



# STMS CATEGORY C HANDBOOK

WAKA KOTAHI - NZ TRANSPORT AGENCY  
VERSION 0.1

**Participant name:**

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# ABOUT THE STMS CATEGORY C TRAINING

## Outcomes of the STMS Category C training

People who successfully complete the STMS Category C (Cat C) training will **know**:

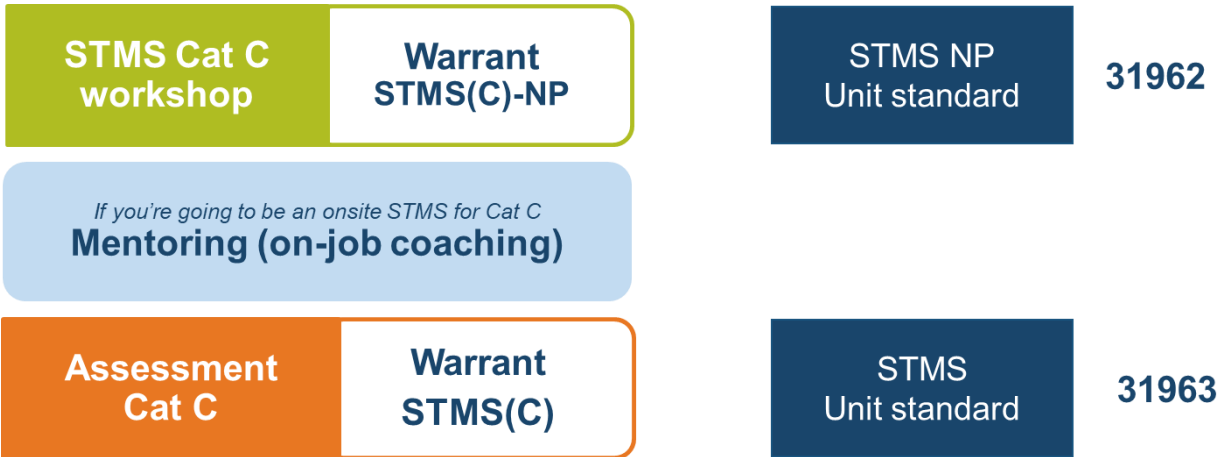
- The key requirements for Cat C roading environments
- How to locate information in the CoPTTM relating to Cat C roading environments.

*If you are going to be in charge of worksites, you will be mentored and assessed.*

At the end of on-job mentoring and assessment you will have the:

- Skills to competently operate within a Cat C roading environment.

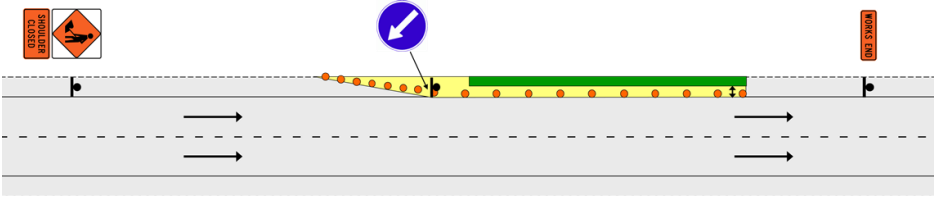
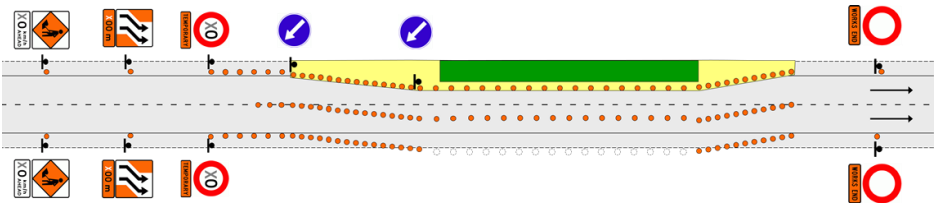
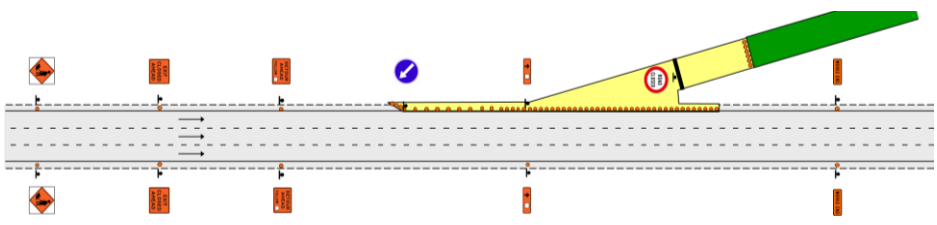
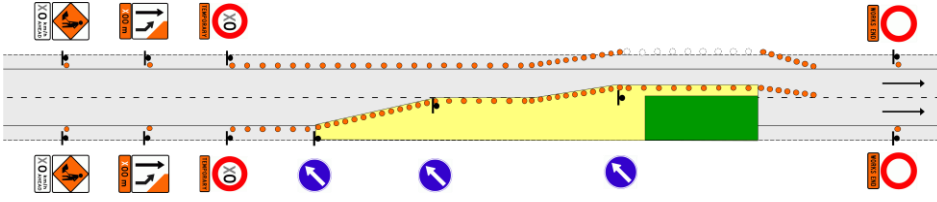
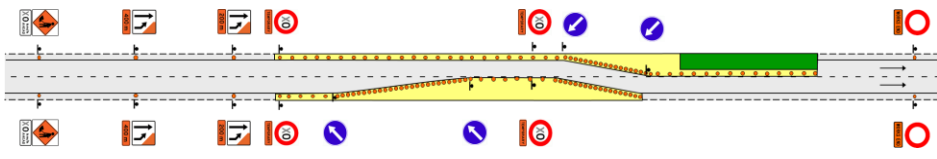
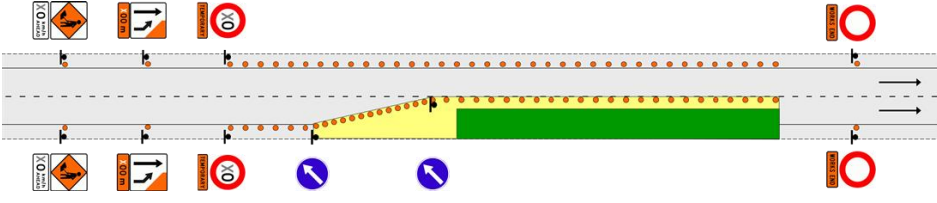
## The STMS Cat C warrants and unit standards



# ASSESSMENT FOR CAT C PRACTISING

The trainee must complete 3 closures from the list of possible closures.

**Any 2 of the following closures:**

1. Shoulder closure	
2. Two-lane temporary diversion	
3. Ramp closure	
4. One-lane temporary diversion	
5. Chicane	
6. Lane merge	

## Important points

Only one closure can be a shoulder closure.  
You will be assessed on a worksite requiring a lane merge.

# RISK MANAGEMENT

## Suggestions to identify risks at a proposed worksite

Complete a drive-through of proposed worksite.

Identify hazards for example:

- Higher speed – longer stopping distances
- Visibility obscured (intersections, curves, traffic)
- Congestion and queuing
- Driver behaviour (overtaking/moving between lanes/wrong way)
- Police pursuits
- Volume of traffic
- Pedestrians and cyclists
- On/off ramps (high speed merge and diverge zones)
- Shoulder and pull over areas
- Slower driver reaction time.

Complete risk assessment before setting up the worksite. For each hazard, identify the risks, determine if it is likely or significant and decide what actions to mitigate the risk.

## Communicating hazards, risks and control measures

Hazards, risks and actions (controls) are documented in the risk assessment.

Hazards and controls identified at the planning stage will be included in the TMP.

These are included in briefings (working space crew induction and visitor induction).

At some worksites (eg longer-term worksites) these may also be displayed on a site hazard board.

## Examples of risk management on Cat C roading environments

Hazard	Risk	Likelihood and severity	Action
<b>TMP is not fit for purpose</b>	Not all stakeholders are protected	Possible but severe.	Do not install the TTM at the worksite. Contact the TTM Planner to discuss actions.
<b>Higher speed – longer stopping distances</b>	Road user errors have more consequence resulting in greater injuries	Possible and severe – risk rating very high.	Greater sign spacings and the use of speed restrictions where appropriate. Pace vehicle operations.
<b>Lack of visibility to the worksite (vertical and horizontal curves)</b>	Road users do not have time to react appropriately resulting in greater risk of loss of control.	Possible and severe – risk rating very high.	Making sure at least 2/3 of the taper can be seen by an approaching road user. The use of speed restrictions and positive TTM where appropriate Additional shadow vehicles may be required during install and removal of TTM equipment to overcome lack of visibility.
<b>Slower driver reaction time</b>	Road users do not have time to react appropriately, loss of vehicle control.	Possible and severe – risk rating very high.	Greater sign spacings and the use of appropriate equipment to provide advanced warning ie Variable messaging boards.
<b>Pedestrians and cyclists</b>	Collisions at higher speeds cause more severe injuries. Some	Possible and severe – risk rating very high.	Ensure that cyclists and pedestrians are included in the planning. The use of alternating flow should be

Hazard	Risk	Likelihood and severity	Action
	roads have no or very little shoulder areas.		considered if cycle and pedestrian routes are affected.
<b>Road geometry (width, number of lanes, terrain and intersections or on-off ramps)</b>	Road users are less alert. Judgement can be impaired, more likely to be involved in an incident	Possible and severe – risk rating very high.	Increased advanced warning and direction and protection to decrease specific road geometry issues that might affect the worksite and road user.
<b>Night work</b>	Road users can easily become confused. Judgement can be impaired, more likely to be involved in an incident.	Possible and severe – risk rating very high.	Increased advanced warning and direction and protection to decrease issues that might affect the worksite and road user.



# LAYOUT DISTANCES TABLES

## LV & L1 combined layout distances table

Permanent speed limit or RCA-designated operating speed (km/h)		≤50	60	70	80	90	100		
Traffic signs									
A	Sign visibility distance (m)	50	60	70	80	90	100		
B	Warning distance (m)	50 or 30*	80	105	120	135	150		
C	Sign spacing (m)	25 or 15*	40	50	60	70	75		
Safety zones									
D	Longitudinal (m)+	10 or 5*	15	30	45	55	60		
E	Lateral (m)+	1	1	1	1	1	1		
	Lateral behind barrier installation	As specified by the Installation Designer							
Tapers									
G	Taper length (m)#	30	50	70	80	90	100		
G	LV roads taper length (m)#	25	30	35	40	45	50		
K	Distance between tapers (m)	40	50	70	80	90	100		
Delineation devices									
	Cone spacing in taper (m)	2.5	2.5	5	5	5	5		
	Cone spacing: Working space (m)##	5	5	10	10	10	10		
* Larger minimum distances apply on all state highways and also on all multi-lane roads. The smaller minimum distances may be applied on other roads to accommodate road environment constraints.									
+ On LV roads the longitudinal and lateral safety zones may be reduced, or eliminated, in order to retain a single lane width. Positive traffic management and an appropriate TSL must be used.									
# 1. On non-state highways with speeds 50km/h or less, a 10m taper (with cones at 1m centres) may be used when there are road environment constraints (eg intersections and commercial accesses).									
2. On all roads where the shoulder width is less than 2.5m and the activity does not affect the live lane, a 10m shoulder taper is permitted (with at least 5 cones at no greater than 2.5m centres).									
3. A taper of 30m (with cones at 2.5m centres) must be used where manual traffic control (stop/go), portable traffic signals or priority give way are employed.									
## LV roads: double the cone spacing alongside working space (eg 5 = 10, 10 = 20).									
Lane widths (based on permanent speed or TSL if applied)									
	Speed (km/h)	30	40	50	60	70	80	90	100
F	Lane width (m)	2.75	2.75	3.0	3.0	3.25	3.25	3.5	3.5

Except for delineation device spacings, which are maximum values, the distances specified in the above tables are minimum values.

**LV/low-risk roads (less than 250vpd - less than 20 vehicles per hour)**

When on the shoulder:

- If CSD **not** available: Advance warning sign and base to be installed with sign visibility distance and warning distance in place
- If CSD **available**: Advance warning sign may be attached to the rear of a work vehicle which has an amber flashing beacon(s) and is visible to approaching road users from the rear.

When the activity encroaches onto a live lane consider alternating flow controls.

If the above requirements cannot be achieved, the operation must be modified to comply with the appropriate level LV or level 1 requirements.

## L2 layout distances table

Permanent/TSL (km/h)		≤50	60	70	80	90	100 /110		
Traffic signs									
A	Sign visibility distance (m)	60/50 <sup>+</sup>	70/60 <sup>+</sup>	80	100	120	120		
B	Warning distance (m)	100/75 <sup>+</sup>	120/90 <sup>+</sup>	140	160	200	200		
C	Sign spacing (m)	50/35 <sup>+</sup>	60/45 <sup>+</sup>	70	80	100	100		
Safety zones									
D	Longitudinal (m)*	15	20	30	45	60	60		
E	Lateral (m)								
	1. Behind cones	1	1	1	1	1	1		
	2. Behind barrier installations	As specified by the Installation Designer							
Tapers									
H	Initial taper length per lane (m)**	90/50 <sup>+</sup>	100/60 <sup>+</sup>	120	150	180	180		
I	Subsequent taper length per lane (m)	50	60	70	80	100	100		
K	Minimum distance between tapers (m)	50	60	70	80	100	100		
Delineation device									
Spacing (centres)	All tapers (m)	2.5	2.5	2.5	2.5	2.5	2.5		
	Cones parallel to the lane - eg between tapers and alongside working space (m)	5	5	10	10	10	10		
	At merge and diverge points for ramps and slip lanes, intersecting road entry and exit points, and worksite access points	2.5m for 10m either side of a change in alignment		2.5m for 20m either side of a change in alignment					
<p>* A longitudinal safety zone is not required when a barrier completely protects the approach end of the worksite.</p> <p>** Taper length is based on a single lane shift of 3.5m.</p> <p>+ The longer distance is the desirable distance, the shorter distance is the minimum distance required. The longer distances must be used wherever possible. The shorter distances may only be used where there are road environment constraints.</p>									
Lane widths (based on permanent speed or TSL if applied)									
Speed (km/h)		30	40	50	60	70	80	90	100/110
F	Lane width (m)	2.75	2.75	3.0	3.0	3.25	3.25	3.5	3.5

Except for delineation device spacings, which are maximum values, the distances specified in the above tables are minimum values.

Approach sign distances and spacings, the initial taper(s) and any longitudinal safety zone associated with that taper must be based on the permanent speed limit. The layout distances of the remainder of the worksite, including any subsequent tapers, may be based on the TSL, provided the TSL is applied prior to the first taper.

## L3 layout distances table

Permanent/TSL (km/h)		≤50	60	70	80	90	100/110		
Traffic signs									
A	Sign visibility distance (m)	60/50 <sup>+</sup>	70/60 <sup>+</sup>	80	100	120	120		
C <sup>+</sup>	Sign spacing (m) - <b>Desirable</b>	50	60	70	160	200	200		
	Sign spacing (m) - <b>Minimum</b>	35	45	70	80	100	100		
Safety zones									
D	Longitudinal (m)*	15	20	30	45	60	60		
E	Lateral (m)								
	1. Behind cones etc	1	1	1	1	1	1		
	2. Behind barrier installations	As specified by the Installation Designer							
Tapers									
H	Initial taper length per lane (m)**	90/50 <sup>+</sup>	100/60 <sup>+</sup>	120	150	180	180		
I	Subsequent taper length per lane (m)	50	60	70	80	100	100		
K	Minimum distance between tapers (m) ***	50	60	70	80	100	100		
Delineation devices (all speeds)									
Spacing (centres)	All tapers (m)	2.5	2.5	2.5	2.5	2.5	2.5		
	Cones parallel to the lane (eg between tapers and alongside the working space) (m)	5	5	10	10	10	10		
	At merge and diverge points for ramps and slip lanes, intersecting road entry and exit points, and worksite access points	2.5m for 10m either side of a change in alignment		2.5m for 20m either side of a change in alignment					
<sup>+</sup> The longer distance is the desirable distance, the shorter distance is the minimum distance allowed. The desirable distances must be used wherever possible. The minimum distances may only be used where there are road environment constraints. Where only one sign is erected in advance of a taper the distance from the sign to the taper is 2xC.									
<sup>*</sup> A longitudinal safety zone is not required when a barrier completely protects the approach end of the worksite. Refer subsections <a href="#">H1.17</a> and <a href="#">H1.18</a> .									
<sup>**</sup> Taper length is based on a single lane shift of 3.5m.									
<sup>***</sup> Must be altered if required to meet the distance shown on the TLS supplementary plate.									
Lane widths (based on permanent speed or TSL if applied)									
Speed (km/h)		30	40	50	60	70	80	90	100/110
F	Lane width (m)	2.75	2.75	3.0	3.0	3.25	3.25	3.5	3.5

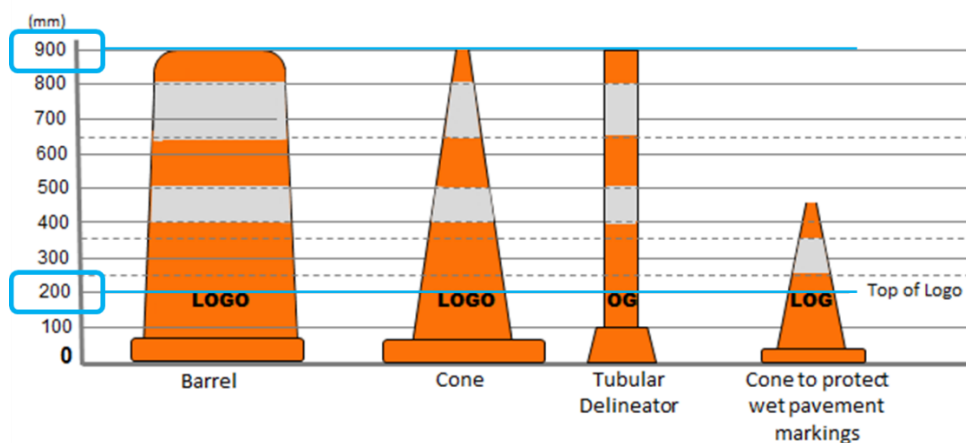
Except for delineation device spacings, which are maximum values, the distances specified in the above table are minimum values. Approach sign distances and spacings, the initial taper(s) and any longitudinal safety zone associated with that taper must be based on the permanent speed limit. The layout distances of the remainder of the worksite, including any subsequent tapers, may be based on the TSL, provided the TSL is applied prior to the first taper.

## Signs at worksites

3 main reasons signs are set out at worksites:

- Provide advance warning
- Direct and protect road users and road workers
- Notify road users to return to normal driving conditions.

## Delineators



When installed, delineators:

- Must not be installed in stacks (single cone only)
- Can be ballasted with sandbags
- Can be stabilised with flexible connecting strips
- Must be stable.

## Cone bars

Cone bars may be used at worksites to guide pedestrians (subject to conditions).

Must not be used to replace a safety fence.

## High visibility garments

High visibility garments must be:

- Done up at all times
- The outer layer (nothing worn over top of the garment)
- Clean.

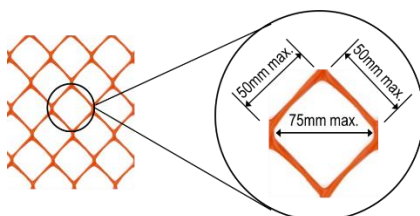
## Safety fences

### Vertical uprights



Vertical uprights are to be no more than **100mm apart**

### Mesh infill



Gap in mesh no more than **75mm across**  
(max 50mm x 50mm mesh)

## Barricades

Barricades may be used to physically close roads.  
They must only be used behind a line of delineation devices.



## Barriers

Barriers are needed when:

- There is a need for physical protection to reduce the severity of potential crashes
- A working space must be shielded from adjacent traffic
- The traffic must be shielded from worksite hazards (eg deep excavations)
- There are no other options to safely channel vehicle and pedestrian movements.





# POSITIONING OF SIGNS

## Sign spacings

Sign spacings allow time for the road user to read, understand and comply with the message on a sign.

Minimum sign spacings can only be used where there are road environment constraints.

### Location of signs

Keep signs as far left as possible.

Position signs so they can be seen as far away as possible.

Do not block footway or cycle lanes.

Be careful not to obscure other permanent signs.

## Sign visibility

If sign visibility cannot be achieved the sign can be advanced up to one sign spacing.

If sign visibility still cannot be achieved place 2 signs.

Advance warning is further enhanced on Category C roads by gating signs and in some cases utilising VMS systems.

## Not enough room to install signs

Smaller signs can sometimes be used to replace type B signs.

A sign may be placed in a footpath if minimum widths are maintained.

Signs may be mounted to some barrier systems using approved brackets.

The spacing between signs may have to be increased to allow for a sign to be positioned safely.



## Signs not in use

Signs and stands must be removed or covered when the activity ceases.

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.

## Installing & removing TTM equipment on Cat A or B roads

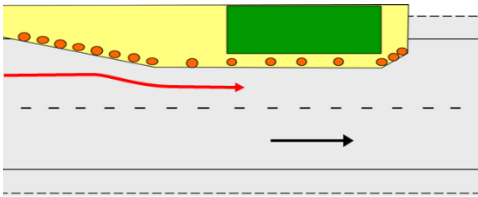
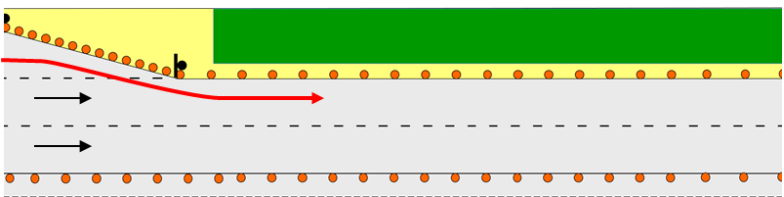
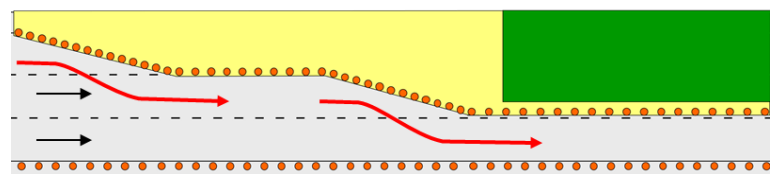
**STMS Cat C** can place TTM equipment on a Cat A or B road environment if:

- The closure is only on the Cat C road environment
- Signs can be placed without interfering with cycle lanes, bus stops, taxi stands, loading zones and restricted parking
- Minimum footpath widths can be maintained
- A shadow vehicle is used and the TTM vehicles when stopped are clear of the lane during the installation process

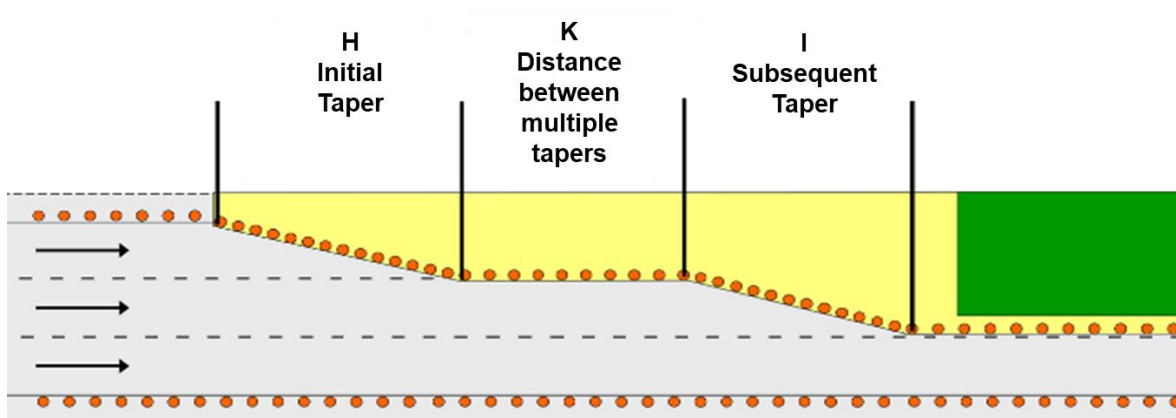
If these conditions cannot be met then an STMS Cat A or B must install and remove the TTM on the Cat A or B road environment

# TAPERS

## Types of tapers

<p><b>A shifting taper</b> Shifting a road user within a lane</p>	 <p>The diagram shows a road with a dashed center line and a solid edge line. A yellow shaded area represents a taper. A red line with an arrow indicates a road user moving from the left side of the taper to the right side within the same lane. A black arrow below the road indicates the direction of travel.</p>
<p><b>A merging taper</b> Merging a road user into another lane</p>	 <p>The diagram shows a road with a dashed center line and a solid edge line. A yellow shaded area represents a taper. A red line with an arrow indicates a road user moving from the left lane into the right lane. A black arrow below the road indicates the direction of travel.</p>
<p><b>Multiple merging tapers</b> Multiple merges across multiple lanes</p>	 <p>The diagram shows a road with a dashed center line and a solid edge line. A yellow shaded area represents a taper. A red line with an arrow indicates a road user moving from the left lane into the right lane. A black arrow below the road indicates the direction of travel.</p>

## Multiple tapers on level 2 and 3 Cat C roads





## Taper reductions

Tapers can be made shorter:

- **If the taper is in a shoulder less than 2.5m wide**  
**(10m taper with at least 5 cones at 2.5m centres)**
- If the taper is a subsequent taper on a L2 or 3 Cat C road
- If the lateral shift on the lane is less than 3.5m, **the equation below is used by the planner** to calculate revised taper length on L1, L2 and L3 road environments.

### Equation

$$\frac{W \times G}{3.5}$$

W = Lateral shift required  
G = Normal taper length  
3.5 = Normal lane width

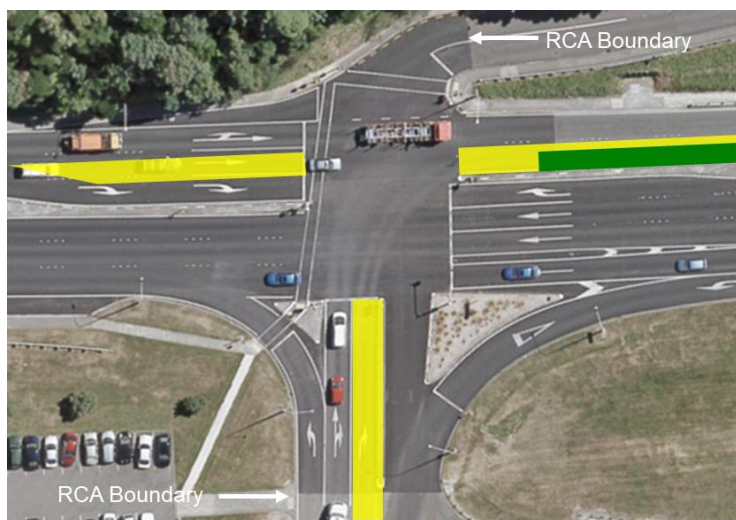
The approved TMP should include taper dimensions

Where diagrams do not include the taper dimensions always check with the planner before implementing an alteration

# MANAGING TRAFFIC AT INTERSECTIONS

## Lane merges/changes

Lane merges/changes must not take place through an intersection.



Where a lane is closed the corresponding approach or exit lanes must be closed.

Cone lines must allow for turning vehicles.

RCA boundaries normally finish 10m from an intersection and can often be identified by a change in seal.

The road user often needs increased advanced warning and decision-making time.

## Interchanges

Interchanges use ramps and over bridges so that traffic on the main route is not impeded by traversing (crossing) traffic.

### High speed on/off ramps

- Multilane merging to one lane
- Ramp signals
- Limited shoulders - guardrails
- Gore areas.

### Working over the main route

- Risk of dropping equipment or the edge into the lane below.

### Driver behavior

- Missing directional queues and trying to drive through protected areas.

### Setup and removal

- Staging/order may involve multiple crews
- Vehicle positioning can be an issue.

## Controlled intersections

Controlled intersections can use a mix of signs road markings and signals to control traffic movements.

### Signalized intersections

- Induction loops can precede an intersection by up to 120m.
- Isolation or repeated triggering of induction loops, needs to be considered.
- STMS to communicate with signals operators (SCATS/TOC/RCA).

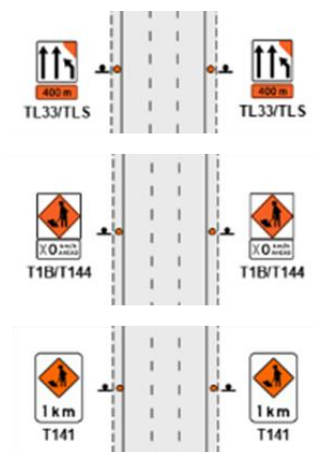
### Other issues at controlled intersections

- Queuing and delays.
- Where there are multiple intersections lane closures may need to be extended.
- Permanent speed limits may vary leading up to and away from the intersection.
- Pedestrian crossings and cycle lanes may be present on Category C roads.
- Different road categories to consider.

## MANAGING TRAFFIC ON LANES AND SHOULDERS

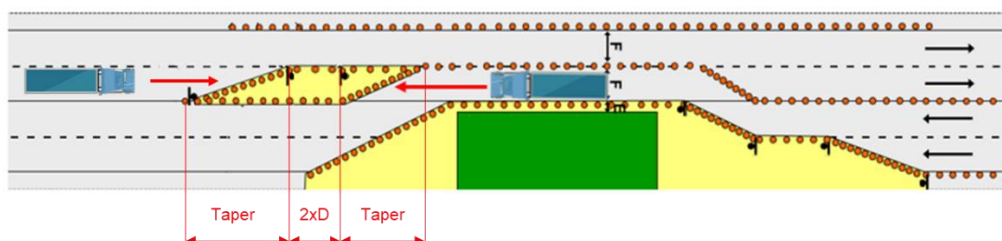
It is important that the road user is informed of activities on the roadway as early as possible this is especially important on Category C roads. We do this in the following ways:

- By gating signs and using larger signs on L2 and 3 roads
- Using earlier advanced warning notification T141/T1B/T142 and T144 signs
- Using supplementary distance plates on the bottom of lane merge or lane shift signs
- Utilising electronic advanced warning systems LAS/VMS and ATMS



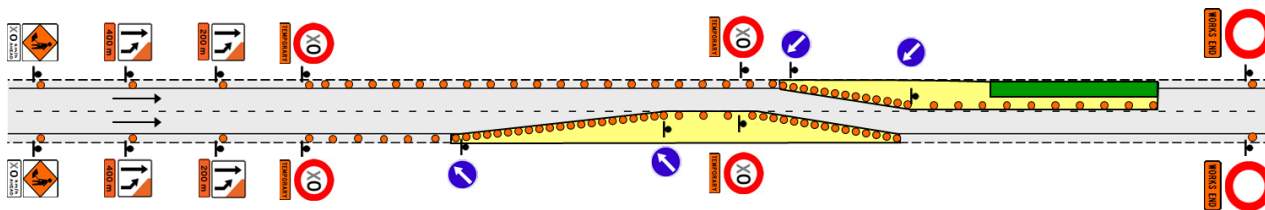
## Contraflows

We create contraflows when we make road users travel in a direction that is against the normal flow of traffic. In this situation road users are often travelling towards each other in the same lane before shifting lanes. Each lane shift requires a taper and **separate no go zone (D)**.



## Chicanes

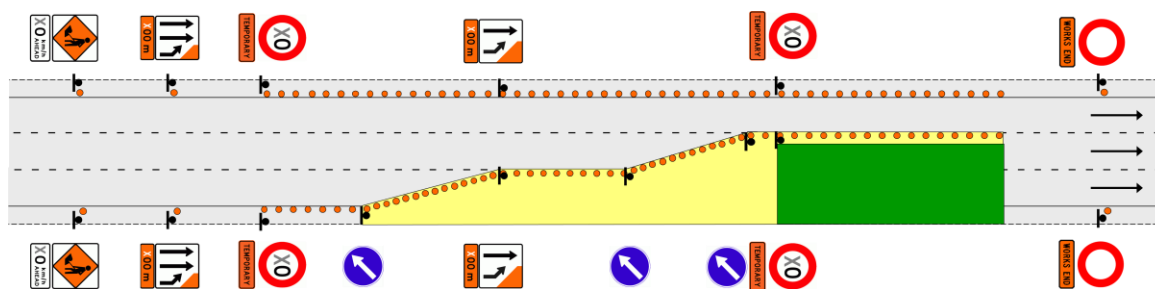
Chicanes are used to merge multiple lanes of traffic (including passing lanes) into a single lane prior to a shift laterally around a working space.



Chicanes are frequently used on L3 Category C road environments when the work activity is in the left lane (or a centre-lane where there are 3 or more lanes in one direction).

## Centre lane closures

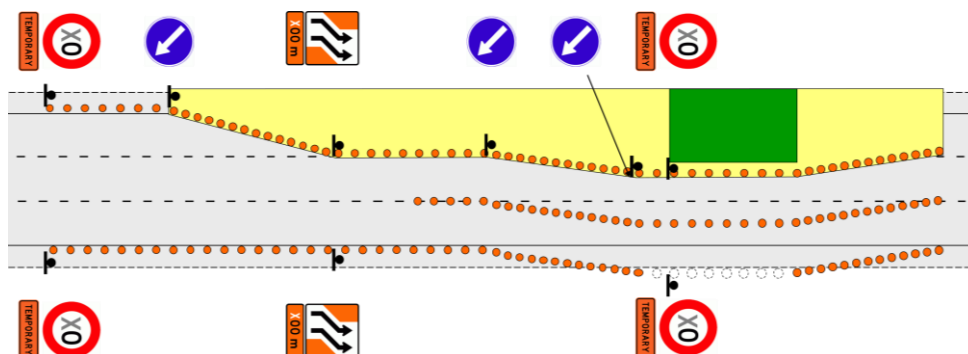
Centre lane closures are not permitted on Category C road environments. Where the activity must be conducted in a centre lane, the lane on either the left or right must also be closed.



For level 1 and 2 category C roads, the lane to be closed is agreed with the RCA (consider intersections and turning bays when choosing the lane to be closed).

## Lane shifts on multilane roads

Lane shifts are signed when two or more lanes must shift simultaneously past a hazard. Sometimes lane shift signs are not used if the K distance is too short.



Multiple simultaneous lane shifts are often more desirable than reducing lane capacity. Shoulder areas can often be utilized to keep multiple lanes open past a working space.

## Utilising the shoulder as a temporary lane

Before implementing a lane shift that includes using the shoulder the STMS must:

- Check it is safe for traffic to traverse
- **Check it is strong enough to carry heavy vehicles**
- Check there is adequate overhead clearance
- Check there is adequate visibility along its length
- Check the surface level height **difference is not more than 25mm** from the adjacent traffic lane.



## Road closures

A road closure is defined as a complete closure of all lanes to all road users. Road closures are installed:

- When there is an emergency
- To isolate unsafe roads
- As a control for some roadworks activities
- When the roadway has been temporarily repurposed for an event.



Planned road closures should incorporate a planned detour route for all road users that are affected. If a road is closed for an emergency the RCA must be informed immediately by the STMS.

## Positive traffic management

TSL signs alone will not slow traffic down. Positive traffic management controls may also be required. These include:

- T144 sign (speed advisory sign)
- Narrowing lanes (side friction)
- Cone offset delineation
- Gradually reducing the space between delineation devices
- Placing cones from the TSL to the taper (often called lead-in cones)
- Using temporary speed humps
- Using flashing beacons, flares, or illuminated signs
- Using a speed information sign

## Setting up detour a route

Before you leave the yard, **make sure you have enough TTM equipment** for the detour – signs, stands, ballast and cones.

**Check the detour route in both directions** to check that it is stable and safe for the types of vehicles that will be using it (eg no overhanging trees that will be hit by passing trucks).

**Notify the RCA** and/or the engineer when the detour is to be activated.

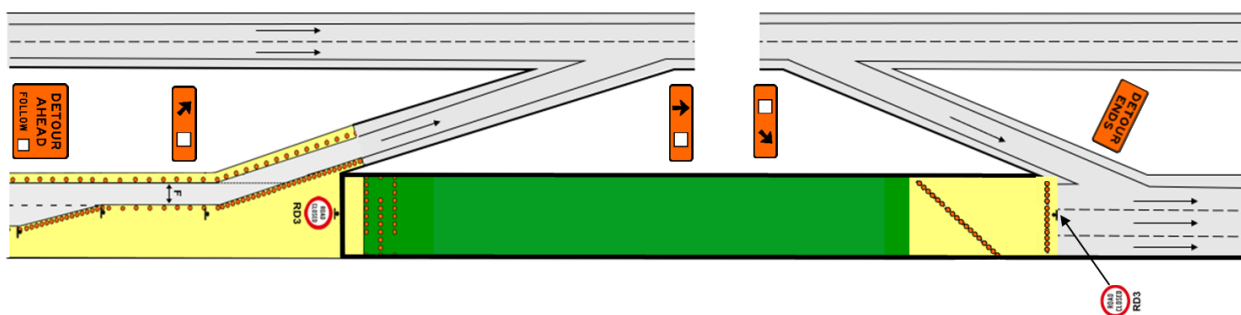
**Open the road when detour is no longer needed.**

**Remove detour route signs when no longer required.**

## Motorway detours

The approved TMP will include any planned or contingency detour routes.

The STMS must contact the RCA before implementing emergency or contingency detours.



## If there is a minor incident (eg a rear end crash):



- Stop all activity and traffic movement.
- Secure the site to prevent injury or further damage.
- Notify the RCA representative and / or the engineer.
- Safely remove TTM and establish normal traffic flow if safe to do so.
- Re-establish TTM and traffic movements when it is safe to do so and when traffic volumes have reduced.



## ALTERNATING FLOW - NOT USED ON CAT C ROADS

### Briefing the MTCs

Manual traffic control involves a manual traffic controller using a stop/go or stop slow/sign to manually control traffic flows.

The STMS is responsible for manual traffic controllers and must train them on how to perform the task safely this includes:

- What protection is required and where are the safe places to operate from
- How to hold and operate the paddle
- Where the trigger points or points where some action is required because of long queues forming
- How to operate a radio.



## NIGHT WORKS

### Night work on Category C road environments

**40%** of roadwork crashes occur between these hours

**61%** of fatal roadwork crashes occur between these hours

Road users are more likely to be involved in a fatal crash at a road works site at night

What needs to be considered before carrying out night works:

- Reduced traffic intensity leads to increased speeds
- Greater frequency of heavy vehicles and over dimension loads
- Reduced driver visibility - driver distraction
- Driver fatigue and slower driver reaction times
- Glare from retro reflective TTM signs, TTM vehicles and artificial lighting
- Equipment that looks acceptable during the day may be marginal at night.

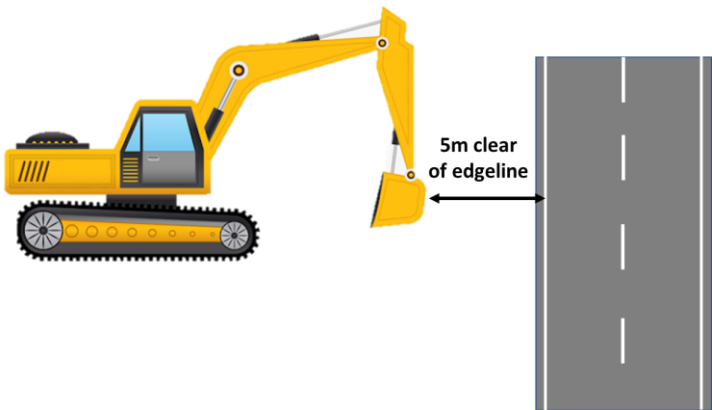
### Glare from artificial lighting impacting drivers

- Lighting must be used to illuminate:
  - The working space
  - Manual traffic controllers.
- Lighting must not create a disabling glare for road users.
- TTM signs are often angled slightly to reduce glare.
- LAS have a day intensity setting and a night intensity setting.

# Parking and storage of vehicles, plant and materials

All plant must be parked:

- at least **5m outside the edgeline**
- on the same side of the road as the working space



## INSTALLATION PROCEDURES

As the STMS you will be working with a crew. Crew and visitor briefings are essential to safety and the control of risk. Briefings should be conducted face to face but are also sometimes by 2-way radios at a distance.

### Traffic count

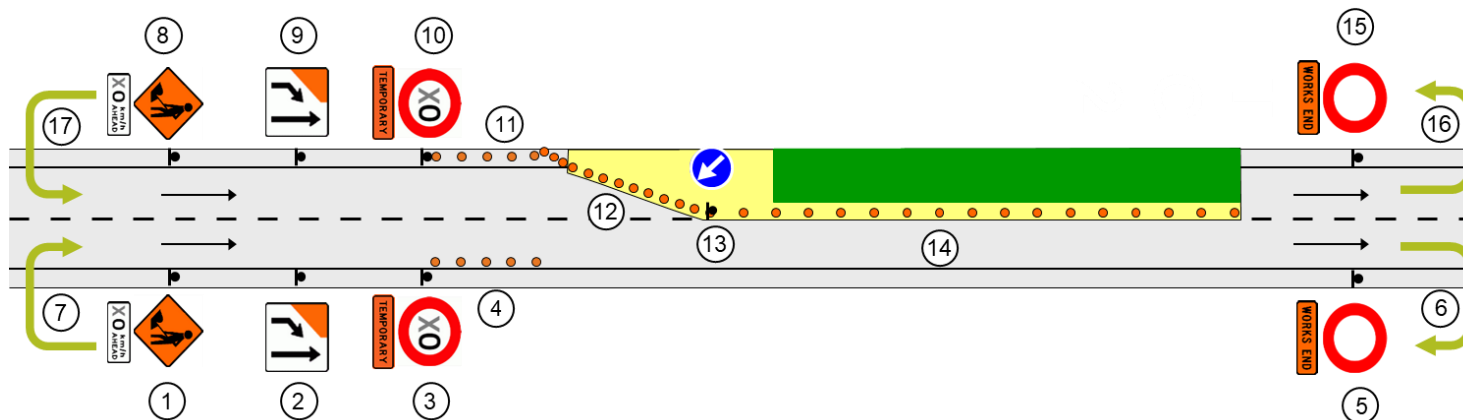
Traffic counts should be completed before installing TTM. Count traffic for 3 minutes and x by 20 to get an hourly count.

Delay calculations/trial plan to determine potential extent of delays
Delay calculations. AADT (vph) 18677 - vph calculation factor - 8 Lanes 2 $18677 / 8 = 2334 \text{ vph} / 2 = 1167 \text{ per lane per hour (Guide for lane merges <1300vph)}$ A lane closure should not be installed where hourly vehicle counts exceed 1000vph
Public notification plan

If there are no traffic count details in the TMP, complete a visual check to ensure that the traffic volume is not unusually high.

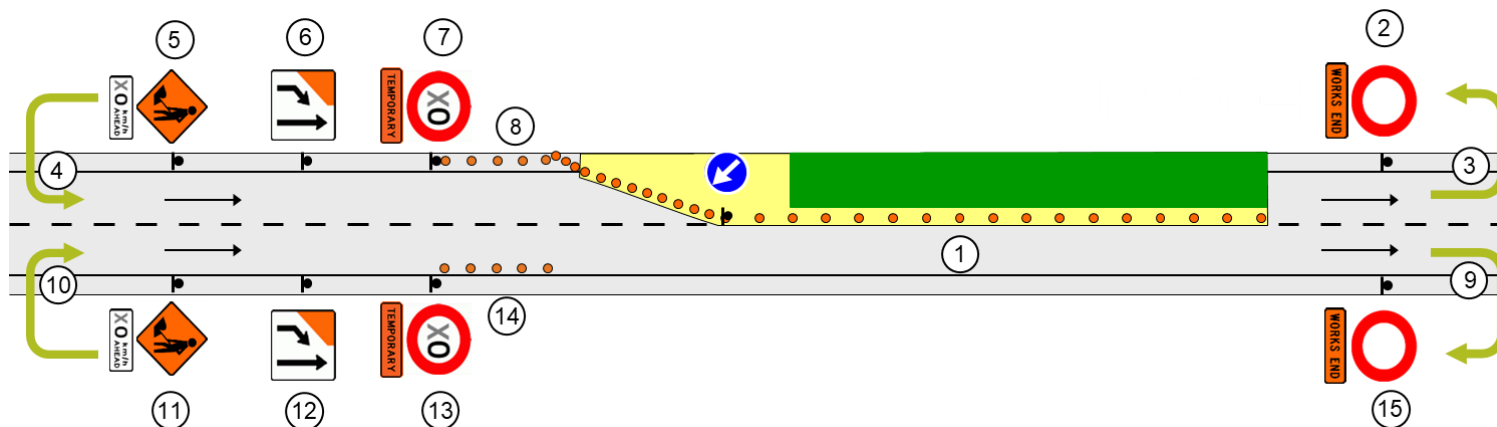


### Level 1 F2.30 ONE-WAY TWO-LANE ROAD – Left-lane closure - Installation procedures



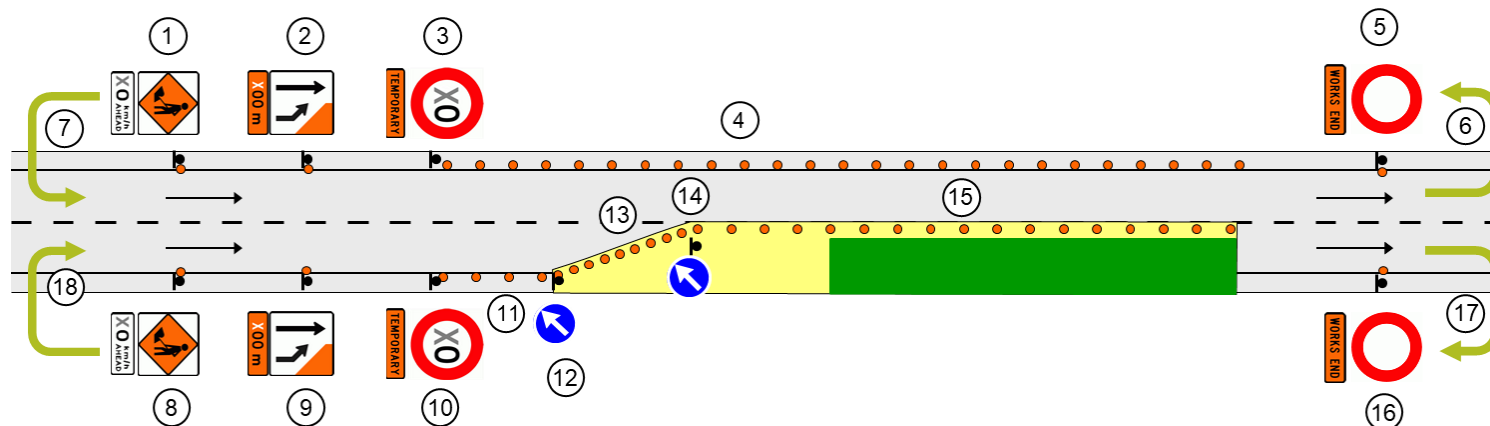
STMS completes drive through check of the worksite once TTM is installed

### Level 1 F2.30 ONE-WAY TWO-LANE ROAD – Left-lane closure - Removal procedures



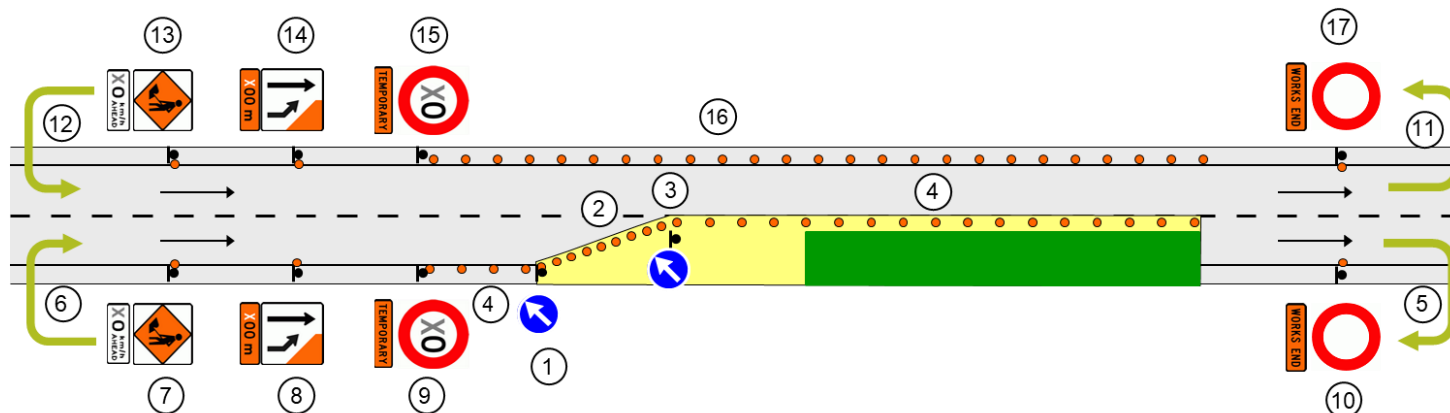
Shadow or tail pilot driver completes final check of the worksite as final TTM is removed

## Level 2 G2.18 - ONE-WAY TWO-LANE ROAD - Right-lane closure - Installation procedures



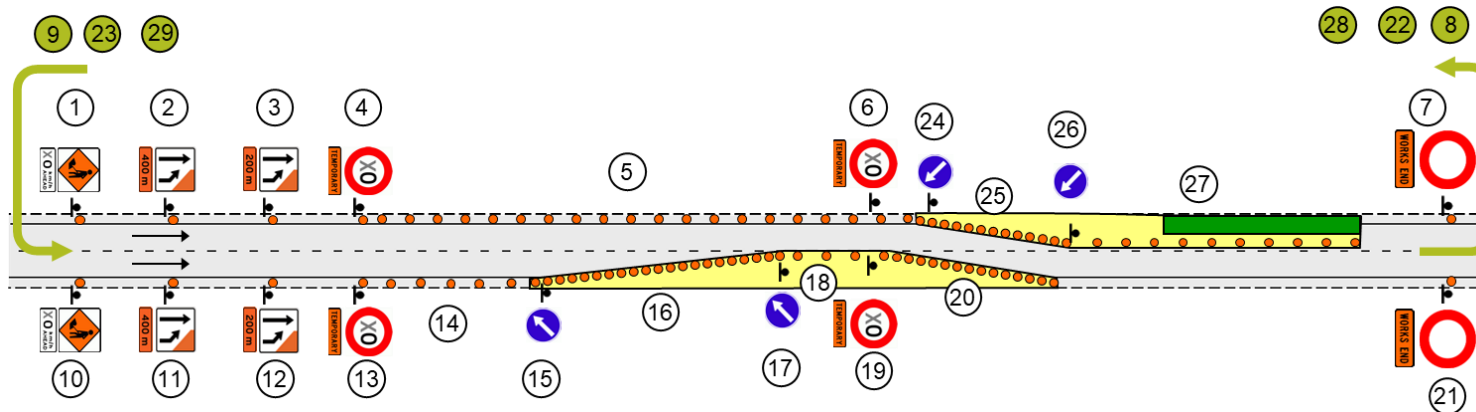
STMS completes drive through check of the worksite once TTM is installed

## Level 2 G2.18 - ONE-WAY TWO-LANE ROAD - Right-lane closure - Removal procedures



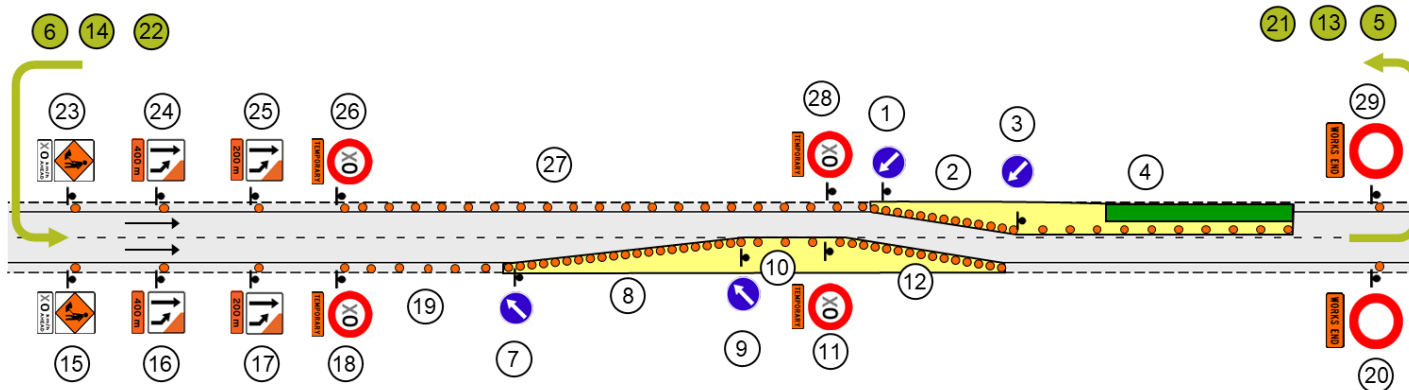
Shadow or tail pilot driver completes final check of the worksite as final TTM is removed

### Level 3 H1.5 - ONE-WAY TWO-LANE ROAD – Left-lane closure - Chicane layout - Installation procedures



STMS completes drive through check of the worksite once TTM is installed

### Level 3 H1.5 - ONE-WAY TWO-LANE ROAD – Left-lane closure - Chicane layout - Removal procedures



Shadow or tail pilot driver completes final check of the worksite as final TTM is removed

## Maintain TTM Equipment

STMS adjusts TTM as required. Paperwork (on-site record, etc) must be completed.

Visitors must be inducted to the site.

STMS completes regular checks of the TTM (at least every 2 hours) – record on on-site record throughout the day.

STMS works with Contractor to manage/track **critical milestones**.

## Removal of TTM equipment

STMS is in charge of the removal. STMS must be present – cannot be done by TC or TMO.

The work crew, equipment and materials are removed from the working space prior to removal of TTM.

The order of removal is; closure first, followed by direction and protection devices in a manner that does not put the road user at risk. When using a tail pilot, AWWMS or other electronic displays the advanced signs can be removed at the start of each final loop for each side of the road before the other signs.

On-site records must be completed. Equipment must be checked for defects and stowed away correctly.

## MOBILE OPERATIONS

### Mobile operations a practising STMS Category C can be in charge of

- Operations to install, maintain and remove TTM on **Category C road environments**.
- Install, maintain and remove semi-static operations on **Cat C road environments**.
- TTM for any activity that moves along the road (eg mowing, road marking) on **Cat C road environments**.

Mobile closure

10

Continuous movement,  
stops less than  
**10 minutes**

Semi static closure

60

Static activity no more than  
**60 minutes** not including  
setup or breakdown

The message displayed on the tail pilot must match the message displayed on the shadow vehicle.

This is vitally important because all messages may be visible to road users at the same time.



### Continuous communication during mobile operations

The STMS must have continuous communication with all mobile operation drivers and crew.

A consistently available channel is required.

Mobile phones do not provide instantaneous communication and do not work in all locations.



### Personnel on foot

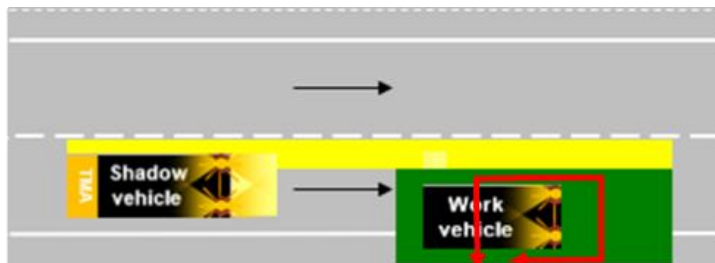
The number of personnel on foot must be kept to an absolute minimum. Personnel must:

- Keep within the working space and safety zones
- Only enter a live lane in an emergency circumstance (if necessary do so with the utmost care).

## Maintaining safety zones when exiting a vehicle

Deck-persons or TTM placers may need to exit the vehicle on the traffic side in some mobile operations.

Manoeuvring the work vehicle as far right as possible will ensure that sufficient lateral safety space between passing traffic and TTM workers is maintained.



## Clear sight distance (CSD)

A mobile operation must be clearly visible to approaching drivers. CSD is the minimum visibility required.

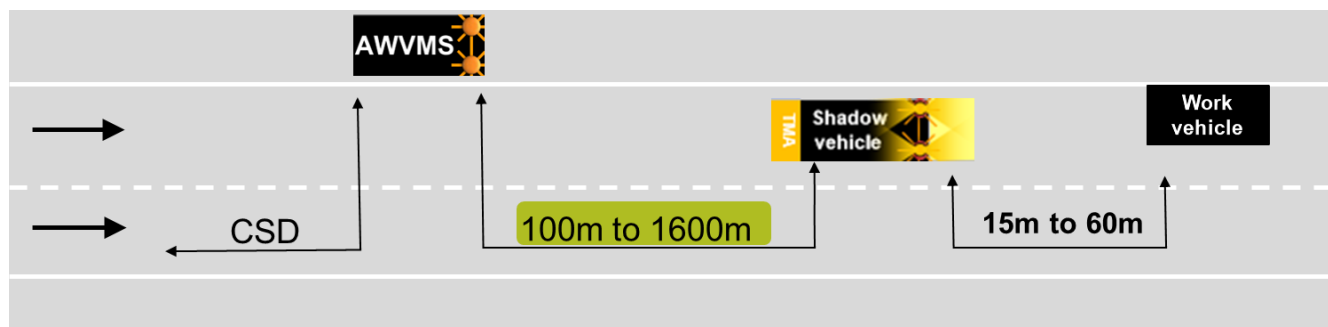
3 x the permanent speed limit (in metres)

**100km/h** x 3 = 300m

**80km/h** x 3 = 240m

**70km/h** x 3 = 210m

## Distances between vehicles on L2 or L3 Cat C roads

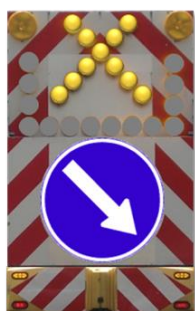


## Options for displays on work vehicles

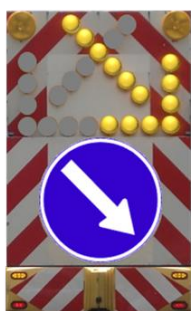




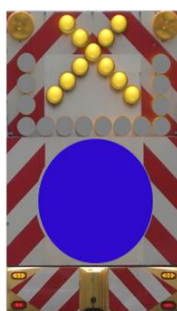
## Options for signs and displays on shadow vehicles



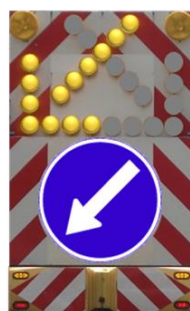
Shoulder closed  
Pass right when  
safe



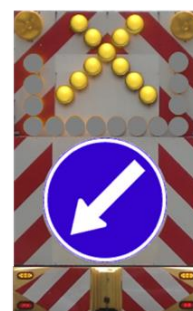
Lane change  
right required



Lane closed  
or  
Rolling block  
Do not pass



Lane change  
left required



Shoulder or  
median closed  
Pass left when  
safe

## Truck mounted attenuators (TMA)



When operating on a L2 or 3 Category C road, if you are **in the lane, partially in the lane, within 2m of the lane** the shadow vehicle must be fitted with a LAS and TMA unit.

The RCA may also require these to be used on some L1 Category C road environments.

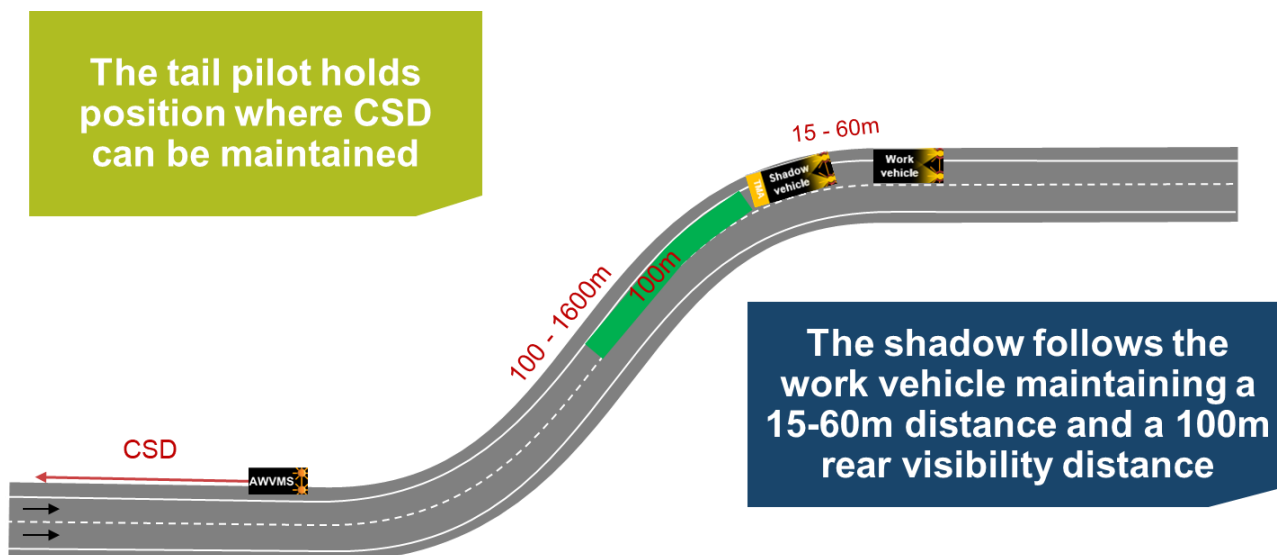
Always check the TMP.

If you are operating a shadow vehicle on any L2 or 3 Category C road with a permanent speed of 70kmhr or greater the TMA must be MASH TL3 complaint. You can check this on the side of the unit.

## Options for signs and displays on tail pilot vehicles



## Maintaining CSD for the activity around curves or over hills

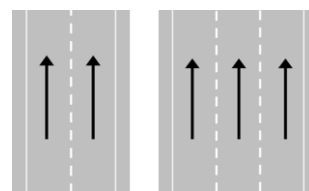




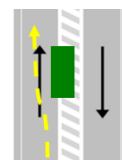
## SEMI-STATIC CLOSURE

A semi static closure is a short-term operation on the carriageway that is more than 10 minutes and less than 60 minutes.

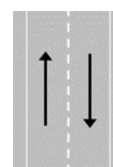
Can be used on all multilane road environments.



Can be used on a bi-directional road if there is a painted flush median and road users can overtake on the left side of the work.



Cannot be used on other bi-directional roads

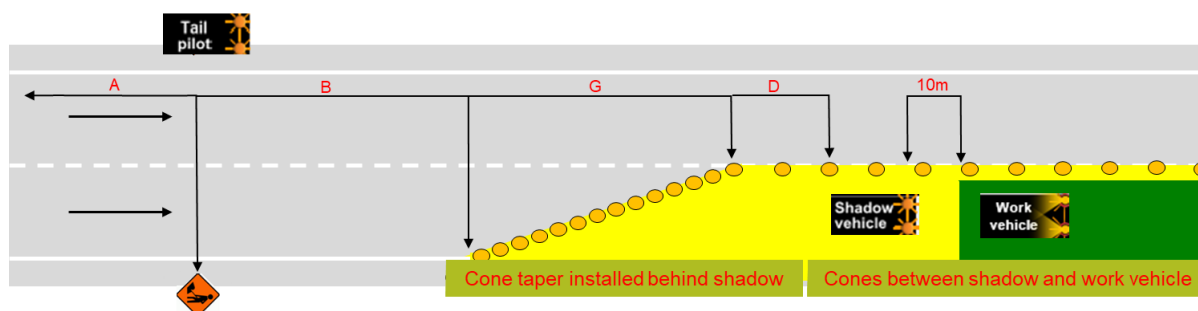


### Semi-static operations - Level 1 Cat C roads

Gated advanced  
waning signs or  
tail pilot and sign

Shadow  
Vehicle

Work  
vehicle

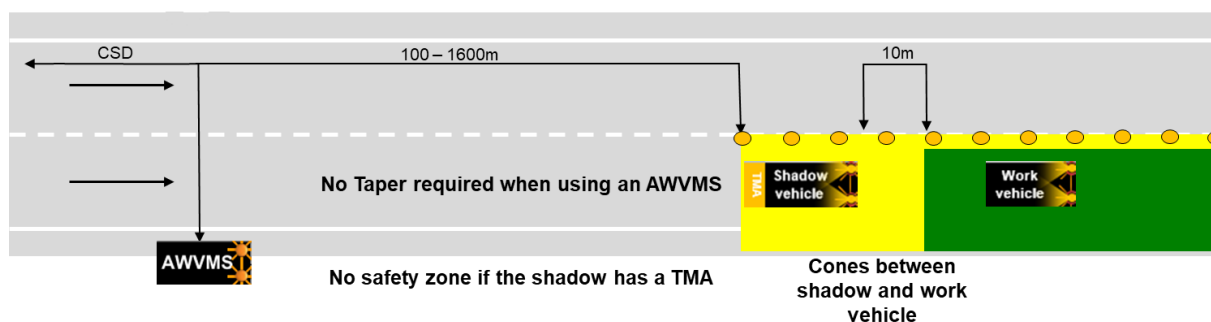


### Semi-static operations - Level 2/3 Cat C roads

AWVMS

Shadow  
Vehicle

Work  
vehicle



## CRITICAL POINTS FOR ME

Add critical points here:

- .....