

In addition, you will need to complete a Job Task Analysis to determine the level of risk associated with the particular traffic control operation you are considering. This dictates the level of training required of TCPs on that job.

Refer to WorkSafeBC’s Guidelines for Part 18.

A sample Job Task Analysis is included in Appendix 1.
Unit 3

Planning and Laying Out Work Zones
3.1 About This Unit

Many factors are considered when a work zone is planned and set up. Duration of the work, road configuration, volume of traffic, site requirements and environmental issues must all be considered. All the traffic control devices must be placed accurately to help protect workers and motorists.

Ideally the planning and layout of the work zone is set out in a Traffic Control Plan.

You may be responsible for set up of the traffic control devices and checking them to make sure they remain correctly placed. In order to plan, lay out, check and adjust the traffic control devices, you must be able to recognize parts of the work zone and locate and check work zone layouts. The topics in this unit will provide you with the knowledge you need to do this properly.

3.1.1 Learning Objectives

When you have successfully completed this unit you will be able to:

- Create a Traffic Control Plan for any work on roadways
- Lay out a work zone where Traffic Control Persons are or are not being used
- Adapt a Traffic Control Plan based on actual situation
- Evaluate traffic control in a work zone to ensure optimal safety
- Work with the site superintendent, contractors or other municipal representatives to ensure traffic control issues are understood and site safety is optimized

3.2 Principles of Traffic Control

A series of fundamental principles are included in section 1.1.1 of the Traffic Control Manual. Locate and read them in your copy of Chapter 1 of the Traffic Control Manual.

It is very important to understand and apply these principles as you plan and lay out traffic control.
3.3 The Traffic Control Plan

Refer to section 1.2.4 of the Traffic Control Manual.

A written Traffic Control Plan is recommended. This may take the form of a full written plan, or a reference to a diagram in the Traffic Control Manual. The complexity of the plan should be in line with the complexity of the job.

Your employer may have a format for the Traffic Control Plan, and if so, that is what you will use. If not, you may wish to use the Ministry of Transportation sample that is included in Appendix 2 of this Guide.

Review each section of the Traffic Control Plan form you have, and make sure you understand how to complete the form. Even if your Traffic Control Plan is as simple as a reference to a specific diagram in the manual, make sure you consider all the factors suggested here and in the sample Traffic Control plan.

Your employer may require a more detailed plan for more complex or long term projects. Make sure you know what your employer requires.

Not only will a Traffic Control Plan help you to lay out your work zone in the safest possible way, it will also be a record of what you did at that work site. This is useful if there are any incidents, complaints or problems.

Traffic Control Plans can be a mechanism for coordinating the flow of construction vehicles, equipment, vehicles and workers operating in close proximity within the activity area so that the safety of the workers can be ensured.

3.3.1 Traffic Control Plan Components

- Incorporate diagrams into the Traffic Control Plan depicting the movement of construction workers and vehicles within the work zone.

- Traffic Control Plans must be legible; using either ink or computer generated graphics.
• Indicate Traffic Control contractors name, address and telephone number. Include name and telephone number of the 24-hour contact person representing the contractor.

• Indicate north arrow and scale or NOT TO SCALE (N.T.S.).

• Show all streets in the work zone vicinity to ensure proper orientation.

• Show all existing traffic signals and traffic control signs.

• Show existing striping, pavement markings, painted crosswalks and bike lanes. Include total roadway widths, individual lane widths, bike lane widths, median dimensions, etc.

• Show existing curbs, gutters, sidewalks, driveways and intersections in the construction work zone including areas affected by taper transition.

• Indicate posted speed limits.

• Show location and dimensions of the construction work zone.

• Show staging area and materials storage area, as appropriate.

• Indicate locations of construction signs, barricades and delineators (includes cones).

• Label all taper lengths and widths, delineator spacing and sign spacing. All taper lengths shall be in accordance with the Traffic Control Manual standards.

• Use a legend to define all symbols and designate them with Traffic Control Manual names.

• Show all parking restriction zones and signs, as appropriate.

• Indicate the permit number or improvement plans number on the Traffic Control Plan.

• Indicate the duration of the construction work and subsequent traffic control on the Traffic Control Plan.

Road closures will require approval from the municipality. In some municipalities you must also notify the Fire Department, as well as the Police Department. In many cases you will be asked to notify the residents in an area.

Signs and barricades will be required to direct pedestrians through or around the construction work zone and shall be shown on the Traffic Control Plan.
Include a communication plan for ensuring workers, contractors and subcontractors are oriented to the Traffic Control Plan and to any changes.

3.4 Parts of a Work Zone

The work zone is an area where construction, maintenance or utility activities take place, on or adjacent to a roadway. It is the area between the first advance warning sign and a point beyond the work area where traffic is no longer affected. Most work zones can be divided into the following parts:

- Advance warning area
- Transition area
- Buffer space
- Work area
- Termination area

If the work activity affects more than one direction of travel, the same principles apply to traffic in all directions.
3.4.1 Advance Warning Area

The advance warning area is necessary so that motorists know what to expect before they reach the work zone. This provides enough time for them to adjust their driving patterns in response to the warning signs.

The length of the advance warning area must be planned with consideration of the speed of the vehicles and the location. It could be as simple as one sign, a flashing light on a vehicle, or a series of signs up to two km from the work area.

Advance warning areas are not required if the work zone is completely off the road shoulder and does not interfere with traffic.

3.4.2 Transition Area

A transition area is used when work is being performed within one or more of the lanes that are normally used by traffic. If no lane or shoulder closure is involved, the transition area will not be used.

A taper is a line made by series of markers that gradually move from one side of a lane (the driver’s right) to the other. The transition area contains the tapers necessary to close off the lane or lanes in which the work is being performed.

The transition area should be obvious to the motorists. It must be clearly marked so that they do not make a mistake and try to follow the old path. Tapers are used to indicate to the motorist the path they should follow to move out of their normal lane. A taper is identified by a series of channelizing devices and possibly pavement markings placed on an angle to move traffic out of its normal path. Tapers may also be used to guide traffic back into its normal lane beyond the work area.

If the work area is constantly moving, then the transition area must also move. A vehicle with a sign, warning lights or a flashing arrow board may be used to guide traffic into the proper lane.

In long duration work, pavement markings may have to be removed and replaced with new markings or pavement marking arrows if the existing markings cause confusion.
3.4.3 Buffer Space

The buffer space is between the transition area and the work area. If the motorist fails to respond to the advance warnings and does not manage to negotiate the transition area, the buffer space provides a place to regain control or stop before reaching the work area. If distance permits, you should always include a buffer space, even though it may not appear necessary.

If the work area is moving, then the buffer space will be the area between the shadow vehicle and the work area.

A buffer space helps make the work site safer for both workers and motorists. It must be kept clear of equipment, workers, materials and vehicles.

If two opposing lanes of traffic are redirected so that one lane of traffic must move into a lane normally used by the other traffic, a buffer space can separate the two tapers to prevent head-on collisions.

3.4.4 Work Area

The work area is that portion of the roadway or shoulder that contains the work activity and is closed to vehicle traffic and pedestrians. The work area may remain in one place or move, depending on the type of job.

Work areas tend to become more hazardous in proportion to:

- How close the work area is to the normally travelled lanes
- How much traffic passes by
- How fast the traffic is going
- How complex the operations are in terms of equipment movement and road conditions
- How far from the normal path the traffic must be diverted

To eliminate as many hazards as possible, the work area should be clearly delineated. In addition, devices can be placed to effectively allow safe entry and exit for work vehicles and still keep traffic out of the work area.
3.4.5 Termination Area

The termination area provides a short distance beyond the work area for the traffic to return to its normal lane or lanes. If the termination area requires that traffic be shifted out of opposing lanes, then a lane closure taper is included to channel traffic back where it belongs.

Make sure that there are no misleading gaps in the traffic control areas that make the motorist think that they have cleared the work zone when they have not.

3.5 Work Zone Planning

The layout of a work zone is planned by Traffic Control Supervisors, Engineers or project managers prior to the work starting. They often refer to typical work zone layouts given in the *Traffic Control Manual for Work on Roadways* and select a layout that most closely resembles their project. In some cases, the typical layouts in the manual do not match their project and they must modify the diagram.

Even if you are not responsible for planning, it is useful for you to be familiar with this planning process and the factors that are considered in selecting a layout because it will help you to set up, check and adjust the traffic control zone as the work progresses.

The Traffic Control Supervisor is responsible for setting up and removing traffic control equipment, however this responsibility may be delegated to experienced Traffic Control Persons (TCPs) or other trained workers.

The following section provides a brief description of the planning process and the main factors that are considered in selecting a work zone layout:

- Duration or type of project
- Road configurations
- Traffic variations (volume, speed, type)
- Environmental conditions
- Work site variations
3.5.1 Duration or Type of Project

The first factor that is considered in selecting a work zone layout is the duration or type of project. The Traffic Control Manual groups typical work zone layouts as short duration, long duration and work on freeways.

Short duration

Short duration work is that which occurs for a period of up to one daytime shift.

Long duration

Long duration work occurs over more than one daytime shift and includes most work at night. The requirements for establishing a traffic control zone for long duration work differ from short duration setup.

Freeways

Freeway work differs from other highway work because of the design of the roadway and the higher speed of traffic. Because of these differences, the requirements for a traffic control zone are also different and usually involve lane closures. Freeways are not normally part of a municipality’s responsibility.

3.5.2 Road Configurations

Another factor to be considered in selecting a work zone layout is the road configuration in the area to be constructed or repaired.

Road configurations will differ depending on location, design and traffic speeds. The main configurations are:

- Two-lane, two-way roads
- Multi-lane roads

Two-lane, two-way roads may be high or low volume, with or without a centre line. Multi-lane roads (including freeways) have two or more lanes in the same direction of travel.

Freeways are physically divided roadways, sometimes with considerable distance between opposing lanes of traffic. This may simplify the establishment of traffic control to only one direction. However, higher speeds and volume of traffic make freeway work very challenging.
A basic road configuration can be changed by the presence of such complications as:

- Railway crossings
- Driveways
- Tunnels
- Bridges
- Interchanges with on and off ramps
- Intersections
- Parking lot entrances and exits
- Left turn lanes

The presence of any of these factors may change the layout of the work zone. Check the Traffic Control Manual and find a closely related diagram, then think carefully about how these differences will affect traffic flow. For example, in the case where a vehicle can enter the work zone from a parking lot exit, you may need additional signage.

Work zones on bridges can be hazardous to workers and TCPs because there is little or no room to escape if motorists drive into the work zone. If possible TCPs should not be positioned on a bridge. The number of advanced warning signs used is often doubled to warn motorists.

### 3.5.3 Traffic Variations

Traffic variations will also affect the work zone layout. These variations in traffic include:

- Volume
- Speed
- Type of traffic

High-speed traffic requires longer transition distances.

The type of traffic will also determine how the areas in the work zone will be established. The Traffic Control Supervisor may have to study the traffic to determine if it is mostly commercial, private or mixed.

Another factor that is considered in selecting the work zone layout is how the work zone will affect traffic and the measures that must be taken to prevent hazardous situations from occurring.

A restriction on the road in high-density traffic will tend to cause a backup. The layout should keep blockages to a minimum and provide the driver with time to make decisions. The number of vehicles may create problems in lane changes or other manoeuvres.
3.5.4 Environmental Conditions

Environmental conditions often cause adjustments to the layout of a work zone. These environmental conditions include:

- Rain
- Ice or snow
- Fog or clouds
- Bright sunlight
- Dust
- Time of day
- Slide or avalanche hazards

The visibility and control that a driver normally has will be affected by all of these factors. Changes in weather and light conditions can drastically alter the ability of drivers to see warning signs or a TCP. The time of day will affect visibility as well and can also have an affect on a driver’s ability to react, particularly if they have been on the road for a time or have been jammed in rush hour traffic.

Make sure you discuss adjustments to the work zone with your Traffic Control Supervisor and crew if traffic control may be affected by any of these conditions.

3.5.5 Work Site Variations

Work sites can vary greatly, for instance they may be on hills or curved roads rather than straight roads. These variations will affect the work zone setup. Site assessment with regard to variations must be included as part of the Traffic Control Plans, and layout and monitoring decisions you make. Using a Traffic Control Manual diagram will not always be sufficient.
3.6 Setting Up a Work Zone

3.6.1 Using Your Plan

The first step is to review the Traffic Control Plan that has been prepared for the project. A Traffic Control Plan is recommended for each work zone. The plan will show the number and placement of traffic devices that are required.

If you do not have a Traffic Control Plan, select a closely matching diagram from the T.C. Manual for the correct situation (short duration - Chapter 3, long duration - Chapter 4, or freeway work - Chapter 5).

3.6.2 Using The Tables in the Traffic Control Manual

You can find the required distance between the devices and other measurements in the Traffic Control Manual.

Refer to Table A Short Duration Work for information about placement distances for traffic control devices as you examine the work zone layout.

Reference: Manual Chapter 3 or 4 (Table A) and 5; (Table B)
Table A Explained

Right now, Table A is the same for short and long duration work.

Minimum metres it takes to lay out taper - normal lane width /no TCP

Move the taper one meter into the lane every 30 meters

For shoulder work or with TCPs

Place cones or markers every 10 meters (Max) for 1a

Minimum Tangent is the distance between the end of one taper and the beginning of the next (same direction of travel)

Space between signs depends on speed

<table>
<thead>
<tr>
<th></th>
<th>50 km/h</th>
<th>60 km/h</th>
<th>70 km/h</th>
<th>80 km/h</th>
<th>90 km/h</th>
<th>100 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Taper length for lane closure</td>
<td>35 (1.10)</td>
<td>45 (1.15)</td>
<td>65 (1.20)</td>
<td>80 (1.25)</td>
<td>100 (1.50)</td>
<td></td>
</tr>
<tr>
<td>1b Taper length for shoulder work or where TCPs used (min 3 cones)</td>
<td>5</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2 Maximum distance between cones or tubular markers for 1a</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3 Minimum tangent distance between tapers</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>4 Distance between construction signs</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>
3.6.3  What Devices to use

Signs and other traffic control devices as shown in the Traffic Control Manual for Work on Roadways shall be used. Drivers are familiar with these signs and know how to react to them. Other devices may be confusing. Choose signs that are appropriate and that accurately describe the work situation.

**Sign supports**

Signs may be attached to posts or to approved portable supports. On long-term projects, most signs should be post-mounted. Portable sign supports are more practical for short duration work and for signs that need to be repositioned often. Sign supports should be lightweight, yielding or have the same breakaway features as for permanent installations. Signs and sign stands must not be weighted down with anything other than sandbags or approved devices, as rocks or similar items can become projectiles.

3.6.4  Placing traffic control devices

Use these guidelines for correct placement of traffic control devices:

- Traffic control devices should be placed in the order that drivers will encounter them, starting with the sign or traffic control device farthest upstream from the work area and the others successively as the work area is approached.

- Start with general sign messages at the beginning of the work zone, then use signs with more specific messages (stating what action should be taken) closer to the actual work area. The overall effect of signs and other devices should be to make drivers aware of what they are approaching and what actions will be required of them.

- Permanent traffic signs that do not apply during the work should be removed or have the faces completely covered with opaque materials. If you use non-opaque materials, the messages can be seen at night because headlights let the reflectorized messages show through.

- Temporary signs that are installed in anticipation of a traffic pattern change should be covered until required.

- Use the larger of the two standard signs where greater emphasis is required (such as for areas of higher speed) as required by the Traffic Control Manual for Work on Roadways.
- On urban streets, recommended advance placement distances may have to be shortened due to the length of city blocks. Additional advance warning signs may be required due to intersections, alleys and accesses.

- Where cyclists and pedestrians are likely to be present, their need for safe and convenient passage must be considered, in particular when signs and other devices are being installed.

- On divided roadways and one-way streets (with two or more lanes in the same direction) signs should be placed on both sides of the roadway.

- If traffic in both directions will be affected, such as with work in the centre lane of a three-lane roadway, the traffic control devices can be placed in both directions at the same time, starting at each end farthest away from the work.

- On multi-lane roadways, traffic travelling in one direction may have to be moved around a work area by crossing the median into the left lane normally available only to traffic travelling in the opposing direction. Where this has to be done, it is essential that control devices be installed first to ensure that traffic in the opposite direction is confined to its right lane before traffic in the diverted direction is moved over the median.

- Temporary STOP and YIELD signs should be mounted at about the same height and the same position as for permanent signs.

- When signs or channelizing devices are to be installed and removed several times during the work operation, spots can be painted to mark device locations, so that the installation can be repeated quickly and with proper placement assured.

- Always check with your Traffic Control Supervisor for the correct measurements and placement of devices if a particular requirement is not covered in the Manual.

- Take a drive through or try to view the work zone through the eyes of a motorist driving through it under the worst possible conditions, then adjust the setup to make signs clearly visible.

- Signs should not block the sight lines of traffic entering a roadway from side roads or accesses.

- In construction zones, permanent traffic control signs may be covered with temporary ones.

- Place signs so they are easily visible.
• Check to ensure devices do not contradict others in the work zone. For instance, signs showing speed limits should all be the same.

• Make sure that parked vehicles or other obstacles do not hide signs.

3.7 Sample Figures

Check the Traffic Control Manual chapters 3, 4, and 5 for Figures that will provide you with guidelines for many situations.

3.8 Moving Work

The procedures for controlling traffic in a work zone that moves include some additional safety features.

Make sure you relocate your traffic control signs promptly as the work zone moves. All signs must be placed within a specified distance from the actual work. Carry extra traffic cones or markers with you to provide additional advance warning around curves and hills. In some cases, TCPs with radios or three TCP are required.

Figures 3.2.1, 3.2.2 and 3.2.3 in the Traffic Control Manual set guidelines for various moving work configurations.

3.9 Night Work

Night work requires extra caution. Requirements for signs and devices change for work at night. It is critical to review your layout at night by driving through the work zone frequently to ensure that traffic is flowing and that devices are in place and in good condition.
If performing work during the shorter non-summer hours remember to follow night work requirements for early morning or late afternoon work, which may be in the dark.

You must ensure that the cones and markers you use have the correct retroreflective striping on them to meet night time standards.

If using Traffic Control Persons, ensure they are using the correct Personal Protective Equipment and Traffic Control Equipment for night work.

3.10 Inspecting and Maintaining a Traffic Control Zone

Once the work zone is installed, it is important that you and the Traffic Control Supervisor ensure that it functions as intended and that any adjustments resulting from an inspection process are made.

Assess the situation before the zone is operational, during the operation and after any changes have been made to the setup. Your ability to visualize potential problems and solve them will improve with experience. The following factors will require changes or maintenance:

- Traffic accidents
- Devices displaced or damaged by vehicles, construction activities, workers, wind and truck slipstream
- Weather damage
- Dead or low flashing light batteries or burned out bulbs
- Low fuel levels for electrical generators
- Traffic volume
- Weather conditions
- Dirt on devices
- Vandalism or theft

The Traffic Control Supervisor will have a comprehensive inspection program that will include the following elements:

- The Traffic Control Manual for Work on Roadways or a formal traffic control plan for reference
- A defined inspection procedure
• A repair and replacement procedure
• Assurance of adequate inventory of devices for emergency replacement or repair
• Follow-up procedures to ensure that repairs are made
• A review to ensure that the public travel path is clearly marked through the entire work zone, both day and night, and particularly at the end of a work day, keeping in mind the possibility of poor weather and light conditions
• Documentation by the Traffic Control Supervisor of inspections and repairs made

The person responsible for inspecting traffic control devices must decide if they are in good condition, and must record the inspection and the results.

### 3.11 Removing the Work Zone

As soon as the work is completed and traffic control devices are no longer needed, they must be removed. Any cones and channelizing devices on the travelled roadway should be removed first, followed by the signs. Flashing arrow boards, high level warning devices, traffic control persons and/or flashing vehicle lights should be used in the removal process.

On low volume roadways, devices should be removed in the reverse order of installation by first removing those closest to the work area and continuing progressively upstream away from the work area.

On high volume roadways (particularly multi-lane) devices may be removed as for low volume or they may be removed with the flow of traffic. If removing with the flow of traffic, use a buffer vehicle, which may be equipped with a rear-mounted impact attenuator.

It is never acceptable to ride on the tailgate or on the outside of a vehicle.
Scenarios

Exercise 1: Municipal Scenarios

Exercise 2: Traffic Control Plan

The diagram below will be used during an exercise that your instructor will give you.
Theory Quiz and Evaluation
Theory Quiz

Traffic Control Planning and Layout

Name ____________________________
Date ____________________________

Read carefully! There may be more than one correct answer. Circle the BEST answer to complete the following statements or answer the questions:

1. When does Section 18.6 of the OHS Regulation say Traffic Control Persons may be used?
   a) If signs and other traffic control devices do not provide adequate protection
   b) Traffic Control Persons should be used whenever possible
   c) Traffic Control Persons may be used when there are low traffic volumes
   d) All of the above

2. Employers must ensure a copy of the Field Edition of the Traffic Control Manual is available at the work site.
   T    F

3. The rules for operation of vehicles on the streets and highways are based on:
   a) the WorkSafe BC Traffic Handbook
   b) the Motor Vehicle Act and Regulations
   c) Municipal bylaws
   d) the driver training handbook

4. According to the Motor Vehicle Act, pedestrians are required to obey traffic control devices.
   T    F
5. The normal colour combination for temporary warning signs is black on white.
   T  F

6. This sign indicates:
   
   ![Sign Diagram]

   a) bridge ahead
   b) merging traffic ahead
   c) road narrows ahead
   d) pavement ends ahead

7. A low volume roadway:
   a) Carries less than 1,000 vehicles per day
   b) Carries less than 1,000 vehicles per day and is located inside city limits
   c) Carries less than 1,000 vehicles per day and is located outside city limits
   d) Carries less than 10,000 vehicles per day

8. Shadow vehicles, with an appropriate sign on the rear, are used:
   a) as devices for directing traffic around heavy equipment
   b) as advanced warning devices in moving operations
   c) as a back-up vehicle for buffer vehicles
   d) all of the above

9. Where can you find the documentation of the distances required between signs and cones?
   a) Table 3c, Motor Vehicle Act
   b) Traffic Control Manual for Work on Roadways
   c) Appendix 5b, Industrial Health and Safety Regulations
   d) From the foreman of the work site
10. The first area that a motorist will encounter at a traffic control site will be:
   a) the Buffer space  
   b) the Transition area 
   c) the Termination area  
   d) the Advance Warning Area

11. Most work zones can be divided into five parts.  
    T   F

12. Advance Areas are not required if the work area is completely off the road shoulder and does not interfere with traffic.  
    T   F

13. What is the most important consideration in a traffic control zone?  
    a) the placement of the control zone  
    b) the placement of the signs  
    c) the organization of the zone  
    d) the safety of the zone

14. A restriction in a roadway with high volume traffic will result in:  
    a) a work slow-down  
    b) a traffic back-up  
    c) loss of at least one lane  
    d) no change in traffic flow

15. Which of the following are considered main factors in selecting a work zone layout for a project?  
    a) environmental conditions and worksite variations  
    b) duration or type of project  
    c) road configuration and traffic variations  
    d) all of the above
16. Environmental conditions are a consideration when selecting and setting up a work zone.

   T   F

17. The time of day is a consideration when selecting or adjusting the work zone layout.

   T   F

18. One of the fundamental principles of traffic control described in Chapter 1 of the Traffic Control Manual for Work on Roadways is:

   a) reduced speed zones should only be used where a clearly demonstrated need exists
   b) in work zones, traffic should always be slowed as much as possible
   c) Traffic Control Persons should be used instead of signs wherever possible
   d) the Traffic Control Plan can not be changed under any circumstances

19. One of the fundamental principles of traffic control described in Chapter 1 of the Traffic Control Manual is:

   a) traffic speeds should always be reduced as much as possible
   b) traffic should be impeded as much as possible
   c) Traffic Control Persons should be used instead of signs wherever possible
   d) a Traffic Control Plan should be in place and understood by everyone involved in traffic control
20. Drivers should normally see this sign:

a) as soon as they see the equipment working
b) first in a long duration traffic control zone
c) first in a short duration traffic control zone
d) right after a temporary speed sign in a long duration traffic control zone
# Course Evaluation Form

## As a result of this Course, I…

<table>
<thead>
<tr>
<th>Activity</th>
<th>Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can use the OHS Reg. and Traffic Control Manual to make planning and layout decisions</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Can identify, use and maintain traffic control devices</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Conduct a Job Task Analysis to assess traffic control risk</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Create a Traffic Control Plan for any work on roadways</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Lay out a work zone where Traffic Control Persons are or are not being used</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Adapt a Traffic Control Plan based on actual situation</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Monitor traffic control in a work zone to ensure optimal safety</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Work with the site superintendent, contractors or other municipal representatives to ensure traffic control is understood and site safety is optimized</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

## Facilitator

<table>
<thead>
<tr>
<th>Attribute</th>
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<tr>
<td>Knew the subject</td>
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<td>Was well organized</td>
<td>1 2 3 4 5</td>
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<tr>
<td>Had appropriate style/energy</td>
<td>1 2 3 4 5</td>
<td></td>
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<tr>
<td>Made participants comfortable</td>
<td>1 2 3 4 5</td>
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<td>Responded to participants</td>
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<td>Rate on a scale of 1 - 5</td>
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<tr>
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<tr>
<td>Training space/location</td>
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<td>Participant Guide</td>
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<td>Scheduling</td>
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<td>Pre-Course Communications</td>
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**Comments**
Appendices

Appendix 1 - Job Task Analysis
Appendix 2 - Traffic Control Plan
<table>
<thead>
<tr>
<th>Traffic Control Job Task Analysis (Risk Assessment)</th>
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</thead>
<tbody>
<tr>
<td><strong>Project ID:</strong> Location: Dates:</td>
</tr>
<tr>
<td><strong>Traffic Control Supervisor:</strong> Name: Email: Contractor Name (if Applicable):</td>
</tr>
<tr>
<td>Telephone: Cell Phone:</td>
</tr>
<tr>
<td><strong>Direction of traffic being controlled</strong></td>
</tr>
<tr>
<td><strong>Traffic speed</strong></td>
</tr>
<tr>
<td><strong>Traffic volume</strong></td>
</tr>
<tr>
<td><strong>Duration of traffic control operation</strong></td>
</tr>
<tr>
<td><strong>Will Traffic control extend into dusk or night time hours?</strong></td>
</tr>
<tr>
<td><strong>Sightline for oncoming traffic</strong></td>
</tr>
<tr>
<td><strong>Overhead hazards?</strong></td>
</tr>
<tr>
<td>Hazards and potential to contact. No potential to contact any hazards.</td>
</tr>
<tr>
<td><strong>In intersection?</strong></td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Active driveways?</td>
</tr>
<tr>
<td>Merging traffic?</td>
</tr>
<tr>
<td>Bus stops?</td>
</tr>
<tr>
<td>Active mobile equipment?</td>
</tr>
<tr>
<td>Other problematic elements?</td>
</tr>
<tr>
<td>Two-way road temporarily reduced to one lane, (Must be designated high risk)</td>
</tr>
<tr>
<td>Where traffic must be stopped to permit work zone equipment to enter or cross a road, (Must be designated high risk)</td>
</tr>
</tbody>
</table>

**Risk Assessment:**

- **High**
  (If TCPs are required, they must be fully trained. See Guidelines, Part 18, for training requirements.)

- **Low or Moderate**
  (If TCPs are required, comprehensive TCP training for high-risk workplaces is not necessary. See Guidelines, Part 18, for training requirements.)

**Risk Assessment Completed by:**

- Name: 
- Date: 

**Copy to Traffic Control Supervisor:**

- Date: 
- ☐ Email 
- ☐ Fax 
- ☐ Hard Copy

**Signature of Person who completed this assessment:**
This form is to assist project supervisors / traffic control supervisors in assessing the factors relating to traffic control and develop traffic control plans appropriate to the site. The intent of traffic control is to clearly direct and control the flow of traffic with as little interruption to the normal flow as possible. Misuse, lack of, or over use of traffic control devices can increase the traffic hazards to workers on this and future work sites. Any sign not necessary must be turned or removed as soon as possible. Refer to the Traffic Control Manual for Work on Roadways.

### Site Factors (Risk Assessment)

<table>
<thead>
<tr>
<th>CONSIDER:</th>
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</thead>
<tbody>
<tr>
<td>Road Alignment: winding, straight, hilly, banked, etc.</td>
</tr>
<tr>
<td>Road Type: divided, undivided, number of lanes</td>
</tr>
<tr>
<td>Sight Distance: signs, trees, buildings &amp; other obstructions</td>
</tr>
<tr>
<td>Approaches: hills, curves, intersections, accesses, etc.</td>
</tr>
<tr>
<td>Site Length: total length and active length</td>
</tr>
<tr>
<td>Regulated Speed:</td>
</tr>
<tr>
<td>Traffic Volumes: &lt;1000, 1000-7000, &gt;7000</td>
</tr>
<tr>
<td>Type of Traffic: local, tourist, commercial, emergency, bus, etc.</td>
</tr>
<tr>
<td>Shoulders: type, width, strength</td>
</tr>
<tr>
<td>Surrounding Land Use: commercial, industrial, residential, etc.</td>
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<tr>
<td>Residential Areas: driveways, school buses, schools, etc.</td>
</tr>
<tr>
<td>Weather Conditions: clear, icy, wet, foggy, limited visibility, etc.</td>
</tr>
<tr>
<td>Site Hazards: rock falls, avalanche paths, runaway lanes, steep hills, wildlife, etc.</td>
</tr>
</tbody>
</table>

### Procedural Factors (Risk Assessment)

- Work on roadway
- Work off roadway
- Work on shoulder
- Site access/egress
- Stationary site
- Continual slow moving site
- Amount of site activity
- Changes of activity as project progresses
- Hours of work: day / night
- Traffic control during off hours
- Emergency vehicle access
- Equipment access
- MV accident scenarios & response
- Number of different traffic control setups: macro plans & micro plans

### Appendix 2

#### Ministry of Transportation TRAFFIC CONTROL PLAN

<table>
<thead>
<tr>
<th>Plan Date:</th>
<th>Site Name:</th>
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<tbody>
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<tr>
<td>Exact Site Location:</td>
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<tr>
<td>Project Supervisor:</td>
<td></td>
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<tr>
<td>Prime Contractor:</td>
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<tr>
<td>Traffic Control Supervisor:</td>
<td></td>
</tr>
<tr>
<td>Description of Work Activity:</td>
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<tr>
<td>Start Date:</td>
<td></td>
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<tr>
<td>Completion Date:</td>
<td></td>
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</tbody>
</table>

**Traffic Control Persons (name and employer):**
### TRAFFIC PLAN

Traffic control hierarchy:
When deciding on traffic control, traffic control devices such as signs, barricades, delineators, flashing arrow boards, changeable message signs, cones and other methods should be considered before using Traffic Control Persons.

Temporary / construction speed zones:
Reduced speed zones are to be kept as small as possible. 30 km/h and 50 km/hour temporary speed zones should not extend any further than 1 km outside the active work area.

### Traffic Plan

Consider the above site factors when determining the traffic control plan. Site factors should support the decisions regarding traffic control.

<table>
<thead>
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<th></th>
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<tbody>
<tr>
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<tr>
<td>• Site/procedural factors</td>
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<tr>
<td>• Types of traffic control devices</td>
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<tr>
<td>• Spacing of devices</td>
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<tr>
<td>• Advanced warning area</td>
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<td>• Transition area</td>
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<td>• Buffer area</td>
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<td>• Work area</td>
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<td>• Termination area</td>
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<tr>
<td>• Delineation during off hours</td>
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<tr>
<td>• Moving signs</td>
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<td>• Turning/removing signs</td>
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<td>• Checking devices</td>
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<td>• Traffic Control Persons:</td>
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<tr>
<td>- Location</td>
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<tr>
<td>- Qualifications</td>
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<td>- Hours of Work</td>
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<tr>
<td>- Communications</td>
<td></td>
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<tr>
<td>- Relief</td>
<td></td>
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<tr>
<td>- Site Instructions</td>
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<tr>
<td>- Traffic Control Supervisor</td>
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**OTHER:**

**Site Diagram** (use additional page if needed): Show all site factors affecting traffic control, traffic control devices, spacing, etc.

Traffic Control Plan Developed by:

Site Discussion:

<table>
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<tr>
<th>Name:</th>
<th>Agency:</th>
<th>Signature:</th>
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