

SECTION C STATIC OPERATIONS

C1 GENERAL

- C1.1 Definition
- C1.2 Work Site Length
- C1.3 Number of Contractors at a Work Site
- C1.4 Inclement Weather Conditions

C2 SITE LAYOUT

- C2.1 Sign Visibility Distance (A)
- C2.2 Warning Distance (B)
- C2.3 Sign Spacing Distance(C)
- C2.4 Layout for Level LV Traffic Management
- C2.5 Layout for Level 1 Traffic Management
- C2.6 Layout for Level 2 Traffic Management
- C2.7 Layout for Level 3 Traffic Management
- C2.8 Minimum Lane Widths

C3 SIGNS AND WORK SITE ZONES

- C3.1 General
- C3.2 Placement of Signs
- C3.3 Sign Height
- C3.4 Advance Warning Zone
- C3.5 Direction and Protection Zone
- C3.6 End of Works Zone
- C3.7 Covering Permanent Signs
 - C3.7.1 Curve Advisory Signs

C4 TEMPORARY SPEED LIMITS

- C4.1 General
- C4.2 Requirement
- C4.3 Authorising TSLs
- C4.4 Selecting a TSL
- C4.5 Length
- C4.6 Duration
- C4.7 Sign Location

C5 CONES AND OTHER DELINEATION DEVICES

- C5.1 General
- C5.2 Use
- C5.3 Placement
- C5.4 Edge Delineation

C6 SAFETY ZONES

- C6.1 General
- C6.2 Working Space
- C6.3 Longitudinal (Lead In) Safety Zones
- C6.4 Lateral Safety Zones
- C6.5 Overhead Safety Zones

C7 TAPERS

- C7.1 General
- C7.2 Types of Taper
 - C7.2.1 Shifting
 - C7.2.2 Merging Tapers
- C7.3 Taper Devices
- C7.4 Taper Visibility
- C7.5 Taper Length
- C7.6 Multiple Tapers
- C7.7 Chicanes

C8 SHOULDER AND LANE CLOSURES

- C8.1 Shoulder Closures
- C8.2 Lane Closures
- C8.3 Length
- C8.4 Lane Widths
- C8.5 Signing a Lane Closure
 - C8.5.1 Level 1 Closures
 - C8.5.2 Level 2 Closures
 - C8.5.3 Level 3 Closures
- C8.6 Centre Lane Closures
- C8.7 Lane Shifts
- C8.8 Using the Shoulder as a Temporary Lane
- C8.9 Presence of Intersecting Roads and On and Off-ramps

- C8.10 Work At or Near Signalised Intersections
- C8.11 Work On or Near Roundabouts
- C8.12 Passing Lane/Passing Bay Closure Principles

C9 ROAD CLOSURES AND DETOURS

- C9.1 General
- C9.2 Notification
- C9.3 Detours
- C9.4 Detour Signing
- C9.5 Gore Areas

C10 POSITIVE TRAFFIC MANAGEMENT

- C10.1 General
- C10.2 Types of Positive Traffic Management
- C10.3 Stop / Go Operations
 - C10.3.1 General
 - C10.3.2 Requirement
 - C10.3.3 Equipment
 - C10.3.4 Location and Site Layout
 - C10.3.5 Procedures
- C10.4 Portable Traffic Signals
 - C10.4.1 General
 - C10.4.2 Requirement
 - C10.4.3 Legal Requirements
 - C10.4.4 Training
 - C10.4.5 Site Layout
 - C10.4.6 Operational Checks
- C10.5 Pilot Car Method

C11 TRAFFIC MANAGEMENT INSTALLATION AND OPERATION

- C11.1 General
- C11.2 Order of Site Establishment
- C11.3 Installation Requirements for Signs
- C11.4 Installation Requirements for Channelling and Delineation Devices
- C11.5 Installation Requirements for Barrier Systems

C12 NIGHT WORK

- C12.1 General
- C12.2 Traffic Signs
- C12.3 Delineation Devices
- C12.4 Artificial Lighting
- C12.5 Excavations
- C12.6 Unattended Sites

C13 PEDESTRIANS AND CYCLISTS

- C13.1 General
- C13.2 Pedestrian Crossings
- C13.3 Temporary Paths and Detours
- C13.4 Covered Walkways
- C13.5 Lighting

C14 WORK VEHICLES, EQUIPMENT AND MATERIALS

- C14.1 Vehicle Movement
- C14.2 Loading and Unloading
- C14.3 Vehicle Mounted Flashing Beacons
- C14.4 Parking and Storage
- C14.5 Mud and Other Debris

C15 MANAGING TRAFFIC QUEUES

- C15.1 General
- C15.2 Queuing
- C15.3 Delays
- C15.4 Capacity

C16 SITE ACCESS

- C16.1 General
- C16.2 Requirement
- C16.3 Signing of Access Points
- C16.4 Manual Traffic Controllers at Site Access Points
- C16.5 Location
- C16.6 Delineation Devices

C17 ARROW BOARDS

- C17.1 General
- C17.2 Requirement
- C17.3 Location
- C17.4 Operating Procedures
- C17.5 Permitted Displays

C18 TRUCK MOUNTED ATTENUATORS

- C18.1 General
- C18.2 Use of TMAs
- C18.3 Location

C19 BARRIER SYSTEMS

- C19.1 General
- C19.2 Influencing Factors
- C19.3 Lateral Placement
- C19.4 Terrain
- C19.5 Barrier Length
- C19.6 End Treatments
- C19.7 Flares

C20 MAINTENANCE STANDARDS

- C20.1 General
- C20.2 Quality Classifications and Requirements
 - C20.2.1 Acceptable Classification
 - C20.2.2 Marginal Classification
 - C20.2.3 Unacceptable Classification
- C20.3 Evaluation for Classification of Temporary Traffic Management Devices
 - C20.3.1 Evaluation Guide: Traffic Signs and Stands /Supports
 - C20.3.2 Evaluation Guide: Cones and Tubular Delineators
 - C20.3.3 Evaluation Guide: Barrels
 - C20.3.4 Evaluation Guide: High Visibility Garments
- C20.4 Maintenance of Traffic Management Measures
- C20.5 Proprietary Barrier and Impact-Absorbing Systems

This page is intentionally blank

C1 General

C1.1 Definition

Static operations are activities contained within a fixed work site area. Activities within a moving work sites are subject to the rules and guidelines in Part D: Mobile Operations.

C1.2 Work Site Length

The length of any work site shall be the minimum required to undertake the activity. Short-term work sites should generally not be longer than one (1) km.

C1.3 Number of Contractors at a Work Site

A work site shall be under the control of only one Contractor at a time. If another Contractor(s) wishes to work on the same section of road they must request permission from the current work site Contractor, the Engineer and the Traffic Management Coordinator. The Engineer must approve any amendment to the existing TMP if it has to be adjusted to accommodate another Contractor's activity.

C1.4 Inclement Weather Conditions

When adverse weather conditions seriously affects visibility of signs and the work site it may be necessary to cease work and clear the site of all personnel, in the interests of safety. In exceptional cases it may also be necessary to clear the carriageway of all obstructions caused by the works, if this can be done safely. A decision on the need to clear the carriageway should be based on a consideration of all prevailing circumstances, including:

- the nature of the works,
- traffic volumes, and
- weather conditions.

This page is intentionally blank

C2 SITE LAYOUT

Worksite layout is normally based on the permanent speed limit. For Level 2 and 3 temporary traffic management the layout of the approach signing, the initial taper(s) and any associated worksite activity shall be based on the permanent speed limit. From the end of the initial taper the temporary speed limit shall be used for the layout of any subsequent tapers and the remainder of the worksite.

C2.1 Sign Visibility Distance (A)

The uninterrupted sight distance from an approaching road user to the first advance warning sign is defined as the Sign Visibility Distance, A. The higher the permanent speed limit the greater the visibility distance required.

Sign Visibility Distances are given in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

C2.2 Warning Distance (B)

A distance between the first advance warning sign and the start of the taper, or the start of the longitudinal safety zone if no taper is required (refer Section C6.3) is defined as the Warning Distance, B. The Warning Distance is normally achieved by locating signs at the appropriate sign spacing. Where this cannot be achieved the sign spacing distances will need to be increased. The Warning Distance has only been shown on drawings where the cumulative sum of Sign Spacing Distances on an approach to a worksite is less than, or equal to, the minimum Warning Distance required.

Warning Distances are given in Table C2.1 for **Level LV** Traffic Management and Table C2.2 for **Level 1** Traffic Management.

C2.3 Sign Spacing Distance (C)

The Sign Spacing Distance, C, is defined as the distance between two signs. Temporary warning and regulatory speed signs are required to be located at Sign Spacing Distances to allow the road user to read, understand and comply with the sign's message. Signs that have a supplementary plate displaying a distance to a taper must be placed that specific distance in advance of the start of the taper, or longitudinal safety zone when no taper is required. Where the cumulative sum of Sign Spacing Distances on an approach to a worksite is less than the minimum Warning Distance required, the sign spacing will need to be increased such that the Warning Distance is achieved.

Sign Spacing Distances are given in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

C2.4 Layout for Level LV Traffic Management

Permanent Speed Limit		≤ 50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
		m	m	m	m	m
Traffic Signs						
A	Sign Visibility Distance	50	60	70	80	100
B	Warning Distance	75	90	105	120	150
C	Sign Spacing	35	45	50	60	75
Safety Zones						
D	Longitudinal	0	0	0	0	0
E	Lateral *	1	1	1	1	1
Taper						
G	Length **	25	30	35	40	50
Delineation Devices						
Spacing in Taper		5.0	5.0	5.0	5.0	5.0
Spacing (Around the Working Area)		10.0	10.0	20.0	20.0	20.0

Table C2.1: Layout Distances for Level LV Traffic Management

- * A full width Lateral Safety Zone should be provided but this may sometimes be impractical because of road environment restrictions. In these situations the Lateral Safety Zone width may be reduced and, in some cases, a Lateral Safety Zone will not be able to be provided.
- ** The taper length represents a single lane shift or half the carriageway width on roads without a marked centreline. The taper length, in metres, is numerically equal to half the Permanent Speed Limit, in km/h. At work sites controlled by either Manual Traffic Controllers (MTC's) or Portable Traffic Signals, and a temporary speed limit of 30 km/h is applied, a 25m taper with delineation devices placed at 2.5m centres may be used in all cases.

Except for taper lengths and delineation device spacings, which are maximum values, the distances specified in the above table are minimum values.

C2.5 Layout for Level 1 Traffic Management

Permanent Speed Limit		≤ 50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
		m	m	M	m	m
Traffic Signs						
A	Sign Visibility Distance	50	60	70	80	100
B	Warning Distance	75	90	105	120	150
C	Sign Spacing	35	45	50	60	75
Safety Zones						
D	Longitudinal *	15	20	30	45	60
E	Lateral					
	1. Behind Cones etc	1	1	1	1	1
	2. Behind Concrete Barrier	0.5	0.5	0.5	0.5	0.5
	3. Behind Other Barriers	As recommended by manufacturers				
Tapers						
G	Length Per Lane**	50	60	70	80	100
K	Minimum Distance between Tapers	50	60	70	80	100
Delineation Devices						
Spacing in Taper		25.	2.5	5.0	5.0	5.0
Spacing (On Approaches, Between Tapers and Around the Working Area)		5	5	10	10	10

Table C2.2: Layout Distances for Level 1 Traffic Management

* A longitudinal safety zone is not required when a barrier completely protects the approach end of the site.

** Taper length is based on a single lane shift of 3.5m. At work sites controlled by either **Manual Traffic Controllers (MTC's)** or **Portable Traffic Signals**, and a temporary speed limit of 30kmh is applied, a 30m taper with delineation devices placed at 2.5m centres may be used in all cases.

Except for taper lengths and delineation device spacings, which are maximum values, the distances specified in the above table are minimum values.

C2.6 Layout for Level 2 Traffic Management

Permanent Speed Limit		≤ 50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
		m	m	m	m	m
Traffic Signs						
A	Sign Visibility Distance	60	70	80	100	120
C	Sign Spacing ♦	50	60	70	80	100
Safety Zones						
D	Longitudinal *	15	20	30	45	60
E	Lateral					
	1. Behind Cones etc	1	1	1	1	1
	2. Behind Concrete Barrier	0.5	0.5	0.5	0.5	0.5
	3. Behind Other Barriers	As recommended by manufacturers				
Tapers						
H	Initial Taper Length Per Lane***	90	100	120	150	180
I	Subsequent Taper Length Per Lane **	50	60	70	80	100
K	Minimum Distance between Tapers	50	60	70	80	100
Delineation Devices						
Spacing	ALL Tapers	2.5	2.5	2.5	2.5	2.5
	Approaches, between Tapers and around the Working Space	5	5	10	10	10
	At merge and diverge points for ramps and slip lanes, intersecting road entry and exit points, and site accesses points	2.5m for 10m either side of a change in alignment			2.5m for 20m either side of a change in alignment	

Table C2.3: Layout Distances for Level 2 Traffic Management

- * A longitudinal safety zone is not required when a barrier completely protects the approach end of the site.
- ** Only applicable where the taper is located a sufficient distance from a temporary speed restriction for drivers to have slowed down to the temporary speed. Taper length is based on a single lane shift of 3.5m
- *** Taper length is based on a single lane shift of 3.5m
- ♦ Where only one sign is erected in advance of the start of a cone taper the distance from the sign to the start of the taper must be 2xC.

Except for taper lengths and delineation device spacings, which are maximum values, the distances specified in the above table are minimum values.

C2.7 Layout for Level 3 Traffic Management

Permanent/Temporary Speed Limit		♦ 80 km/h	100 km/h
		m	m
Traffic Signs			
A	Sign Visibility Distance	100	120
C	Sign Spacing – Minimum ♦	80	100
	Sign Spacing - Desirable	160	200
Safety Zones			
D	Longitudinal *	45	60
E	Lateral		
	1. Behind Cones etc	1	1
	2. Behind Concrete Barrier	0.5	0.5
	3. Behind Other Barriers	As per manufacturer's recommendations	
Tapers			
H	Initial Taper Length Per Lane ***	150	180
I	Subsequent Taper Length Per Lane **	80	100
K	Minimum Distance between Tapers	80	100
Delineation Devices			
Spacing	ALL Tapers	2.5	2.5
	Approaches, between Tapers and around the Working Space	10	10
	At merge and diverge points for ramps and slip lanes, intersecting road entry and exit points, and site accesses points	2.5m for 20m either side of a change in alignment	

Table C2.4: Layout Distances for Level 3 Traffic Management

- * A longitudinal safety zone is not required when a barrier completely protects the approach end of the site.
- ** Only applicable where the taper is a sufficient distance from temporary speed restriction for motorists to have slowed down to the temporary speed. Taper length is based on a single lane shift of 3.5m
- *** Taper length is based on a single lane shift of 3.5m
- ♦ Where only one sign is erected in advance of the start of a cone taper the distance from the sign to the start of the taper must be 2xC.
- ♦ For temporary speeds less than 80 km/h use Table C2.3.

Except for taper lengths and delineation device spacings, which are maximum values, the distances specified in the above table are minimum values.

C2.8 Minimum Lane Widths

The minimum lane width is a function of the speed limit applied at a worksite.

The minimum lane widths for temporary traffic management are:

Permanent/Temporary Speed		30 km/h	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
F	Minimum Lane Width	2.75 m	3.00 m	3.00 m	3.25 m	3.25 m	3.50 m

Table C2.5: Minimum Lane Widths

Temporary lane widths should not exceed 4m.

Work sites with a high proportion of heavy vehicles may require lane widths greater than the minimums given in Table C2.5 above.

This page is intentionally blank

EXPLANATORY NOTE - Purpose of Signs (Refer Section C3.1)

Temporary traffic management signs provide the road user with information on:

- ***Advance Warning:*** The presence of the work site and the type of hazard
- ***Direction:*** The route they are required to travel to negotiate the work site safely
- ***Protection:*** The areas of the road which may and may not be used
- ***Regulation:*** The start and end of the temporary speed limit for the work site
- ***End of Works:*** The end of the hazard created by the work site and the return of normal road operating conditions

C3 SIGNS AND WORK SITE ZONES

C3.1 General

All temporary traffic management signs must meet the design requirements of MOTSAM and Section B1: Signs.

A standard work site is divided into three distinct, but interrelated, zones. These are:

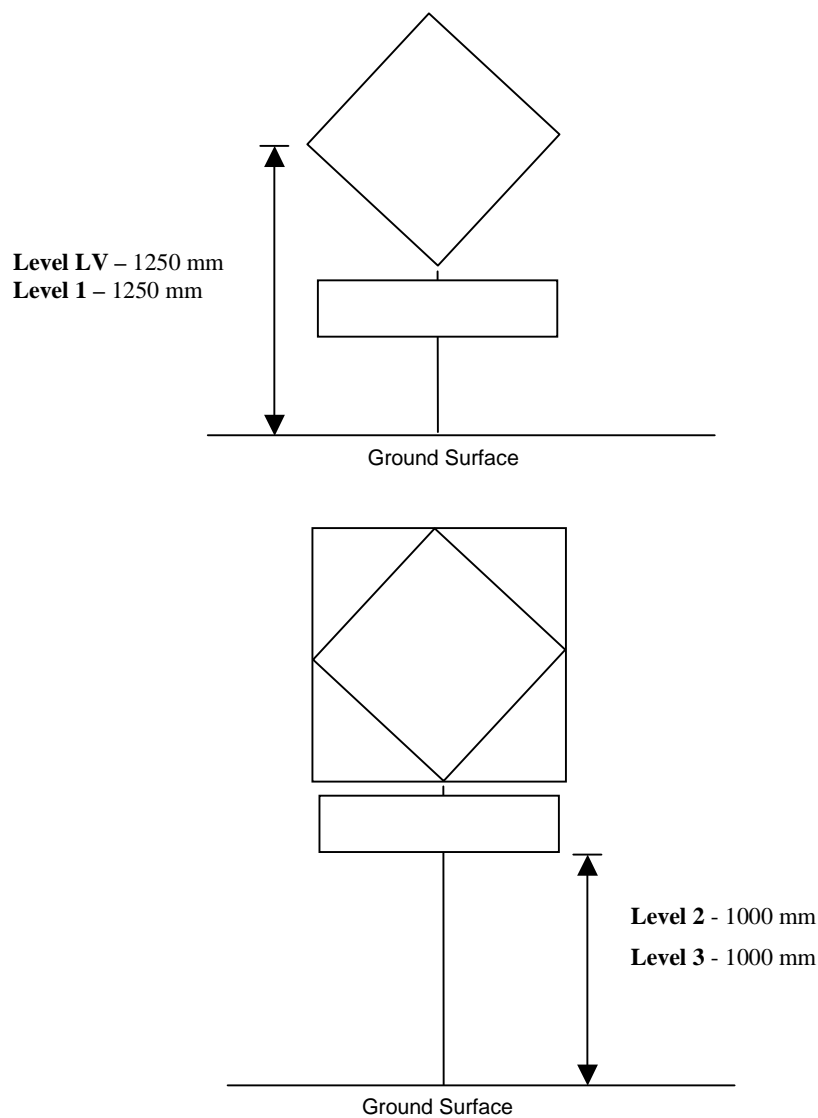
- Advance Warning,
- Direction and Protection, and
- End of Works.

C3.2 Placement of Signs

On ALL roads temporary warning and regulatory signs are required to be located on the left-hand side of the road. On Level 2 and Level 3 roads, and multilane Level 1 roads, additional temporary warning and regulatory speed signs must also be located on the right-hand side of the road.

All traffic signs must be positioned to ensure they are:

- upright,
- 0.5m clear of the travelled path, wherever possible, on **Level LV and Level 1** Roads,
- 1.25m clear of the travelled path wherever possible, on **Level 2 and Level 3** roads,
- not obscured by parked vehicles, trees or other obstructions,
- not a hazard to road workers or road users, including cyclists,
- not directing traffic into incorrect or dangerous situations,
- not obscuring view of other signs, devices or other traffic on the road,
- kept clean in accordance with maintenance standards especially in dusty or muddy conditions,
- removed or covered when the activity ceases, and
- sign bases must not be left in place, without signs attached, in a manner that will be a hazard to any road user, including pedestrians and cyclists.

EXPLANATORY NOTE - Example of Sign Height (Refer Section C3.3)

On **Level 2** and **Level 3** roads all signs shall be mounted on stands. At least one delineation device must be placed at the base of each sign stand on the side closest to traffic, unless more are specified. Where site restrictions such as local topography, median barriers, bridges etc, preclude the placing of the signs required either:

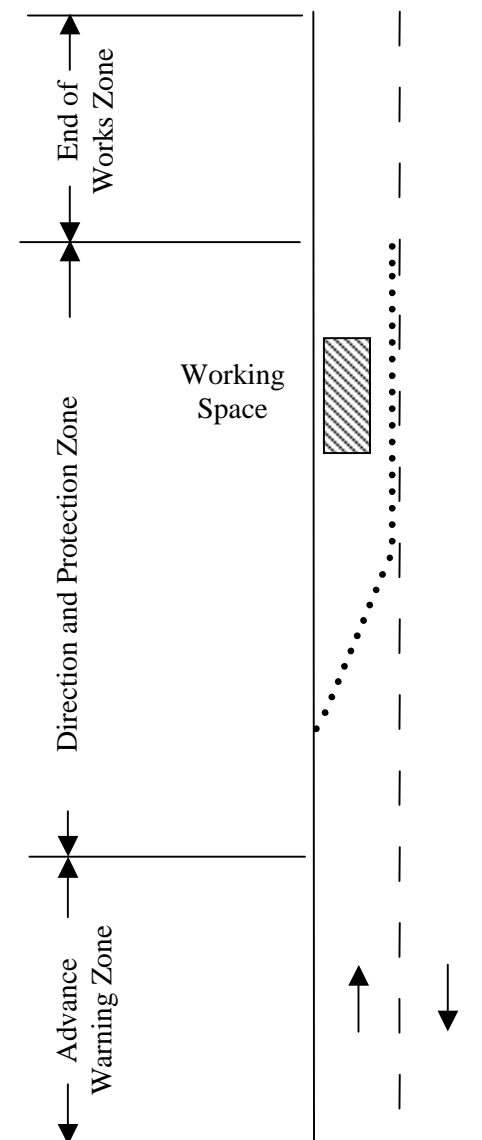
- the signs shall be moved forward away from the obstacle and additional signs provided, or
- smaller signs may be used, subject to the approval of the RCA and Engineer.

Details of any variations to the standard placement of signs must be specified on the TMP and submitted to the RCA for their approval. Signs must be located in a manner such that the safety of road users, including pedestrians and cyclists, is not affected. Signs must not be placed in a marked cycle lane or on a footpath unless it is safe to have them there. A delineation device, such as a cone, must be placed next to a sign erected in a cycle lane or on a footpath so that the sign can only be passed on the delineated side.

C3.3 Sign Height

Signs must be installed to the minimum heights given in the following table.

Road Level	Minimum Height from Ground Level to Lowest Edge of Sign	Minimum Height from Ground Level to Middle of Main Sign
Level LV and Level 1	N/A	1250 mm
Level 2 and Level 3	1000 mm	N/A

EXPLANATORY NOTE - Work Site Zones

C3.4 Advance Warning Zone

Advance warning signs alert road users to a hazard or activity on, or near, the road. The signs indicate the nature of the hazard or activity and must be placed at specific distances from the hazard to give road users sufficient time to slow down or to change their direction of travel.

Advance warning signs are required for traffic travelling in both directions for all activities associated with work on the carriageway, shoulder and footpath, and where the normal operating conditions of the road are changed due to the nature of the work. When the work and associated safety zones are outside the edge line and not on a sealed shoulder or footpath, advance warning signs are required in only one direction, eg. a power line maintenance activity outside the edge line on a grass shoulder only requires advance warning signs in the direction of travel affected.

Advance warning signs, and their appropriate use, are described in Table B1.1: Advance Warning Signs

C3.5 Direction and Protection Zone

Direction and protection signs advise road users that the normal traffic lanes are not available and that they are required to change lanes, or that manual traffic controllers or portable traffic signals are operating. A limited number of regulatory signs are also used. Direction and protection signs, and their appropriate use, are described in Table B1.2: Direction and Protection Signs.

C3.6 End of Works Zone

End of works signs advise road users that the work site or temporary hazard has been passed and that the condition of the road and the speed limit are returned to normal operating conditions.

The TW-16 'Works End' sign is erected on its own stand opposite the first advance warning sign for a road works site. If advance warning signs are located on both sides of the road a TW-16 sign may be attached to the back of each sign. A road controlling authority may approve the erection of a TW-17 'Thank You' sign immediately below the TW-16 sign, when the additional message is considered desirable.

The TW-17 'Thank You' sign is erected on its own stand to indicate the end of a section of road that has been signed to give advance warning of a temporary hazard other than road work activities. If advance warning signs are located on both sides of the road a TW-17 sign may be attached to the back of each sign.

End of works signs, and their appropriate use are described in Table B1.3: End of Works Signs.

EXPLANATORY NOTE - Existing Markings and Signs (Refer Section C3.7)

Road users could be confused if the information on existing signs or road markings are not applicable at a work site. The RCA may approve the altering, covering or replacing signs or road markings to suit the work site circumstances. It is essential that any markings or signs at the work site visible to road users accurately represent the prevailing conditions at all times.

EXPLANATORY NOTE - Materials for Covering Permanent Signs (Refer Section C3.7)

Non-adhesive material must be used to cover permanent signs that are not applicable for the duration of the work. Adhesive material will damage the reflective material on the sign reducing its night time visibility.

Materials that are plastic and/or non-breathable may cause heat damage or moisture damage to the reflective surface.

C3.7 Covering Permanent Signs

All permanent signs made redundant by the works must be covered, removed, or temporarily modified during the period of work. Overhead gantry signs do not, however, need be covered.

Temporary signs must not be allowed to obscure existing permanent signs that still apply. Permanent signs covered, removed, or temporarily modified during the period of work shall be restored immediately prior to completion of the works, unless no longer required.

The material used to cover any permanent signs, which no longer apply during the work phase, must prevent all road users viewing the sign and also reflection from vehicle's headlights at night. The material used to cover the signs must be:

- durable,
- opaque,
- non-adhesive,
- non-plastic;
- breathable; and
- securely fastened.
- 'Spray-on' masking materials **must not** be used to cover up permanent signs because the removal process may damage the sign surface.

C3.7.1 Curve Advisory Signs

Curve advisory signs shall only be covered where the advisory speed value is higher than the temporary speed limit imposed. In this situation, the supplementary speed plate shall be covered and the yellow diamond shaped sign indicating the type of the curve shall remain visible to road users.

It is recommended that an additional temporary speed limit sign (RG-4) be placed adjacent to any curve advisory sign that has been covered because the supplementary speed plate has higher speed value than that of the temporary speed limit at the work site.

EXPLANATORY NOTE - Supplementary "X0 km/h Ahead" Signs (Refer Section C4.1)

This sign is a supplementary plate to the TW-1 sign erected in advance of temporary speed limits imposed on **Level 2** and **Level 3** roads. The sign combination is referred to as TW-1B/3 sign.

The sign has no regulatory meaning and only advises road users that there is a temporary speed restriction on the road ahead. It has been used successfully on Auckland and Wellington Motorways.

C4 TEMPORARY SPEED LIMITS

C4.1 General

The RCA, or a person with delegated authority, must authorise the setting of a temporary speed limit (TSL) for a work site.

In determining a TSL consideration should be given to:

- the danger to road users,
- the danger to road workers, and
- the damage to the road surface.

A TSL must be:

- authorised in writing by the RCA, or person with delegated authority,
- at least 20 km/h less than the existing permanently gazetted speed limit,
- in multiples of 10 km/h; and
- appropriate to the condition of the road.

Refer to Appendix B for the LTSA Guidelines for the *"Correct Use of Temporary Speed Limits"* and *"Land Transport Rule – Setting of Speed Limits 2003 – Rule 54001"*.

C4.2 Requirement

TSLs must be appropriate for the type of work site activity and the condition of the road surface. TSLs may be needed where one or more of the following conditions exist:

- there are loose materials or stones on a sealed road which has been repaired or reconstructed,
- the surface of the road is being sealed or resealed,
- personnel or equipment, and their associated safety zones encroach on the live lanes,
- visibility is restricted while travelling through the work site due to dust, work equipment, construction materials, or abnormal weather conditions,
- the alignment, width or road surface is reduced to a standard lower than adjacent sections of road,
- the safety of road workers and road users could be affected,
- emergencies, eg. flooding, slips, crashes, etc,
- single lane traffic operation of a two lane, two way road, and
- a reduced number of lanes are available.

Note: This list is a guide only and does not include all possible activities.

EXPLANATORY NOTE - Compliance from Road Users (Refer Section C4.4)

Inappropriate use of TSLs leads to a reduction in compliance by road users. Their effectiveness is reduced when used in other situations where they could have a positive benefit to road safety. A speed limit set too low will result in higher speeds and a greater mix of speeds, both of which increase the safety risks to road users and personnel.

EXPLANATORY NOTE - Buffer Speed Limits (Refer Section C4.4)

Progressive speed limits (sometimes called buffer speed limits) in advance of a work site, eg. 70 km/h followed by 50 km/h followed by 30 km/h, that are not justified in terms of the surrounding activity have proven to be ineffective in reducing traffic speeds. Progressive speed limits should not be used and, where necessary, repeater temporary speed limit signs should be used to reinforce the temporary speed message.

C4.3 Authorising TSLs

The location and value of every TSL must be authorised, in writing, by the RCA or a person with delegated authority. An application form for this purpose is included as Appendix B.

C4.4 Selecting a TSL

Once the need for a TSL has been determined the following principles are to be used:

- **TSLs of less than 70 km/h in areas with permanent posted speed limits of 100 km/h, or less than 50 km/h in areas with a permanent posted speed limit of 70 or 80 km/h shall not be used without additional "Positive Traffic Management" measures. Refer to Section C10: Positive Traffic Management.**
- The speed limit should not be so low that road users disregard it.
- The speed limit should not exceed the maximum safe travel speed, which depends on the degree of pedestrian and vehicle activity, the type and extent of the work in progress and the characteristics of the road, eg. Its surface condition. The maximum safe speed is lowered by frequent hazards and potential work site conflicts.
- Speed limits should encourage a uniform speed, but should be low enough to allow road users time to react to unusual events or to directions from manual traffic controllers.

Recommended TSLs are given in Table C4.1. A lower temporary speed limit may, however, be selected after due consideration of the principles noted above.

Posted Speed Limit (km/h)	Temporary Speed Limit (km/h)
50	30
60	30
70	50
80	50
100	70

Table C4.1: Recommended Temporary Speed Limits

Note: Temporary speed limits of less than 30 km/h shall not be used.

EXPLANATORY NOTE - Duration of Temporary Speed Limit Signs (Refer Section C4.6)

It is important that the TSL reflects the condition of the site at any given time. A road user should be able to see the features that necessitate the speed restriction. If the road user does not see any noticeable change it is very likely that the restriction will be ignored. A uniform standard must be achieved at all work sites to increase safety for road users, road workers and the road surface.

Some situations will require a speed restriction lower than those recommended in Table C4.1. These include, but are not exclusive to:

Situation	Recommended Temporary Speed Limit
Where traffic has to traverse the actual active work site	30 km/h
The approach to a two-way one-lane operation, eg. manual traffic controllers or portable traffic signals	30 km/h
Protection of a new seal	50 km/h
New seal, swept but not marked	70 km/h
Work site activities protected by a Barrier System	No temporary restriction

Table C4.2: Specific Temporary Speed Limits

Where the working space is longer than 400m more than one temporary speed limit may be used. For example, a lower limit could be applied over a short section of road that has considerably more construction activity than other areas of the work site. Each individual temporary speed limit section must, however, be at least 200m long and the speed restriction must be justified in terms of the work activity.

C4.5 Length

On long work sites TSL signs must be repeated at intervals no greater than 400m, as a reminder to road users of the maximum speed they may travel past, or through, the work site. These signs must always be erected on the left-hand side of the road before additional signs are erected on the right hand side of the road.

C4.6 Duration

TSLs must be removed as soon as the circumstances under which the speed restriction was imposed no longer exist.

EXPLANATORY NOTE - Enforcement of Temporary Speed Limits (Refer Section C4.7)

The temporary speed restriction sign (RG-4) and the applicable permanent speed limit sign (RG-1, RG-2, RG-2.1 or RG-3) used to de-restrict traffic must be placed directly opposite the restriction on the other side of the road. This creates a uniform speed through a work site in both directions meeting the requirements of the Traffic Regulations (1976). The Police can be asked to legally enforce a temporary speed limit if road users are not obeying the restriction and are creating an unnecessary hazard for road workers, the road surface or other road. The temporary speed limit can only be enforced if the work site is set out to the requirements of this Code.

C4.7 Sign Location

The **start** of every TSL must have:

- A TSL (RG-4) sign on the left-hand side of the road*;
- An additional TSL (RG-4) sign on the right-hand side of the road for **all Level 2** and **Level 3** roads and multilane **Level 1** roads.

Any side road entering a restricted speed limit area must also have a TSL installed.

The **end** of every temporary speed limit must have:

- The relevant permanent speed limit (RG-1, RG-2, RG-2.1 or RG-3) sign placed opposite the RG-4 sign on the left-hand side of the road, and on every side road where traffic leaves the temporary speed limit;
- The relevant permanent speed limit (RG-1, RG-2, RG-2.1 or RG-3) sign placed opposite the RG-4 on the right-hand side of the road whenever the RG-4 sign has been erected on the right-hand side.

On one-way roads, the (RG-1, RG-2, RG-2.1 or RG-3) sign may be erected with the "Works End " sign as a supplementary plate. The sign is to be placed on both sides of the road, a distance from the hazard as specified by the 'Sign Spacing Distance' in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

On two-way two-lane roads the "Works End" sign is to be erected opposite the first advance warning sign. Where the first advance warning sign is installed on both sides of the road, the "Works End" sign may be placed on the back of the first advance warning sign.

* **Note:** The setting of speed limits 2003 requires that, by 1 July 2005, signs are erected on both sides of the road for each direction of travel

EXPLANATORY NOTE-- Delineation Devices (Refer Section C5.1)

Equipment detailed within the Code of Practice is not intended to be exclusive and use of new equipment that is specifically designed for temporary traffic management is encouraged. It should be noted that the approval to use equipment for a particular operation does not necessarily mean that it would be suitable for other situations.

C5 CONES AND OTHER DELINEATION DEVICES

C5.1 General

For short-term work sites the form of devices should superimpose themselves on the permanent system to the extent that they dominate it by size, colour and reflectivity. Permanent road markings should not be altered for short-term work sites. For long-term work sites on **Level 2** and **Level 3** roads the permanent road markings should be modified to reflect the revised situation.

Cones and other delineation devices are used for a variety of applications within a work site. These devices are usually placed in the Direction and Protection zone (refer Section C3.3) of a work site.

Different types of devices should not be mixed or used over distances of less than 100m.

C5.2 Use

Cones and tubular delineators are mainly used to mark tapers and to form temporary traffic lanes. It is recommended that cones be used in preference to tubular delineators wherever possible.

Barrels are used to convey bulk. Where used to separate road users from non-frangible objects, such as concrete barriers or parked plant etc, an RG-17 or RG-34 sign shall be placed alongside the barrel, or the first barrel in a row of barrels, to indicate the appropriate side for which road users are to pass.

The use of steel drums is prohibited.

C5.3 Placement

Delineation devices shall be placed in accordance with Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management. These devices shall be installed in straight lines or smooth curves to help road users travel past the hazard.

On all Level 2 and 3 layouts cones shall be installed along the edgeline, from the RG-4 Temporary Speed Limit sign to the start of the taper or hazard area where no taper is installed.

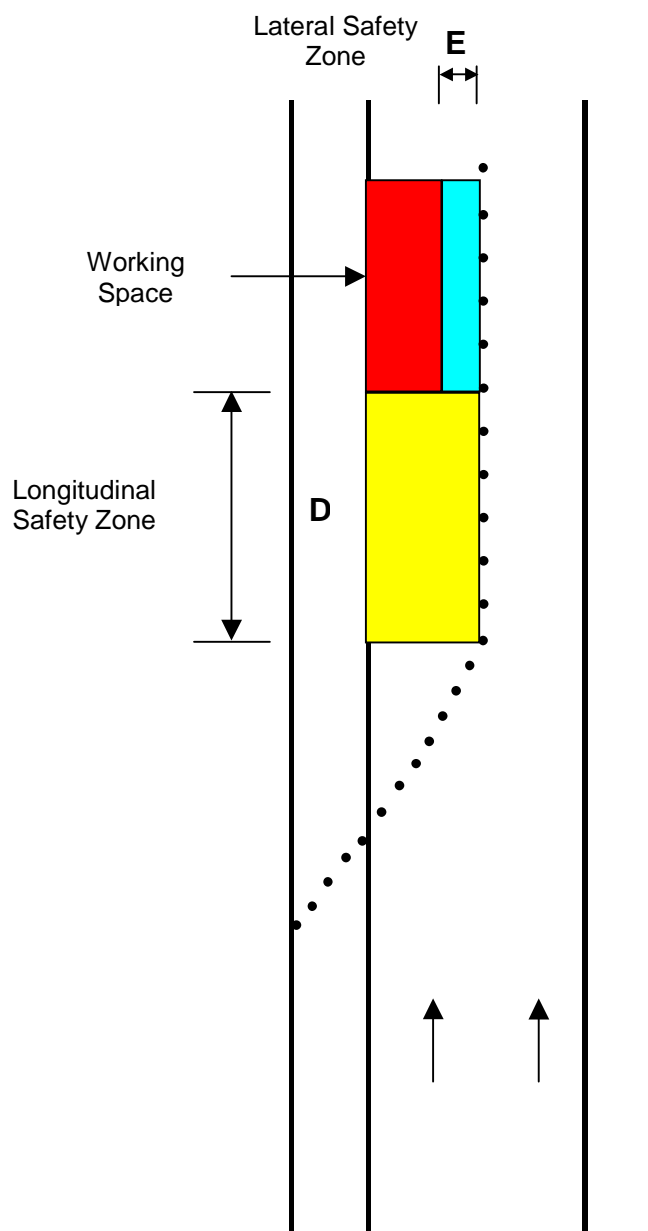
C5.4 Edge Delineation

Edge marker posts DO NOT meet the requirements for temporary delineation and they must not be used for temporary traffic management.

Edge delineation with existing marker posts and/or raised pavement markers (RPMs) must be maintained where the edge of the carriageway remains unaltered during the roadwork activity. Where traffic is required to deviate from their normal direction of travel, or the nature of the activity requires shoulder reconstruction, then the edge marker posts and RPMs shall be removed and replaced by temporary delineation devices. Permanent edge marker posts and/or RPMs shall be reinstated before the removal of the temporary delineation devices.

Edge marker posts that conflict with temporary delineation should either be covered or removed.

This page is intentionally blank

EXPLANATORY NOTE - Example of Safety Zone Design

C6 SAFETY ZONES

C6.1 General

Safety zones provide additional protection for road workers and road users.

There must be a safety zone between the working space and the edge of the live lane, except where road users must actually traverse through the work site.

The safety zone is three dimensional, extending from the front to the back, to the sides and above the working space. It provides a clear zone that should not be used by personnel, equipment or materials and includes the areas within the coned tapers, even though these areas are **NOT** included in the longitudinal safety zone dimension.

C6.2 Working Space

An adequate working area must be provided within the work site to allow for the movement of workers, equipment and transport, including sufficient waiting and storage space for the above items. The working space may vary during the period of the work and need not be a constant width around the work site.

TC's may enter a safety zone to place, replace and remove temporary traffic management equipment, as necessary. Additional TC's are required to watch for hazards when TC's are working in a safety zone.

TMA, arrow boards, signage, safety zone intrusion alarms and temporary traffic management equipment associated with personnel, including Stop/Go operators, may also be stationed in a safety zone. The dimensions of safety zones are given in Section C2: Site Layout.

C6.3 Longitudinal (Lead In) Safety Zones

A Longitudinal Safety Zone is the initial portion of a closed lane in advance of the working space.

Longitudinal Safety Zones are measured from the end of the taper leading into the working space to the start of the hazard.

Minimum lengths for Longitudinal Safety Zones are given in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 **Level 3** Traffic Management.

Where longitudinal safety zones cannot be achieved on **Level 2** and **Level 3** roads a TMA shall be installed to provide safety for road users, road workers and equipment.

EXPLANATORY NOTE - Height Restrictions (Refer Section C6.5)

The maximum legal vehicle height permitted on roads is 4.25m but road users often illegally exceed this limit. Before any reduction to the permanent height clearance is effected, the RCA must be consulted so that road users can be advised of the changed circumstances.

C6.4 Lateral Safety Zones

A Lateral Safety Zone is the minimum distance from the edge of the live lane to the edge of the working space.

C6.5 Overhead Safety Zones

At all sites where work is being carried out above the road, all road users must be adequately protected from falling objects by nets, platforms or other devices, or alternatively the respective part of the carriageway shall be closed.

Where the work will impose a temporary height restriction, eg. a safety platform or falsework underneath a bridge soffit, the RCA must approve it. Road users must also be warned of the temporary height restriction.

This page is intentionally blank

C7 TAPERS

C7.1 General

Tapers are used to move traffic from its normal travel path to a temporary travel path around, or through, a work site. Tapers are created by placing a number of delineation devices, usually cones or other suitable delineation devices, in a straight line or smooth curve across the width of the lane that is no longer available for use.

C7.2 Types of Taper

C7.2.1 Shifting

This type of taper is used where traffic is simply required to shift laterally without conflict with other traffic.

On **Level 1 and 2**, two-lane two-way roads that have been reduced to one lane and are being used alternately by traffic in each direction, the taper can be reduced to 30m provided a temporary speed restriction of 30 km/h is imposed and cones are spaced at 2.5m centres. Manual traffic controllers or portable traffic signals always control this situation.

C7.2.2 Merging Tapers

This type of taper is used on multilane roads where one lane of traffic must merge into another lane.

Merging shall only be carried out one lane at a time. Where more than one merge is required, the subsequent merge(s) may use a taper rate greater than the initial taper, provided a TSL has been applied prior to the initial taper.

C7.3 Taper Devices

Cones or barrels used in tapers must meet the specifications described in Section B2: Delineation Devices.

C7.4 Taper Visibility

Tapers should be located so that their full length is visible to approaching traffic. Where this is not possible at least 2/3 of the taper must be visible. If this cannot be achieved the taper length must be extended so that the 2/3 requirement can be achieved.

EXPLANATORY NOTE - Lengths of Tapers for a Lateral Shift of less than 3.5 m

Taper lengths are based on a lateral shift of 3.5m, which generally equates to the width of a live lane.

For lateral shifts of less than 3.5m the length of the taper may be reduced. The reduction in the length of the taper is calculated thus –

$$(\text{the lateral shift} \div 3.5) \times (\text{the taper length for a 3.5m shift}).$$

Example: (**Level 1** road) – 100 km/hr

- Lane width = 3.5m
- Taper length for 3.5m shift = 100m
- Lateral shift required = 2.0m
- Revised taper length = $2.0 \div 3.5 \times 100 = 57\text{m}$

EXPLANATORY NOTE - Benefits of Chicanes (Level 3 Roads Only)

- Better controlled merging of the various lanes particularly the higher speed right hand lane
- Site layout approaches are uniform
- Traffic is calmed by lane merging and shifting well in advance of the working space
- The potential for optimum capacity and improved safety through the site

C7.5 Taper Length

The length of taper depends on the speed limit and the lateral shift. Tapers are specified as a taper length for all temporary traffic management **Levels**. Refer to Table C2.1 for **Level LV** Temporary Traffic Management, Table C2.2 for **Level 1** Temporary Traffic Management, Table C2.3 for **Level 2** Temporary Traffic Management and Table C2.4 for **Level 3** Temporary Traffic Management. Taper lengths shown on these tables are based on a lateral shift of 3.5m. For **Level 2** and **Level 3** traffic management initial tapers are based on the permanent speed limit and any subsequent tapers are based on the temporary speed limit.

C7.6 Multiple Tapers

Closures of more than one lane require multiple tapers. Lane closures must be effected one lane at a time. The distances between multiple tapers are given in Table 2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

C7.7 Chicanes

A chicane involves merging multiple lanes of traffic into a single lane prior to a shift laterally around the working space, refer to Explanatory Note on page C7 - 2.

Chicanes are only used on **Level 3** roads and **Passing Lanes**.

When merging traffic on a passing lane the use of chicanes is essential unless the lane is completely closed.

Chicanes are used where there is a sufficient length of road free of intersections.

Chicanes are most frequently used when work is being carried out in the left lane but they may also be used in other situations.

EXPLANATORY NOTE - Shortening Shoulder or Lane Closures (Refer Section C8.3)

Shoulder or lane closures should be kept as short as possible to minimise the length of road under temporary traffic management and to improve the efficiency of the road network.

C8 SHOULDER AND LANE CLOSURES

C8.1 Shoulder Closures

Shoulder closures are used to provide minimal disruption to traffic on all roads where the works are restricted to a trafficable shoulder that is typically 2m or more wide.

Where safety zones are compromised for short-term works on **Level 2** and **Level 3** roads, the installation of a semi-static closure with the protection of a TMA can be used. If this is not practicable a full lane closure may be necessary.

C8.2 Lane Closures

A lane should be closed to traffic whenever an activity is carried out:

- such that passing traffic is required to cross a lane line, or cross a centreline and it is not possible to retain a contra-flow situation;
- where the air space up to 6m over the area is occupied by the activity or where there is a risk of objects falling from above;
- in a location where the combination of signing and physical restriction created by the working space plus safety zone will not result in a satisfactory reduction in traffic speed to maintain a safe working space;
- there is insufficient room to maintain the same number of traffic lanes past the work site as is on the approach to the site while satisfying the minimum lane width requirements.

C8.3 Length

The length of shoulder and lane closures should be kept to a minimum while ensuring the longitudinal safety zones are still provided.

The length of the working space must not exceed one km for shoulder and lane closures without specific approval from the RCA.

Shoulders and lane closures should be shortened as work progresses along the road.

C8.4 Lane Widths

Shoulder closures and lane closures must ensure that the minimum lane widths given in Table C2.5: Minimum Lane Widths are always provided. These lane widths are the clear lane widths and are exclusive of delineation devices, safety zones and road markings. Temporary lane widths should not exceed 4m.

Work sites with a high proportion of heavy vehicles may require lane widths greater than the minimum widths specified.

C8.5 Signing a Lane Closure

Lanes must be closed with a TW-7, TW-7.1 or TW-7.2 'Lane Closure' sign, as detailed in Table B1.2: Direction and Protection Signs, to warn road users that normal lanes are not available. **“Lane Closure” signs are only placed in advance of the start of the taper and are not required at the start of the taper.**

C8.5.1 Level 1 Closures

The “Lane Closure” sign does not require a supplementary sign displaying the distance to the lane closure.

The “Lane Closure” sign is placed in advance of a distance from the start of the taper as shown in Table C2.1, Row C.

C8.5.2 Level 2 Closures

The “Lane Closure” sign requires a supplementary sign displaying the distance to the lane closure.

Depending on site requirements, the first “Lane Closure” sign is placed 100 metres or a multiple of 100 metres in advance of the start of the taper.

For multiple lane closures, the second lane closure must be signed 100 metres in advance of the start of the second taper.

C8.5.3 Level 3 Closures

The “Lane Closure” sign requires a supplementary sign displaying the distance to the lane closure.

The first “Lane Closure” sign shall be placed 400 metres in advance of the start of the taper and followed by another “Lane Closure” sign at a distance of 200 metres from the start of the taper.

For multiple lane closures, the second lane closure must be signed 100 metres in advance of the start of the second taper.

C8.6 Centre Lane Closures

On roads with three or more lanes in one direction, centre lane closures are not permitted. Where work must be conducted in a centre lane the lane(s) on either the left **or** right must also be closed.

On **Level 3** roads it is recommended that the right-hand lane be closed. On **Level 1** and **Level 2** roads the other lane to be closed shall be stipulated by the contractor in their TMP and reviewed by the RCA who have the ultimate decision as to which lane is closed. Consideration should be given to intersections, including turning bays, when choosing the lane to be closed.

C8.7 Lane Shifts

The signing of lane shifts follows a similar pattern to that for lane closures but implies simultaneous lateral shifts of lanes rather than merging of one lane with another.

Lane shifts are only signed when there are two or more lanes in one direction must shift simultaneously past a hazard. Lane shifts are indicated with TW-8 and TW-8.1 signs.

Lane shift signs are not required for two-lane two-way roads. In these situations an RG-17 sign must be installed at the start of the row of delineation devices that separates the opposing traffic flows.

On **Level 2** and **Level 3** roads the lane shift signs require a supplementary sign displaying the distance to the lane shift. Where traffic has to shift twice it may not be appropriate to display the distance to the second shift, especially at short work sites.

C8.8 Using the Shoulder as a Temporary Lane

If the traffic demand expected is likely to exceed the capacity of the road during work activities the shoulder may be used as a temporary lane.

A shoulder used as a temporary lane must:

- be safe for traffic to traverse at the given TSL,
- be at least the minimum width for the speed through the work site,
- have adequate overhead clearance,
- have adequate visibility along its length (vegetation may need to be trimmed and traffic signs moved, with the permission of the RCA),
- not have a surface level height difference of more than 25mm from the adjacent traffic lane for multiple lane situations where the shoulder is used as one of those lanes and
- be delineated on both sides.

EXPLANATORY NOTE - Signalised Intersection (Refer Section C8.10)

Work that significantly alters approach speeds, traffic density, lane availability or approach alignment can significantly affect traffic signal operation. Work that damages vehicle detection systems, hardware or cabling or generates spurious demands may also severely affect signal operation. Vehicle detector loops may extend up to 120m in advance of the painted limit line.

C8.9 Presence of Intersecting Roads and On and Off-ramps

When the work site is on a side road of a lower level (say Level 1) than the road where the advance warning signs are required (say Level 2) then the advance warning signs may be in accordance with the lower level.

When the work site is on a side road of a higher level (say Level 2) than the road where the advance warning signs are required (say Level 1) then the advance warning signs may be in accordance with the lower level.

Where lanes are closed through intersections the delineation devices must allow for turning movements of the vehicles entering or leaving from side roads. Where side roads have two or more lanes turning into the main road that has lanes closed because of the work, tapers must also close the respective lanes on the side roads.

Lane closure tapers should not start within 50m of an intersection on **Level 2** roads. This distance is extended to 100m clear of any ramp or intersection on **Level 3** roads measured from the point where the merge area finishes or where the diverge area commences.

If the work operation blocks a side road and a manual traffic controller cannot direct the traffic around the site then a detour may be required, refer Section C9: Road Closures and Detours.

Merging of traffic from a side road having two lanes at the intersection into a road with only one lane at a work site is unsafe. The number of lanes on a side road must not exceed those available for road users bypassing the work site.

C8.10 Work At or Near Signalised Intersections

In addition to the requirements in Section C8.9 the following applies where the work occurs at or adjacent to existing signalised intersections. The road controlling authority must be advised at least five working days prior to commencement of any work. Where multiple signalised intersections occur close together the taper rates may need to be increased or lane closures extended.

EXPLANATORY NOTE - Passing Lane Closures (Refer Section C8.12)

The figure of 600m is based on the distance required to safely pass another vehicle at 100 km/h whilst allowing for a safe sight distance ahead. This distance can be reduced in consultation with the RCA based on local conditions where traffic is travelling much slower, such as on steep gradients.

C8.11 Work On or Near Roundabouts

All or part of a roundabout should be closed whenever work occurs on or adjacent to a roundabout if the required safety zones cannot be met. On multiple lane roundabouts where the work is confined to one lane, all entrances shall be reduced to a single appropriate lane as for ordinary intersections and the respective lane on the roundabout closed except where required for exits. Where entrances or exits are required to be closed the requirements of Section C9: Road Closures and Detours, shall be followed.

C8.12 Passing Lane/Passing Bay Closure Principles

Where work occurs within a passing lane the following principles apply:

- If the start of the first taper is less than 600 metres from the start of the passing lane, the lane should be completely closed from its start point to the work site.
- If the start of the first taper is more than 600 metres from the start of the passing lane a taper should be installed in advance of the work site, as for a normal lane closure.
- If the passing lane extends beyond the work site then the lane should be opened beyond the work site.

A passing lane must have signs placed on both sides of the road for both directions of travel.

EXPLANATORY NOTE - Emergency Services and Road Closures (Refer Section C9.1)

In the event of an emergency, emergency services may close a road to secure a site. The RCA must be informed immediately this type of situation arises. This is normally a requirement of the RCA's "Emergency Strategy Procedures".

C9 ROAD CLOSURES AND DETOURS

C9.1 General

A total road closure should only be considered if there is no practical means of providing a safe work site or by the scope of works required. A road closure is defined as the complete closure of all trafficable lanes to all road users.

In general there are four criteria for closing a road:

1. ***An emergency***
eg. a traffic crash: closed immediately by emergency services and RCA notified immediately.
2. ***Unsafe road conditions***
eg. floods, slips, snow: closed immediately by the Police, Civil Defence etc. in consultation with the RCA or Engineer.
3. ***Road works (with delays of more than 15 minutes)***
Five days notice is required, closed by the RCA.
4. ***Cultural or sporting events***
42 days notice is required, closed by the RCA.

All planned road closures and detours must be authorised in writing by the RCA.

C9.2 Notification

The RCA must notify other affected RCA's, the Police, Fire Service, Ambulance Services and the AA of any planned road closures or detours.

If the proposed detour route includes roads under the authority of another RCA, the RCA must ensure that the road has been approved for use as a detour route by the responsible RCA.

In addition to other required notification procedures, the following minimum advance notice should be provided prior to closing any length of road:

- **By the Engineer to the Road Controlling Authority:**
Two (2) working days following receipt of Traffic Management Plan, in writing.
- **By the Contractor to the Public:**
 - Five (5) working days before commencing work where the activity is recognised as a road work activity, otherwise
 - 42 days before holding an event by advertisement in the appropriate daily newspaper - refer to Appendix E: Newspaper Advertisement Standard, for a typical format, or
 - other specified media as detailed in the contract documents.

This notification will only be made after the RCA has agreed to the proposal to close the road. Any additional public notification requirements shall be specified by the RCA. The media releases shall be formatted to the approval of the RCA and approved as part of the proposed TMP procedure. Provision for these should be made in the contract documents (schedule of prices).

C9.3 Detours

All detour routes must be agreed in advance with the RCA, and full information provided to all emergency services.

Detours shall provide a clearly delineated route for road users around the road closure.

The length of a detour versus the expected time of closure and the location of works determines the practicality of installing a detour. It is acknowledged that in some remote areas of New Zealand practicable detours do not exist.

Signs used for all detours shall comply with those shown in MOTSAM. Where a road closure affects more than one important destination each destination should be individually signed with a different symbol on the signs, to ensure that road users can find their way to the correct destination. This principle also applies to opposing traffic flows where both have been affected by the closure.

This page is intentionally blank

EXPLANATORY NOTE - New Detour Signs (Refer Section C9.4)

The TW-21 'Detour Ahead Follow Symbol' sign is used for advance warning of a detour



The TW-22 'Detour Direction Indicator' sign guides and reassures road users along the route of a detour. The sign ensures road users other than those following the detour are not misdirected. The sign is always mounted horizontally with the arrow either vertically upward, at 45° upwards to the left or right or horizontally upward to the left or right. For multiple detours at one locality different symbols can be used for each detour. Recommended symbols include a square, circle and triangle. Symbols may be any colour provided that colour contrasts with the orange sign background.

***EXPLANATORY NOTE - Detour Signing Principals (Refer Section C9.4)***

The principle of signing detour routes is to ensure that road users can safely and effectively navigate their way to their intended destinations without any confusion or excessive delay. The sign layout should not cause road users not affected by the closure to deviate from their intended route.

Sufficient signs should be erected along the route to direct road users to such a point where they can continue their journey using permanent route sign information. This usually involves directing road users back onto their original route of travel, at a point past the work site.

C9.4 Detour Signing

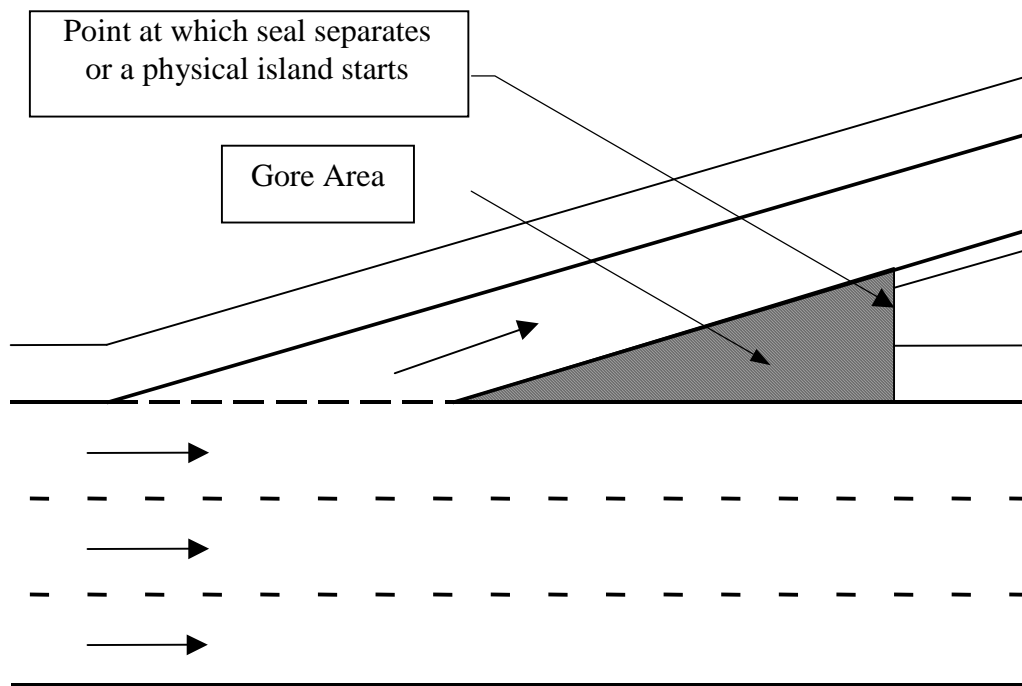
The TW-21 'Detour Ahead Follow Symbol' sign gives advance warning of a detour. A TW-12 'Supplementary Distance Plate' may be attached to this sign and the distance shown must be no greater than 400m, rounded to the nearest 100m.

The TW-21 sign may only be used if an RG-16 'Road Closed' sign is installed at the closure. The TW-21 sign is used to direct road users to a suitable alternative route. At subsequent changes of direction along the route TW-22 'Direction Indicator' signs should be used. Road users diverted from a closed section of road are advised to follow the specified symbol along the diversion route until the intended route is rejoined. By employing this system, the entire detour route can be indicated ahead of time by the symbol chosen, which will be meaningless to road users who have not seen the sign at the start of the detour. It is most important that a detour route is clearly and consistently signed throughout its length and that a TW-22 'Detour Ends' sign is erected at the end of the detour. The purpose of this sign is to indicate to road users that the special temporary signing terminates at that point and that the permanent signing should now be followed.

Detour signs shall have black legends on orange backgrounds. This is to distinguish them from permanent directional signs and to attract the road user's attention in the unusual surroundings of the detour route.

In general the following principles apply to detour signage:

- The first TW-22 'Direction Indicator' sign should be located no more than 100m past the TW-21 'Detour Ahead Follow Symbol' sign.
- The frequency of subsequent TW-22 signs will depend on the intersections encountered and route required - the road user must be confident that they are on the correct detour route at all times. On **Level 1** roads marker arrows should not be placed more than one (1) km apart. On **Level 2** and **Level 3** roads they should be not more than two (2) km apart.
- TW-22 signs should always be placed well before multilane intersections to allow the road user to select the appropriate lane necessary, and at the intersection.
- TW-22 signs should also be placed at, or immediately after, important or complex intersections, irrespective of whether a change in direction was required, to confirm that the road user is on the correct detour route.

EXPLANATORY NOTE - Example of a Gore Area (Refer Section C9.5)

Work should not be undertaken in the equivalent areas of 'on ramps' unless the on ramp has been closed.

C9.5 Gore Areas

A Gore Area is an area of seal at an on or off ramp located outside the edge line of the ramp. When working in the Gore Area on **Level 2** and **Level 3** roads, the ramp on which the work is being carried out must be closed.

This page is intentionally blank

EXPLANATORY NOTE - Side Friction (Refer Section C10.2)

Side Friction gives road users the perception that they are travelling faster and in a narrower lane than they actually are, creating a reduction in speed to that desired through the work site.

C10 POSITIVE TRAFFIC MANAGEMENT

C10.1 General

Temporary speed limit signs alone will **not** ensure that vehicles will pass through a work site at the temporary speed. Work sites need positive traffic management controls, in almost all circumstances, to reduce vehicle speeds to the temporary limit.

Positive traffic management is measures that may be necessary during the work site activity to safely reduce the speed of traffic through the site to the temporary speed limit. Positive traffic management exerts a natural and acceptable restriction on traffic passing through the site and serves to highlight the location and nature of the work site.

C10.2 Types of Positive Traffic Management

The most effective means of reducing the speed of traffic through a work site is to use active temporary traffic management measures, including, but are not limited to:

- manual traffic controllers using Stop/Go paddles,
- portable traffic lights, and
- shuttle pace vehicles.

Other means of effectively reducing the speed of traffic through a work site is the use of passive temporary traffic management measures, these include, but are not limited to:

- narrowing lane widths adjacent to the hazard area by the use of cones or other delineation devices to increase the phenomenon known as *Side Friction*,
- close spacing of traffic delineation devices, and
- using rotating flashing beacons, flares, or illuminated signs.

Different levels of positive traffic management will be necessary depending on the nature of the works, the **Level** of road as specified by the RCA, sight distances and road alignment. The provision of positive traffic management in a TMP allows Contractors to use innovative techniques that will improve safety levels for road workers and road users. All positive traffic management measures detailed shall be in accordance with this Code of Practice and shall be fully detailed in the TMP.

C10.3 Stop / Go Operations

C10.3.1 General

Stop / Go Operations shall not be used where two way traffic flow can be maintained past a work site.

A Manual Traffic Controller (MTC) is a person employed by the Contractor to manage traffic through a work site. A MTC must receive a briefing and thorough training relating to the task from the STMS nominated for the activity.

MTCs may be used for situations that include:

- stopping traffic to avoid other hazard,
- allowing traffic from opposite directions to use one lane alternately (alternating flow),
- stopping all road traffic to allow construction traffic to cross or for blasting,
- slowing traffic where they need to travel very slowly, eg. over new seal, and
- giving road users verbal instructions or directions.

C10.3.2 Requirement

All two-way two-lane roads reduced to one-lane require MTCs or portable traffic signals to manage traffic. Special exemption may be granted by the RCA for roads carrying less than 1000 vpd, in which case the TW-13 or TW-13.1 "One Lane" sign shall be used in conjunction with RG-19.1 "Single Lane - Give Way" and RG-20 "Single Lane - Priority" signs.

The use of MTCs during the hours of darkness and during times of poor visibility should be avoided.

C10.3.3 Equipment

MTCs shall use STOP/GO paddles except in unforeseen emergency situations when flag or hand signals may be used.

MTCs should wear reflective arm bands in addition to the required high visibility garment, this may be in the form of a long sleeved garment.

If the use of MTCs for night work cannot be avoided an illuminated wand must be used in conjunction with the STOP/GO paddle and MTCs must be on an area illuminated by artificial lighting.

Additional delineation devices should be used to assist the MTC provided they do not create a hazard to road users.



To stop traffic turn the paddle to STOP and facing the traffic raise the other hand into the stop position with the palm towards the traffic.



To move traffic, turn sideways then turn the paddle to GO and use the arm nearest the traffic to wave road users on with a sweeping movement across the body in the direction of travel.

Figure C10.1: Manual Traffic Controller Signals

EXPLANATORY NOTE - Location of Manual Traffic Controllers (Refer Section C10.3.4)

Manual traffic controllers should take particular care to ensure they are:

- visible at dawn or dusk, against low morning or evening sun, when in shadow on a sunny day, or in dusty conditions
- well lit at night
- not obstructing a road user's view of other signs and devices
- not hidden by other signs and devices by standing at the beginning of the two-way one-lane taper stopped vehicles will not obstruct vehicles travelling in the opposite direction leaving the controlled area

C10.3.4 Location and Site Layout

Work sites controlled with MTCs must have an advance temporary speed limit of 30 km/h. Positive traffic management will often be necessary to ensure speeds of approaching traffic are reduced to that desired.

MTCs must have a clear view of approaching road users for at least 120m.

It is the STMS's responsibility to set up the TW-15.1 sign at the beginning of the work and take it away when the work is complete and MTCs are no longer required.

MTCs should stand facing traffic at the beginning of the two-way one-lane taper on the left-hand shoulder or on the edge of the closed lane. MTCs should not stand in a live lane. MTCs should only move into this lane to make themselves visible to approaching traffic or to communicate with road users.

Normally two MTCs will be needed (one at each end of the work site). If the section of closed lane is very short, on a **Level 1** road and the MTC has at least 120m clear visibility to approaching road users from either direction, then one MTC operating in the middle of the site may be used. Single operators must also be protected from work site and traffic hazards, and should not manage traffic unless it is safe to do so.

Where multiple MTCs are used they must

- ensure that road users cannot see a conflicting message from the MTC at the opposite end of the work site;
- be in continuous radio contact with each other site when they are not visible to each other.

Side roads intersecting a work site under the management of MTCs must also have a MTC at the intersection to help side road traffic safely pass through the work site.

For long-term work sites, MTCs should be regarded as inappropriate and Contractors should be prepared to phase out this method of traffic management as alternative equipment becomes available. The recommended device for traffic management in these areas is portable traffic signals, or barrier arm systems. A description of the use of portable traffic signals is in Section C10.4 and their specifications and operational requirements is in Section B5.

EXPLANATORY NOTE - Manual Traffic Controller Attributes (Refer Section C10.3.5)

Manual traffic controllers are responsible for public safety and make the most contact with the public of all personnel. Manual traffic controllers must have the appropriate level of training applicable to the **Level** of road they are working on.

C10.3.5 Procedures

MTCs should:

- give definite and clear signals as shown in Figure C10.1,
- ensure they have an escape path ready in the event of a vehicle appearing not to stop,
- be courteous at all times in dealing with the public, and
- remain in place until directed by the STMS to leave, or be relieved by another worker.

C10.4 Portable Traffic Signals

C10.4.1 General

Portable traffic signals shall not be used where two-way traffic flow can be maintained past the site.

Portable traffic signals are used for temporary traffic where alternating traffic flows are required on temporary single lane, bi-directional roads.

Where portable traffic signals are used on a road where a side road(s) intersects the work site, MTCs must be used on side roads.

Portable traffic signals are used to:

- allow traffic from opposite directions to use one lane alternately (alternating flow), and
- stop all traffic to allow construction traffic to cross or for blasting.

C10.4.2 Requirement

Portable traffic signals are intended for activities of relatively short duration. Where activities continue for more than two months without the location of the working space changing, temporary "fixed" traffic signals must be installed.

Portable traffic signals must not be used where there is still sufficient road width to allow traffic to flow in both directions at once except where two-way traffic is controlled to allow construction vehicles to manoeuvre in and out of a work site.

C10.4.3 Legal Requirements

The Traffic Regulations 1976 require portable traffic signal installations to have the written consent of the LTSA Regional Engineer when the traffic signals:

- do not operate continuously 24 hours a day; or
- operate continuously 24 hours a day but do not comply with the regulatory requirements for permanent traffic signals. Portable traffic signals generally do not meet all the requirements for permanent traffic signal installations.

The location of every portable traffic signal installation must be authorised in writing by the LTSA Regional Manager. The RCA must retain these records.

C10.4.4 Training

Where portable traffic signals are used, the operator must:

- be a qualified Traffic Controller; and
- understand and be able to implement contingency plans.

C10.4.5 Site Layout

Work sites controlled with portable traffic signals must have a temporary speed limit of 30 km/h. Positive traffic management will often be necessary to ensure the speed of approaching traffic are reduced to that desired.

Traffic signals must be located on the left-hand side of each approach unless they would be more visible on the right.

The TW-14 'Traffic Signals Temporary' sign must be placed in advance of the signals and at the spacing specified in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

Limit lines (temporary or permanent) shall be installed at the appropriate locations when using portable traffic signals.

Multiple lane approaches must be reduced to a single lane, using the appropriate taper lengths, at least 100 metres in advance of signals.

120 metres of unobstructed visibility must be provided to all traffic signals.

This page is intentionally blank

EXPLANATORY NOTE - ‘Pilot Car Follow Me’ Sign (Refer Section C10.5)

The TW-25 “Pilot Car Follow Me” sign shown in Figure C10.2 is based on a sign in the US Manual for Uniform Traffic Control.

C10.4.6 Operational Checks

Portable traffic signals must be regularly inspected to ensure:

- the settings are appropriate,
- the alignment of the signal displays is correct,
- the associated signs are intact and properly displayed,
- detectors are functioning correctly,
- there are no burnt out lamps and
- batteries are changed.

C10.5 Pilot Car Method

The pilot car method is very useful in restricting vehicle speeds through a long work site. This method involves a pilot car leading a queue of vehicles through the site and MTCs are positioned at each end of the site to stop traffic until the pilot car is available.

The sign shown in Figure C10.2 is mounted on the rear, or the roof, of the pilot car. This is to ensure the sign is able to be seen by the drivers of vehicles not immediately behind the pilot car.

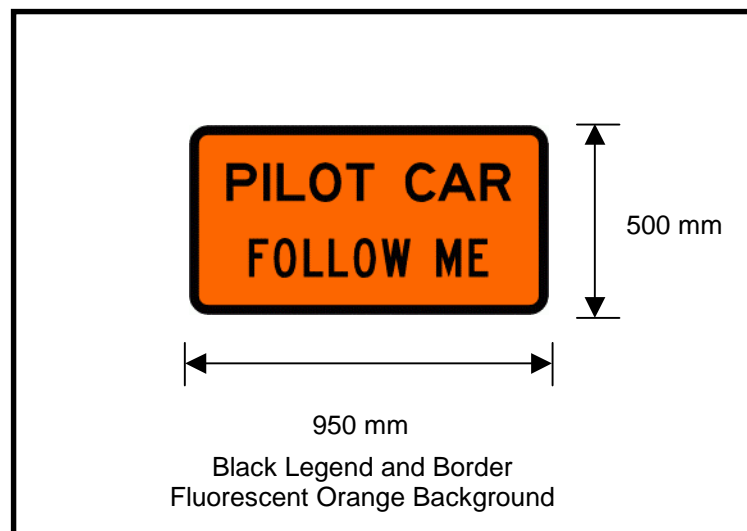


Figure C10.2: TW-25 "Pilot Car Follow Me" Sign

This page is intentionally blank

C11 TRAFFIC MANAGEMENT INSTALLATION AND OPERATION

C11.1 General

Traffic management measures should be installed and removed in a planned and safe manner, as detailed in the approved TMP.

The installation of traffic management signs and devices shall be undertaken such that it:

- does not conflict with information on any warning signs already erected,
- does not create an unavoidable hazard for road users or workers, and
- is efficient, logical and quickly isolates the work zone from road users.

Short-term static closures will usually require a mobile closure to install and remove them. Long-term static closures on **Level 2** and **Level 3** roads will usually require a short-term static closure to install and remove barrier systems. The TMP must specify the different stages of operation eg including the mobile closure to install the static closure.

C11.2 Order of Site Establishment

- (a) Signs shall be deployed on the left side of the road first, and then on the right hand side of the road, if required. The first sign erected shall be the "Advance Warning" sign.
- (b) Following the erection of the "Advance Warning" sign(s) the "Direction and Protection" signs shall be erected followed by the "End of Works" signs.
- (c) Any tapers and delineation devices required should then be placed.
- (d) Before any construction equipment or materials are brought onto the work site a drive through check of the site shall be made in both directions. This check shall confirm that the site is:
 - Safe.
 - Legal.
 - To the minimum standard shown in the TMP and that:
 - the restriction to traffic flow is reasonable,
 - the signs and delineation devices give clear messages to road users, and
 - all signs and delineation devices are securely erected and will remain in their correct position under the expected traffic volumes and weather conditions.

The removal of temporary traffic management measures shall be in the reverse order of establishment, i.e. reverse order for removal as per (d), (c), (b), (a).

C11.3 Installation Requirements for Signs

Signs must comply with the requirements of Sections B1: Signs, and the operational requirements of Section C3: Signs and Work Site Zones.

They should be installed so that:

- the nearest edge is at least 500mm clear of the travelled path of vehicles on **Level LV** and **Level 1** roads and 1250mm clear of the travelled path on **Level 2** and **Level 3** roads,
- the reflective face of the sign is angled at slightly more than 90 degrees from the road centreline so that the light is reflected away from the road user,
- they are clearly visible to oncoming road users, and
- they are well ballasted and stable in reasonably expected weather and traffic conditions.

Installing signs on **Level LV** and **Level 1** roads should be done to the side of, or in front of, the work vehicles. Under no circumstances should signs be erected or any work carried out by personnel behind a work vehicle exposed to oncoming traffic. Before installing and removing signs on **Level 2** and **Level 3** roads short-term static closures must be implemented using mobile closures.

C11.4 Installation Requirements for Channelling and Delineation Devices

All equipment used should comply with the requirements of Section B2: Delineation Devices.

The spacing of delineation devices should be to the requirements of Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management. These devices should be installed in straight lines or smooth curves, to give clear direction to the road users.

On **Level 1** roads delineation devices can be installed and removed by personnel on foot.

Before installing and removing delineation devices on **Level 2** and **Level 3** roads short-term static closures must be installed using mobile closures.

C11.5 Installation Requirements for Barrier Systems

Barrier systems are used to provide continuous work site protection. Acceptable forms of barrier system must comply with the design requirements of Section B11: Barrier Systems. The layout must conform to the approved TMP and the barrier system must be installed in accordance with the manufacturer's recommendations. During installation, modification and removal of the barrier system, exposure of unprotected ends must be minimised and, where necessary, protection should be provided.

This page is intentionally blank

EXPLANATORY NOTE - Crashes At Work Sites During the Hours of Darkness (Refer Section C12.1)

Crashes at work sites are over represented at night. A study conducted by the LTSA showed that during 1996, 44% of the recorded work site crashes occurred mainly at night and at unattended work sites. In comparison, 32% of all road crashes in New Zealand occur at night.

EXPLANATORY NOTE - Work Site Delineation (Refer Section C12.3)

Long length work sites delineated entirely with yellow flashing lights may confuse approaching road users. Delineation with reflective type devices reduces site confusion for long work sites.

C12 NIGHT WORK

C12.1 General

Night work is effective in reducing delays to traffic because traffic volumes are lighter than during most daylight hours.

Work at night work shall be subject to careful additional planning and inspection. Nighttime traffic management measures need to consider that:

- traffic density will be less and hence traffic speed may increase,
- road user's visibility is reduced,
- road users awareness may be reduced for a variety of reasons,
- positive traffic management measures may be different;
- additional lighting for working spaces, safety zones, manual traffic controllers, pedestrian and cycle lane detours, and for mobile working plant is required. These should always be chosen and mounted so that they direct light downward. **Light sources that produces glare that could dazzle road users are not permitted,** and
- manual traffic controllers should use illuminated wands, ideally 'LED' type or similar luminance.

C12.2 Traffic Signs

On all **Levels** the first temporary warning sign encountered by road users shall have a retro reflective fluorescent orange material background. All other signs on **Level LV** and **Level 1** roads, and all signs on **Level 2** and **Level 3** roads, must have a delineation device placed at the base of each sign. The delineation device shall be placed on the side of the sign to which road users are expected to pass.

C12.3 Delineation Devices

On **Level LV** and **Level 1** roads where a hazard is less than 30 metres long, and on a footpath or cycle lane, yellow flashing warning lamps must be placed on barricades and fences. A lamp must also be placed on each corner of the barricade/fence, to help make the site and hazard more identifiable.

On **all Levels** of road suitable reflectorised delineation devices parallel to the direction of traffic are to be installed when the hazard is more than 30 metres long, eg. barricades and fences. The recommended reflectorised delineation device is the 200mm x 150mm Retro-Reflective Chevrons as detailed in Section B11.5. These devices should be installed at 10 metres spacing, and at every corner.

C12.4 Artificial Lighting

Artificial lighting must be used for the safety of personnel and road users at all active night time work sites. The Contractor must indicate the type of lighting to be used in the TMP.

Lighting is to be used to illuminate:

- the working space, and
- manual traffic controllers where it has not been possible to avoid their use

Lighting must not create a disabling glare for road users. A drive through the site from all approaches immediately after the lighting is installed to check for glare must be undertaken.

Pedestrian and cyclist detours or temporary paths must be adequately lit, especially when the site is unattended.

This page is intentionally blank

EXPLANATORY NOTE - Excavations (Refer Section C12.5)

According to the "Health and Safety in Employment Regulation 25"

Every employer shall take all practicable steps to ensure, where any excavation is:

- (a) Readily accessible to any person; and
- (b) Likely to collect or retain water of such a depth as to constitute a danger to any person, - that
- (c) Any such excavation is covered or fenced, when no employee is in the immediate vicinity to prevent access to it by any person; and
- (d) Any such excavation created in the course of the work is covered, fenced or filled at the completion of the work.

C12.5 Excavations

Any excavation capable of holding water must be protected in terms of the Health and Safety Regulation 25 (Excavations of Hazardous Depth). Excavations greater than 1.5m deep must comply with Regulation 24: Excavations with a face more than 1.5m high. Further information may be found in the "Approved Code of Practice for Safety in Excavations and Shafts for Foundations" (1995).

Any excavation left unattended must either be fully enclosed by a safety fence, plated or backfilled, in that order of preference, to prevent pedestrians and cyclists from falling into them.

Barricades, cones, plastic mesh netting not supported by a solid frame and hurdles are **NOT** sufficient to adequately protect road users from excavations.

Guideline specifications for suitable safety fences to protect excavations are detailed in Section B6: Safety Fences. Figures C12.1 and C12.2 show examples of safety fences adequately protected excavations in daylight hours.



Figure C12.1: Showing Delineation Taper in Advance of Safety Fence.



**Figure C12.2: Excavation and Site Protected by a Safety Fence.
Note the Lateral Safety Zone and Delineation**

C12.6 Unattended Sites

When sites are unattended the actual size of the work space should be reduced as much as possible. All equipment and materials must be positioned well clear of the live lanes and adequate protection for road users must be maintained at all times.

Unattended sites must be made:

- safe,
- secure, and
- stable.

A separate TMP that details the method of traffic management to be used while the site is unattended must be submitted to the RCA.

This page is intentionally blank

EXPLANATORY NOTE - Barricades (Refer Section C13.2)

Barricades are used to indicate the start of a road or footpath closure. They may also be used to enclose temporary footpaths and cycle lanes for non-vehicular traffic to pass a work site.

Design requirements for Barricades are given in Section B7: Barricades.

C13 PEDESTRIANS AND CYCLISTS

C13.1 General

Where work activities affect pedestrians or cyclists, the temporary traffic management must ensure that:

- pedestrians or cyclists are not led into direct conflict with the work operation or traffic moving through or around the work site;
- if cyclists or pedestrians are directed into live lanes they should be adequately protected from traffic by delineation and/or barriers and suitable warning signs;
- safe and impediment free temporary paths are provided where footpaths and/or marked cycle lanes are blocked by the activity.

C13.2 Pedestrian Crossings

Where a pedestrian crossing becomes unusable or where the zebra road markings are removed or obliterated, the belisha beacons, discs and any other indication of the crossing must be covered and barricades placed across the pedestrian access to the crossing.

An alternative pedestrian crossing system must be provided particularly when the crossing serves elderly residents or a school.

C13.3 Temporary Paths and Detours

In urban areas where pedestrian or cycle paths become unusable due to the work activity a temporary path must be provided. Where it is not practical to create a temporary path a suitable detour must be created. Temporary paths and cycle lanes should have a surface, similar to that of the original, which is readily trafficable in reasonable expected weather conditions. Allowance must be made for the use of temporary paths by mobility vehicles, wheelchairs, pushchairs, cyclists and the like using temporary ramps as appropriate.

Suitable detours and their applicable signs are:

- Pedestrian Crossing Closed: (TW-30)
Sign: "Crossing Closed Please Use Alternative Crossing"
- Footpath Closed and Temporary Path Cannot be Formed: (TW-31)
*Sign: "Footpath Closed Please Use Other Side." **

***Note:** that this sign can only be erected on **Level 1** roads with a posted speed limit of less than 65 km/h. When using this sign it must be shown in the TMP with sight distances to the sign.

Temporary footpaths adjacent to the work site may use the symbolic TW-32 "Pedestrian Direction" sign to direct pedestrians and other footpath users into the temporary walkway.

Temporary walkways must be at least 1.2m wide and cannot be part of an adjacent traffic lane, ie. the minimum traffic lane width required must always be provided outside a temporary walkway.

Where work site activity blocks a marked cycle lane or a road frequently used by cyclists, a temporary cycle lane must be created in addition to any temporary pedestrian walkway.

Temporary cycle lanes must be at least 1.5m wide.

Barricades or a safety barrier must be used to separate pedestrians from the working space. Cones or other approved delineation devices must be used to separate pedestrians from the traffic lane.

C13.4 Covered Walkways

A covered walkway shall be provided where falling debris is a concern, refer to Section C6.5: Overhead Safety Zones.

C13.5 Lighting

Temporary paths and covered walkways must be adequately illuminated at night, refer Section C12.4. This may mean that artificial lighting to the appropriate level required by AS/NZS 1158.1.1:1997 has to be installed.

C14 WORK VEHICLES, EQUIPMENT AND MATERIALS

C14.1 Vehicle Movement

Work vehicles must not travel against the flow of traffic outside the working space or within the associated safety zones.

Plant operating within a work site must not intrude into the safety zones at any time.

Operators should be aware that road users may follow construction traffic into a closed lane work site and must check carefully before reversing after entering the closed lane.

C14.2 Loading and Unloading

The loading and unloading of materials should be conducted in the working space and not within the associated safety zones or live lanes.

C14.3 Vehicle Mounted Flashing Beacons

Work vehicles must have at least one, and preferably two, vehicle mounted flashing beacons that are visible to road users from all directions at all times.

Vehicle mounted flashing beacons:

- must be switched on prior to a work vehicle entering or leaving a working space;
- must be switched off once the vehicle has left the work site;
- may be switched off once the work vehicle is within the boundaries of the working space.

Vehicle mounted flashing beacons must be either yellow or amber.

C14.4 Parking and Storage

When in use, vehicles, equipment and materials should always be parked/stored within the working space. Where this is not possible they should:

- be parked/stored at least 5 metres from the edge line when outside the working space,
- be parked/stored on the same side of the road as the work site,
- **not** be parked/stored within safety zones, and
- **not** be parked/stored on the footpath, unless they have been properly protected with a fence and a temporary footpath for pedestrians has been formed.

On **Level 3** roads vehicles must not stop in live lanes and engage in loading or unloading activities, even with the assistance of TMA. Such activities interfere unnecessarily with traffic flows and create hazards.

TTM equipment or plant not in immediate use should be stored, safely, off the carriageway.

C14.5 Mud and Other Debris

The Contractor shall ensure that all operations do not deposit debris or material on a road surface open to traffic. Any material on the road surface of a work site should be cleaned off at the earliest opportunity and the road surface must be completely clean before the road is open for road users. Any loose gravel/chip on a sealed surface adjacent to a work site shall be removed immediately.

This page is intentionally blank

EXPLANATORY NOTE - Rear End Crashes (Refer Section C15.1)

Rear end crashes are a major concern at work sites. Approximately 20% of crashes at work sites are queuing related crashes.

EXPLANATORY NOTE - Example of Simple Delay Calculations (Refer Section C15.4)**Example 1**

One lane is to be closed on a two-lane two-way road. The lane closure is within 200 metres of an intersection. The estimated traffic volumes (provided by RCA) for the planned work times are 300 vph (southbound) and 250 vph (northbound).

The total traffic volume required to use one lane is 550 vph (300 + 250) and this traffic volume is greater than 500 vph i.e. the threshold for lanes within 200m of an intersection.

From this information the contractor would decide that delays of more than five minutes were reasonably expected because the 500 vph threshold is exceeded.

Example 2

One lane is to be closed on a two-lane one-way road. The peak hourly traffic volumes are unknown but the AADT is 6000. The lane closure is not within 200 metres of an intersection.

Peak hourly traffic per lane is $6000/2 = 3000/8 = 375$ vph

The sum for the 2 lanes is 750 vph (375 + 375)

Delays of more than five minutes are **not** unreasonable while the work is in progress because the threshold of 1000 vph for lanes more than 200 metres from an intersection is not be exceeded.

C15 MANAGING TRAFFIC QUEUES

C15.1 General

Activities on a road often disrupt traffic and result in delays to road users. Road users should be disrupted or delayed as little as possible and delays of more than five minutes must not be imposed, unless specifically authorised by the RCA in the TMP.

C15.2 Queuing

The STMS is responsible for monitoring the queue length to ensure that the first advance warning sign is always located where an approaching road user can see the end of the queue. This can be a problem on one-way multilane divided roads through a work site and where the road alignment has significant vertical and/or horizontal curvature. In these circumstances the advance warning and direction and protection signs may need to be located further in advance of the work site and in a position that they are clearly visible to all road users approaching the end of the queue. Additional reminder signs may need to be erected closer to the work site when queues and/or visibility restrictions are excessive.

C15.3 Delays

TMPs must address any delays anticipated by work site activities, including simple calculations to determine if delays of more than five minutes are likely. The applicant must supply this information for **Level 2** and **Level 3** roads.

The RCA must be informed if delays of more than five minutes are likely. The RCA is responsible for verifying the calculations and determining, in negotiation with the Contractor/Applicant, the appropriate action, eg. allow the predicted delays to be imposed, restrict work hours, periodically pause work to allow queues to disperse etc.

Where substantial queuing is expected, and alternative routes are available, consideration should be given to the use of those routes.

C15.4 Capacity

The maximum traffic capacity through a work site should be provided with due consideration of safety. Delays are unavoidable at times.

Simple delay calculations can be done for closing one lane on a **two way two lane** road on the assumption that delays of more than five minutes occur when the following thresholds are exceeded:

- If a lane more than 200 metres from an intersection carries more than 1000 vehicles per hour, and;
- If a lane within 200 metres of an intersection carries more than 500 vehicles per hour.

Delays can be assessed as follows:

- 1 Find the peak hourly traffic volume for each lane past the work site. (If the peak hourly traffic volume per lane is not known it can be estimated using half the AADT divided by 8).
- 2 Sum the peak hourly traffic volume for both lanes.
- 3 If the sum is greater than 500 vph and the work site is within 200 metres of an intersection then five minute delays are expected.
- 4 If the sum is greater than 1000 vph and the work site is further than 200 metres from an intersection then five minute delays are expected.
- 5 If the thresholds in (3) or (4) are not exceeded then delays in excess of five minutes are not expected.

These traffic volume thresholds may need to be reduced if:

- the road is rough or unsealed,
- the horizontal geometry restricts speeds to less than 40 km/h, or
- the proportion of heavy vehicles exceeds 12 percent.

These calculations must be carried out by the RCA or Engineer and must be supplied to the Contractor. The delay calculation method described above is only applicable to two-way two-lane roads. Other types of road require more elaborate queuing and delay calculations.

Guideline capacities in the table below indicate when delays can be expected.

Road Type	Single lane flow	Two-lane to one-lane merge on a one-way carriageway (ie. one direction on a divided carriageway road)	Two-way flow on a one-lane section of road (based on a 500 metre closure and a two to five minute signal cycle)
Interrupted traffic flows and queuing is likely to occur at about:	1500 vph	1300 vph	600-800 vph (two-way)

Table C15.1: Guideline Capacities

C16 SITE ACCESS

C16.1 General

Vehicles must only enter and exit a work site in the direction of traffic flow. Vehicles are not allowed to stop in a live lane and reverse into a work site, except when the site is classified as an emergency and is under the control of emergency services.

Temporary traffic management must be designed to allow the safe and efficient movement of work vehicles to and from the work site. Maintaining the safety of the site access is the responsibility of the STMS.

C16.2 Requirement

Except for sealing and paving works, which are typically moving operations within a larger site, clearly defined access and exit points are required for work sites on **Level 2** and **Level 3** roads where the work site is delineated and separate from the live lanes.

A special access for construction and associated work vehicles is required if these vehicles have difficulties entering and leaving the site at the normal access point.

C16.3 Signing of Access Points

The site access must be identified by the TW-28 'Site Access' 'm' advance warning sign and the TW-29 'Access Direction' sign.

The site must meet all other temporary traffic management requirements of this Code of Practice.

C16.4 Manual Traffic Controllers at Site Access Points

MTCs may be used on **Level 1** and **Level 2** roads to control the flow of vehicles into and out of the work site. MTCs are permitted on **Level 3** roads but they cannot slow or stop traffic in live lanes on these roads.

Entry and exit to the site should be via a clearly signed and delineated site access point.

C16.5 Location

Site accesses should be located at least the distances given in Table C16.1: Location of Site Access from any intersection, on or off ramp, taper, or obstruction that could restrict visibility.

Where necessary, multiple access/exit points may be provided. However, the location of these should always be in accordance with the provisions of this Code of Practice.

The provision of the appropriate acceleration and deceleration areas either side of a site access is desirable, particularly in high-speed situations.

*Permanent/Temporary Speed Limit	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
Minimum distance between a site access and any intersection, on or off ramp, taper, or obstruction.	50 m	60 m	70 m	80 m	100 m

* Section C2 details where temporary speed limits are used to set up site layouts

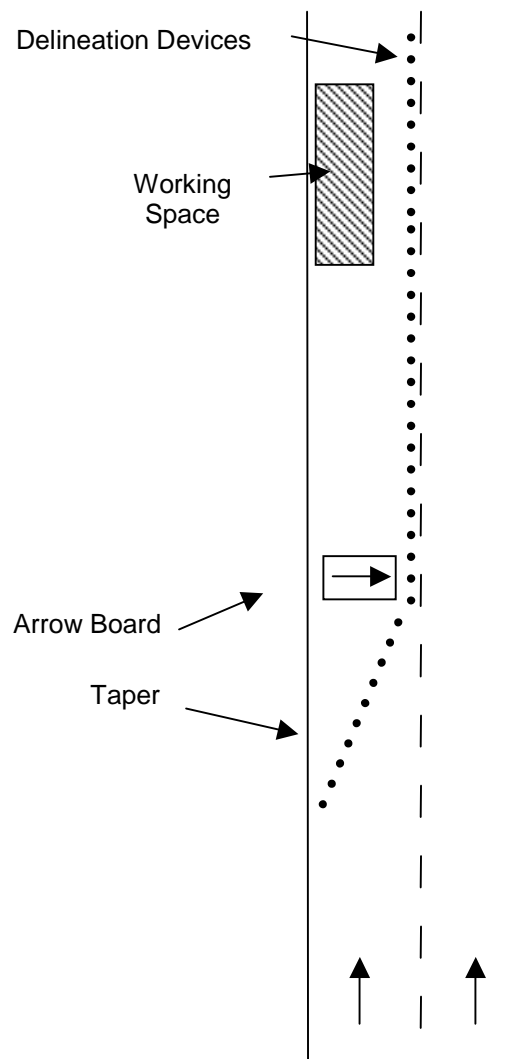
Table C16.1: Location of Site Access

C16.6 Delineation Devices

To allow work vehicles to gain access to a working space delineating devices may need to be removed. These devices must be replaced immediately to ensure other road users do not enter the working space. An STMS or TC must always undertake the removal and replacement of these devices.

Delineation devices must be placed according to the distances specified in Table C2.1 for **Level LV** Traffic Management, Table C2.2 for **Level 1** Traffic Management, Table C2.3 for **Level 2** Traffic Management and Table C2.4 for **Level 3** Traffic Management.

This page is intentionally blank

EXPLANATORY NOTE - Example of Arrow Board Location (Refer Section C17.3)

C17 ARROW BOARDS

C17.1 General

Arrow Boards are used to:

- direct road users to the left or right, and
- caution traffic.

Arrow boards are used extensively for mobile operations (refer Section D6.2: Arrow Boards) but they may also be used for static operations.

C17.2 Requirement

Arrow boards for static operations are generally only used on **Level 2** and **Level 3** roads. Arrow boards may be used for both static and mobile operations on **Level 1** roads, to increase levels of safety.

Arrow boards must not be used to direct traffic in alternating flow situations.

C17.3 Location

Arrow boards for static operations must be positioned in the centre of the closed lane taper and behind delineation devices.

C17.4 Operating Procedures

Where approaching drivers must pass or move:

- (a) to the left of the arrow sign, the sequential left arrow display should be used, or
- (b) to the right of the arrow sign, the sequential right arrow display should be used

When it is unsafe to pass on either side the caution mode must be activated.

When the arrow board is operating all other flashing lights and beacons must either be turned off or positioned where they do not impair the visual performance of the arrow board.

C17.5 Permitted Displays

The arrow board displays permitted are shown in Figures C17.1 and C17.2

Refer to Section B8.4: Display Configurations for details of the requirements for each display.

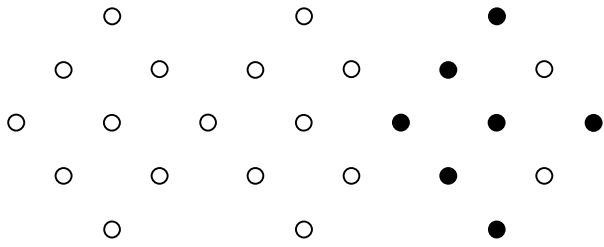
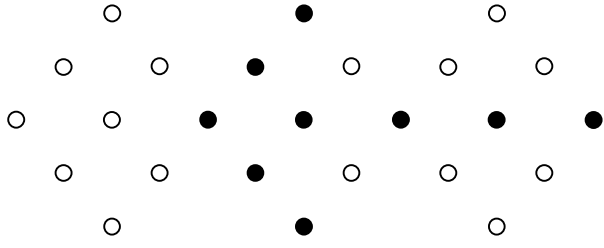
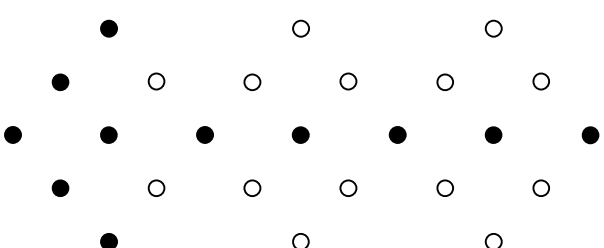
Mode	Phase	Display
Single Sequential Arrow Left (Reverse direction for arrow right)	Phase 1	
	Phase 2	
	Phase 3	

Figure C17.1: Single Sequential Arrow

(After Phase 3 the sequence returns to Phase 1)

Note: This display configuration varies from that shown in AS/NZS 4192.

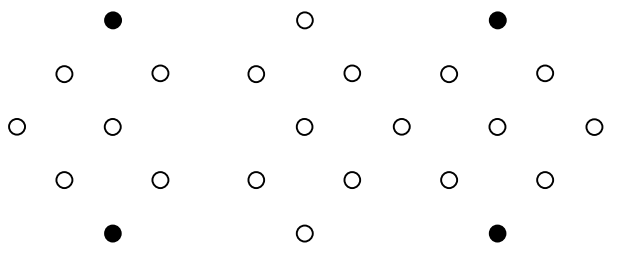
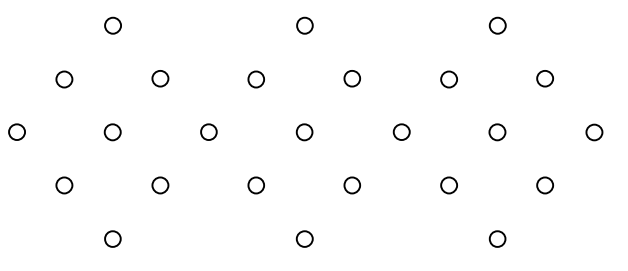
Mode	Phase	Display
Caution Mode	Phase 1	
	Phase 2	

Figure C17.2: Caution Mode
(After Phase 2 the sequence returns to Phase 1)

Note: This display configuration varies from that shown in AS/NZS 4192.

EXPLANATORY NOTE - Working Vehicles as Protection (Refer Section C18.1)

Work vehicles are often used to shield personnel from passing traffic. However, if a vehicle crashes into the back of the vehicle serious injuries can result, especially at high approach speeds.

C18 TRUCK MOUNTED ATTENUATORS

C18.1 General

On **Level 2** and **Level 3** roads Truck Mounted Attenuators (TMA) are used to reduce the severity of vehicle crashes into the back of work site vehicles. TMAs may be used on **Level 1** roads where extra protection is needed and practicable.

C18.2 Use of TMAs

TMA's must be used in accordance with the manufacturer's recommendations.

While TMAs are primarily used for mobile operations they can also be useful in some high-risk static and semi-static operations.

The need for TMAs in mobile and semi-static operations is specified in Section D5: Mobile Operation Requirements.

For static operations TMAs:

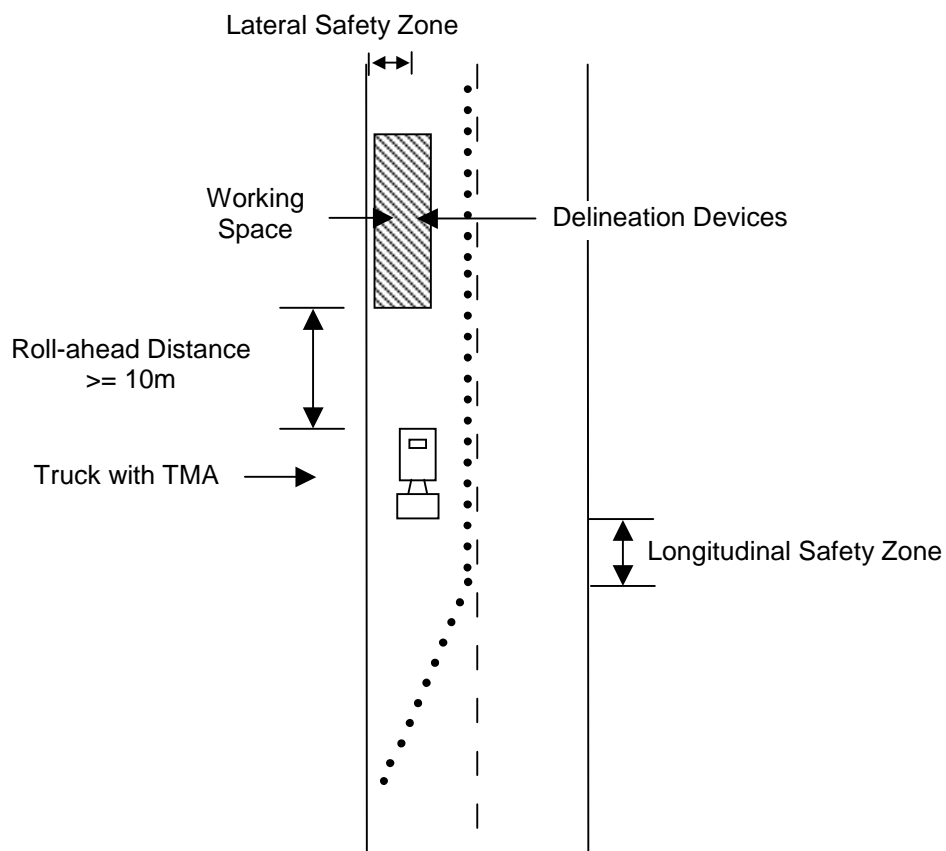
- are generally only considered for sites occupied by personnel or objects that will present a hazard to road users and
- are generally only justified on **Level 2** and **Level 3** roads for lane closures. They may also be used for work sites on the shoulder to increase road worker and road user safety.

EXPLANATORY NOTE - Roll Ahead Distance (Refer Section C18.3)

When a TMA is impacted it is possible that the truck will roll forward. This roll-ahead distance is dependent on many factors including:

- angle of impact
- weight of the vehicle impacting the TMA
- weight of the vehicle mounted with the TMA
- pavement conditions
- brake engagement.

A clear distance of at least 10m in front of a truck mounted with an attenuator will allow the truck to safely move forward if impacted by a light vehicle travelling at a speed of less than 100 km/h.

EXPLANATORY NOTE - Example of TMA Location (Refer Section C18.3)

C18.3 Location

For static operations the TMA should be located in advance of the work area and there must be at least a 10 metre clear space between the work area and the front of the truck mounted with the attenuator. This distance allows the truck to move forward safely in the event it is impacted from behind. This space should be kept clear of personnel and equipment.

The recommended longitudinal and lateral safety zones should still be provided in advance of the TMA and between the TMA and live traffic lane respectively.

EXPLANATORY NOTE - Using Barrier Systems

The requirements and guidelines in this section are based on the Code of Practice for Working on High Capacity Highways (1997), AS/NZS 3845: 1999 Road Safety Barrier Systems Transit New Zealand Specification for Road Safety Barrier Systems TNZ M/23:2002, and "International Best Practice".

C19 BARRIER SYSTEMS

C19.1 General

Barrier Systems are designed to provide a strong continuous physical barrier between a traffic lane and the working space. They will prevent penetration of the working space by an out of control vehicle and will also have some vehicle redirection properties.

Barrier Systems shall be used to:

- protect vehicular traffic from severe hazards within the work site, eg. a deep excavation or a bridge pier;
- protect personnel within the work site and pedestrians from vehicular traffic, especially where recommended safety zones cannot be practically provided, and
- separate two-way traffic flows.

Barrier systems may also serve to channel traffic flows. However, the protective requirements of the work area and not the channelling needs should govern the use of barriers.

Different types of barrier systems shall not be mixed and the manufacturer's recommendations for their use must be followed at all times.

C19.2 Influencing Factors

The following factors influence whether a longitudinal portable barrier should be used:

Traffic Volume	Generally only Level 2 and Level 3 roads will justify the installation of barriers. Barrier systems may be considered for long-term work sites in the traffic lane in Level 1 roads.
Traffic Speed	Except for protecting pedestrians, eg. when a temporary footpath makes use of a road shoulder, barriers will generally only be justified on roads with speed limits greater than 65 km/h.
Site Restrictions	eg. width available
Duration	Generally only a long-term operation will justify the installation of barriers, ie. more than one day on Level 2 and Level 3 roads, especially if space constraints reduce the safety zones.

EXPLANATORY NOTE - Lateral Placement (Refer Section C19.3)

Increasing the distance between a barrier and the traffic lane:

- increases the space available for vehicles to regain control before impacting the barrier,
- increases sight distances,
- reduces the length of barrier required to shield a particular hazard, and
- reduces drivers "shy line" reaction to the barrier.

C19.3 Lateral Placement

Barrier systems should be placed as far from the traffic lanes as conditions permit.

Drivers tend to “shy away” from objects placed close to the roadway. The distance from the traffic lane beyond which roadside objects do not cause such a reaction is called the “Shy Line”. Table C19.1 gives shy line offsets for various temporary speed limits used at worksites.

Barrier systems are designed to deflect on impact and sufficient space for this to occur must be provided behind the barrier. The distance between the working space or an area occupied by personnel and the barrier must be sufficient for the likely deflection of the barrier to occur. The amount of deflection space required is dependent on the type of barrier system being used. Rigid, semi-rigid and flexible systems vary greatly in their expected deflection upon impact and the manufacturer’s recommendations for deflection offset must be provided.

**Temporary Speed	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
Distance from edge of traffic lane	1.0m	1.0m	1.0m	1.0m	2.0m

**Use the permanent speed limit in cases where a temporary speed limit is not applied

Table C19.1: Shy Line Offsets*

* As per AS/NZS 3845:1999 Road Safety Barrier Systems

On works sites where space is limited, smaller shy line offsets may be requested in the TMP. However, the absolute minimum offset in all situations shall be 300mm from the edge line. Distances greater than those given in Table C19.1 should be provided wherever possible.

C19.4 Terrain

Barrier Systems are designed for impacts by vehicles with all four wheels on the ground and the suspension components in their normal position. The ground between the traffic lane and the barrier should, therefore, be as level as possible.

Any kerb(s) between the barrier and the traffic lane should be removed where the distance to the face of the kerb is greater than:

- 1.5m where the speed is 60km/h or less,
- 2.1m where the speed is 70km/h, and
- 2.7m where the speed is 80km/h or more.

Barrier Systems should not be installed on embankments with slopes steeper than 1:6, and preferably not steeper than 1:10.

EXPLANATORY NOTE - Barrier Length (Refer Section C19.5)

Out of control vehicles typically leave the road at angles of less than 25 degrees and may travel considerable distance before impacting a hazard.

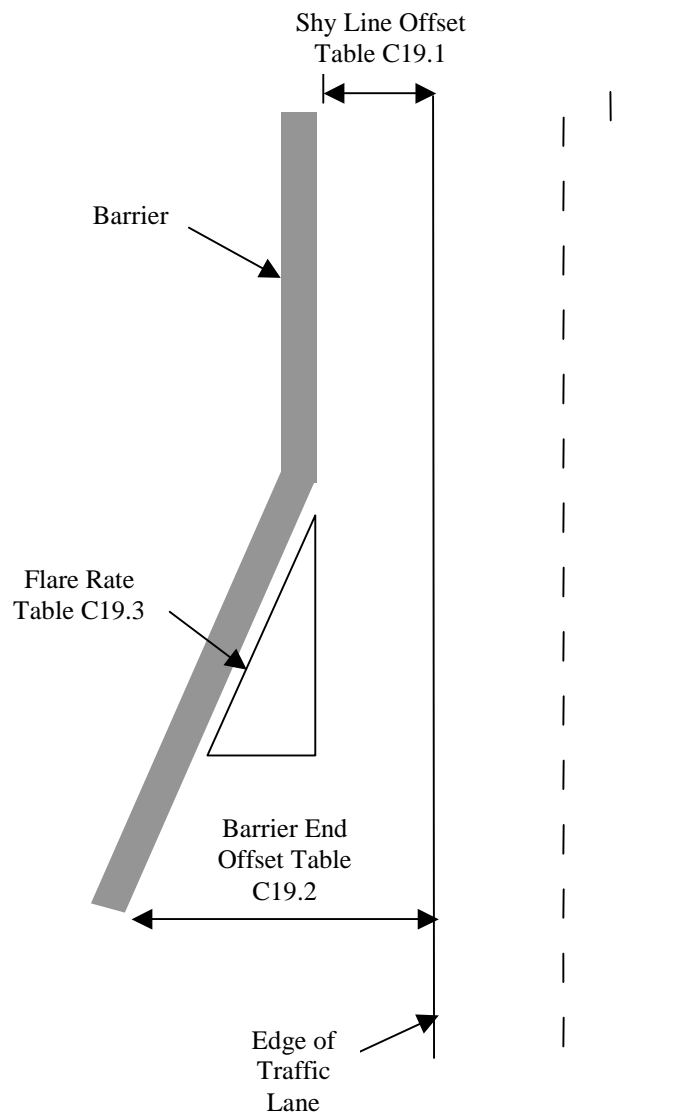
The Barrier Length requirement assures that a sufficient length of barrier is installed to prevent a vehicle leaving the road, passing through the barrier into a work site and impacting with the hazard being shielded by the barrier.

C19.5 Barrier Length

The length of barrier must be longer than the hazard itself.

Factors influencing the length of barrier required includes:

- the length and width of the hazard to be protected, or the area personnel are occupying,
- the stopping distance required for a vehicle to avoid hitting objects in the hazard area,
- the layout of the barrier, including its lateral placement,
- the location of the start of the flare (if any) and its flare rate, and
- the minimum length of barrier required for the barrier system to develop its ribbon strength. For proprietary systems manufacturers will provide this information.

EXPLANATORY NOTE - Example of Flare Design (Refer Section C19.7)

C19.6 End Treatments

The ends of Barrier Systems are hazards in themselves. Where the end of a barrier is offset less than the relevant distance given in Table C19.2 from the edge of the adjacent traffic lane it shall be protected by an appropriate TNZ M/23 compliant end treatment terminal that is securely attached to the barrier.

End treatments terminals will generally be non-gating, re-directive systems. If a gating re-directive system is used, a 22.5m x 6.0m clear zone with a maximum slope of 1:10 must be provided behind the end treatment and barrier.

**Temporary Speed	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
The minimum distance between an unprotected barrier end and the edge of a traffic lane	3m	4m	6m	8m	9m

**Use the permanent speed limit in cases where no temporary speed limit is posted

Table C19.2: Barrier End Offsets

End treatments need only extend to the point where the shoulder ceases to be able to be traversed by a vehicle.

End treatment terminals shall be installed at the earliest practicable time, to maximise road user safety.

C19.7 Flares

Flares are used to locate the end of a barrier further away from a traffic lane. Barrier flares can be useful for ensuring the barrier end is beyond the recommended barrier end offset to a traffic lane so that a TMA, or crash cushion, is not needed. Recommended flare rates for Barrier Systems are given in Table C19.3.

**Temporary Speed	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h
Barriers inside shy line	1:15	1:15	1:15	1:20	1:30
Rigid barrier systems beyond shy line	1:10	1:10	1:10	1:15	1:20
Flexible barrier systems beyond shy line	1:10	1:10	1:10	1:10	1:15

**Use the permanent speed limit in cases where no temporary speed limit is posted

Table C19.3: Recommended Flare Rates *

* As per AS/NZS 3845:1999 Road Safety Barrier Systems

EXPLANATORY NOTE - Application of Maintenance Standards (Refer Section C20.1)

To meet the requirements of this Code of Practice the “The maintenance of temporary traffic management devices should be to high standards to assure that legibility is retained, that the devices are visible, and that they are removed if no longer needed. Clean, legible, properly mounted devices in good location command the respect of road users. Furthermore, carelessly executed maintenance can destroy the value of a group of devices by throwing them out of balance”.

To achieve safe and efficient work sites, signs, delineation devices and other traffic management equipment need to have high levels of visibility at the time of installation. These levels need to be maintained throughout the life of the work site. Since it is not practical to require new devices to be installed at all times, acceptable minimum standards are required. These standards define the condition of "used" equipment, by visual evaluation, to assure the continued effectiveness of the equipment.

EXPLANATORY NOTE - Assessing Retro-Reflectivity (Refer Section C20.2)

National standards do not currently exist for measuring retro-reflectivity criteria. However, routine inspections shall be undertaken at night to ensure that the level of retro-reflectivity is adequate for the particular site conditions and that the devices are clearly visible and legible.

C20 MAINTENANCE STANDARDS

C20.1 General

The normal use of temporary traffic management equipment subjects it to wear and tear that does not occur with permanently installed equipment or devices. Much of this wear and tear occurs during the storage, travel, installation, relocation and removal phases of temporary traffic management and causes deterioration in the appearance and effectiveness of the equipment and devices.

Whenever a high number of these worn and damaged devices are installed on a work site the general appearance of the work site deteriorates, reducing the level of safety for both road workers and road users.

C20.2 Quality Classifications and Requirements

The quality of temporary traffic management devices is divided into three categories: **Acceptable**, **Marginal**, and **Unacceptable**.

At the time of the initial installation, or at the time of any major changes to the work site, 100% of each type of device, ie. cones, tubular markers, barrels, barricades, barrier delineators, fence delineators, signs, variable message signs, arrow boards, temporary pavement markings, raised pavement markings and high visibility clothing, shall be in an **acceptable** condition.

Equipment that must be in an **acceptable** condition at all times are:

- Delineation devices at changes in direction including cone tapers, lateral lane shifts and chicanes,
- TW-1, TW-2, TW-3, TW-4, TW-5, RG-1, RG-2, RG-2.1, RG-3, RG-4 and TW-15 signs, and
- High visibility safety garments.

Up to 25% of other equipment and devices may be in a **marginal** condition. Once more than 25% of devices at a site are identified as being in a **marginal** condition the equipment and devices shall be cleaned to an **acceptable** standard, or replaced with **acceptable** equipment and devices within 12 hours.

Equipment and devices that are identified as being in an **unacceptable** condition are not permitted on the work site and must be replaced immediately.

C20.2.1 Acceptable Classification

Devices that meet the quality requirements as described in paragraph C20.2: Quality Classifications and Requirements for this classification, and all other requirements such as design, size, colour, weight etc. in the plans and specifications, shall be considered to be acceptable for use as a traffic management device at work sites.

C20.2.2 Marginal Classification

The term 'Marginal' means “marginally acceptable”, or “at the lower end of acceptability”. Devices that meet the quality criteria for marginal as described in paragraph C20.2: Quality Classifications and Requirements for this classification, may remain on the work site until more than 25% of the devices on the site are classified as marginal, or until it is determined that they have become unacceptable. When devices in the marginal category exceed 25% those devices shall be cleaned or replaced to the acceptable standard within 12 hours.

C20.2.3 Unacceptable Classification

Devices in this category shall not be delivered to the work site. When found at a work site, they shall be replaced or repaired immediately.

This page is intentionally blank

C20.3 Evaluation for Classification of Temporary Traffic Management Devices

C20.3.1 Evaluation Guide: Traffic Signs and Stands /Supports

Acceptable

There are several abrasions on the surface but very little on the lettering or symbol. There has been no touch-up of the lettering or symbol. This message is legible per the design criteria of the Transit NZ/LTSA Manual of Traffic Signs and Markings: Part 1 (MOTSAM Part I).

Marginal

Of the many surface abrasions throughout the sign face, many are within the individual letters or symbol of the message. The sign surface is free of any residue. Some colour fading is evident, the background colour and reflectivity are still apparent at night. This message is legible per the design criteria of MOTSAM Part 1.

Unacceptable

Signs with asphalt splattering, bitumen, cement slurry or dirt, and of an amount similar to the abrasions that are evident throughout the face of this sign are unacceptable. The symbol and/or some letters have a loss of more than 50%. There is a noticeable colour fading. The message is illegible per the design criteria of MOTSAM Part I. The stands or supports upon which signs are mounted, barricade frames and the like, shall be evaluated in terms of their:

- Stability,
- effectiveness in holding sign panels, and
- potential for damaging sign panel faces or injuring workers while being handled or transported.

Stands or supports should be evaluated as being in **marginal** condition if they:

- are buckled or bent such that the sign panel cannot be correctly supported,
- allow panels to be deformed by wind or other loading, and
- allow round panels to be rotated within their frame.

Stands or supports shall be evaluated as being in **unacceptable** condition if they:

- have hanging weights of any type attached to the frame,
- have break away bases that will roll, and
- are non-frangible.

DAYTIME

NIGHT-TIME



Acceptable



Marginal



Unacceptable



Images Courtesy of RTL Ltd

C20.3.2 Evaluation Guide: Cones and Tubular Delineators

Acceptable

The shape of the delineation device shall remain clearly identifiable with no significant distortion and must be free standing in its normal position. The surface shall be free of punctures and abrasions. The surface shall be free of asphalt splatter, cement slurry or other material and will readily clean up by washing. The reflective bands have little or no loss of reflectivity with only minor tears and scratches.

Marginal

The surface has some asphalt splattering, bitumen, cement slurry or dirt and **cannot** be readily cleaned due to abrasion and discoloration. The reflective bands have numerous tears and scratches, but are free of large areas of residue or missing material.

Unacceptable

Punctures and large areas of staining asphalt splatter, bitumen, cement slurry or dirt that make the device an unlikely candidate for improvement. A large area of missing or stained reflective material also makes the delineation device unacceptable.

DAYTIME



Acceptable



Marginal



Unacceptable

NIGHT-TIME



Images Courtesy of RTL Ltd.

C20.3.3 Evaluation Guide: Barrels*Acceptable*

The sheeting has only minor tears and scratches. Dents do not seriously reduce the reflectivity. The barrel maintains its original shape.

Marginal

The sheeting has numerous tears and scratches, however, it is free of large areas of asphalt splatter, bitumen, cement slurry, dirt and missing reflective material. The dents do not reduce the effectiveness of the upper reflective band and the barrel strength is not reduced. The barrel maintains its original shape.

Unacceptable

The large areas of missing reflective material on the fractured upper area of the barrel make it unacceptable. Asphalt splatter, bitumen, cement slurry, dirt or any combination of missing and covered reflective material would also make the barrel unacceptable. Substantial deformation, which reduces the original dimensions of the barrel, will make it unacceptable, even if other parameters are still acceptable.

DAYTIME

NIGHT-TIME



Acceptable



Marginal



Unacceptable



Images Courtesy of RTL Ltd

C20.3.3 Evaluation Guide: High Visibility Garments

Section B3: High Visibility Garments details the design requirements for high visibility clothing. All high visibility clothing must be:

- in acceptable condition, and
- done up at all times when working on the road.

Acceptable

The garment has only minor tears and scratches. Any abrasions do not seriously reduce the reflectivity or daytime impact. The garment is done up.

Marginal

The garment has numerous tears and scratches. The garment has some asphalt splattering, bitumen, dirt or cement slurry and may not be readily cleaned due to abrasion or discoloration however; it is free of large areas of residue or missing reflective material.

Unacceptable

The large areas of missing reflective material or asphalt splatter, bitumen, dirt or cement slurry make this garment unacceptable. Garments with all or any combination of missing and covered reflective material would also make a jacket unacceptable.

Jackets that are undone reduce the target value and are classified as unacceptable.

DAYTIME



Acceptable



Marginal



Unacceptable

NIGHT-TIME



Images Courtesy of RTL Ltd

EXPLANATORY NOTE - Monitoring Frequency for Temporary Traffic Management Measures (Refer Section C20.4)

- Monitoring frequency is to be set out in the approved TMP
- The frequency will depend on individual site conditions
- Crashes or near crashes, skid marks, traffic queues, unusually high or low speeds are indicators that traffic management measures may need to be reviewed
- If actions are required every time traffic management measures are monitored, then the monitoring frequency should be increased

C20.4 Maintenance of Traffic Management Measures

The maintenance measures contained in this section are mandatory for **Level 2** and **Level 3** roads and recommended for **Level 1** roads.

Checklists derived from the Contractors Quality Plan should be provided in advance and completed following each inspection.

The Contractor shall ensure that:

- all traffic management devices function properly for the full duration of their installation,
- the visibility and effectiveness of all devices and signs is maintained,
- damaged equipment is repaired or replaced, as appropriate, and
- suitable equipment should be available at short notice in case of un-programmed removal, alteration or installation of a closure is necessary.

At attended work sites the STMS shall carry out the checks listed below:

Device	Minimum Inspection Frequency
Sign: Position and Cleanliness	Two (2) hourly
Portable Channelling and Delineation Devices: Position and Cleanliness	Two (2) hourly
Flashing Beacons on Vehicles	Daily
Wearing of Safety Jackets	Continuously
Safety Jacket Cleanliness	Daily
Arrow Board Operation in Mobile Closures	Prior to Start of Work Operation and 2 hourly thereafter
Arrow Board Operation in Static Closures	Two (2) Hourly
Non Portable Equipment	Daily

Table C20.1: Minimum Inspection Frequency for Traffic Management Devices

The first inspection should take place as soon as the equipment has been installed. This should verify that all devices are correctly in place, no item has been omitted, all equipment meets its cleanliness requirements and no conflicting messages exist between permanent signs, temporary signs and other devices.

To facilitate site maintenance adequate stockpiles of equipment should be available, to ensure that response times can be achieved.

C20.5 Proprietary Barrier and Impact-Absorbing Systems

Where the surfaces of these devices are intended to aid delineation, because of their colour, they should be kept clean and be to at least the acceptable standard defined in C20.3.3 Evaluation Guide: Barrels.

The following must be inspected immediately after installation, every alternate working day and immediately after any involvement in a traffic crash.

- Alignment,
- barrier continuity,
- linkage systems,
- tensioning systems,
- ballast fill levels,
- ballast leakage,
- damage due to impacts or wear and tear,
- condition of frangible or crushable components, and
- cracked barriers (these are to be replaced).

Repairs and adjustments shall be made to alignment faults greater than 30mm within one hour of occurrence, or within one hour of inspection, whichever allows the earliest remedial repairs to be undertaken. Other faults shall be rectified within one working day.