WAKA KOTAHI
NZ TRANSPORT AGENCY

HANDBOOK - STMS CATEGORY B EXTENSION (AFTER CATEGORY A)

NZ TRANSPORT AGENCY

VERSION 2.0

Participant name:

New Zealand Government

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More information

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Contents

ABOUT THE STMS CATEGORY B TRAINING

Outcomes of the STMS Category B training

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

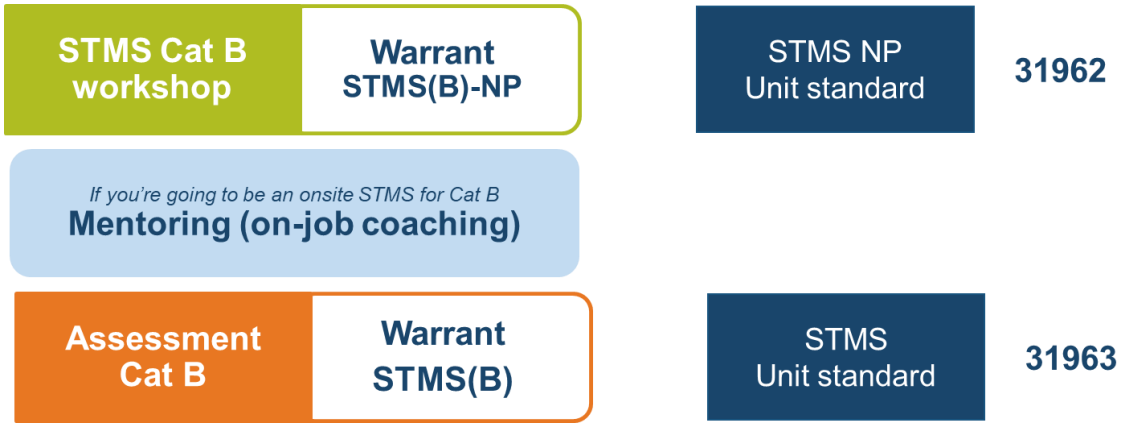
- The key requirements for Cat B roading environments
- Common hazards, risks and controls for Cat B road environments.

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 B roading environment.

The STMS Cat B warrants and unit standards

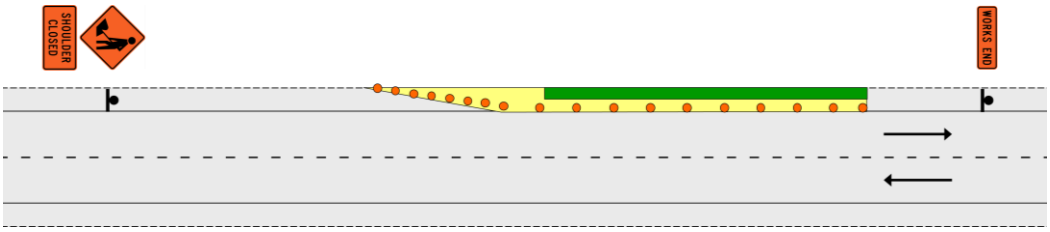


Assessment for Cat B practising

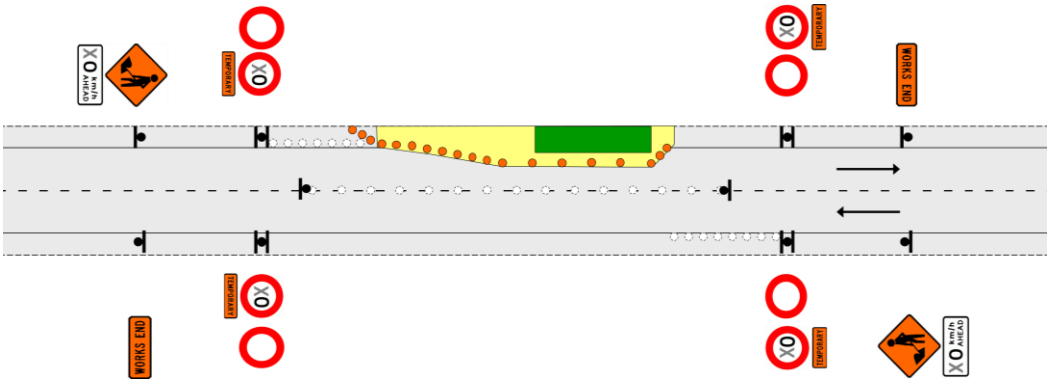
The trainee must complete 3 closures from the list of possible closures.

Any 2 of the following closures:

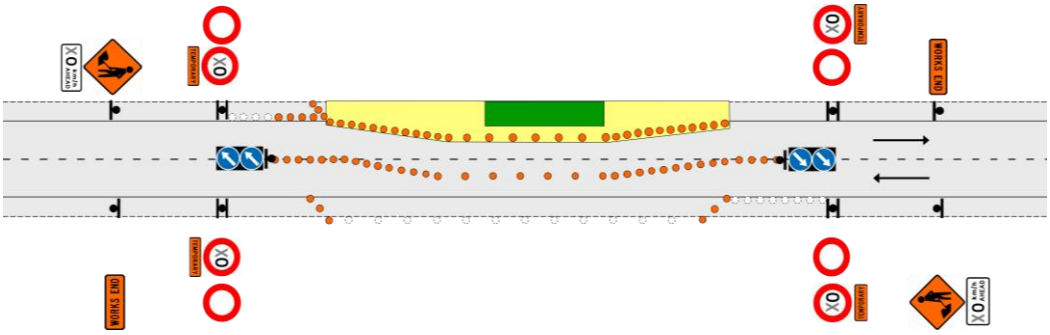
1. Shoulder closure



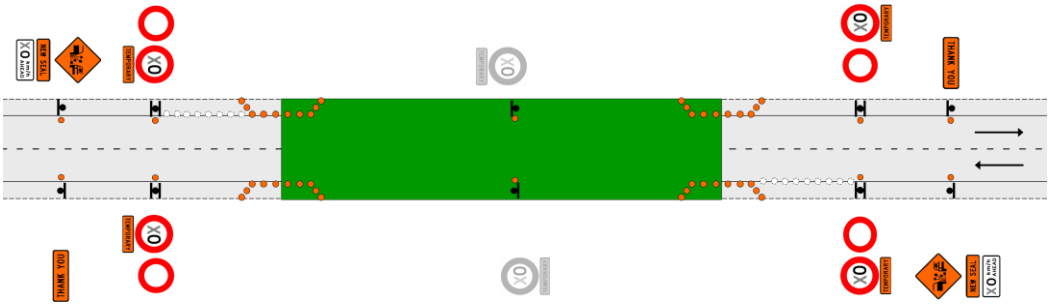
2. Partial lane shift



3. Two-lane diversion

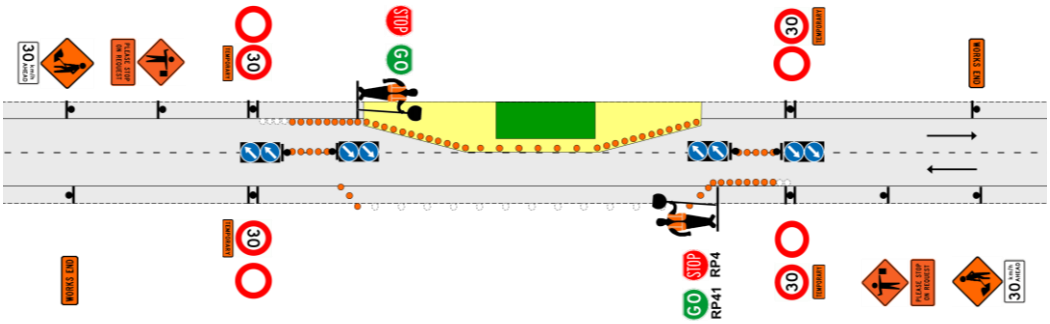
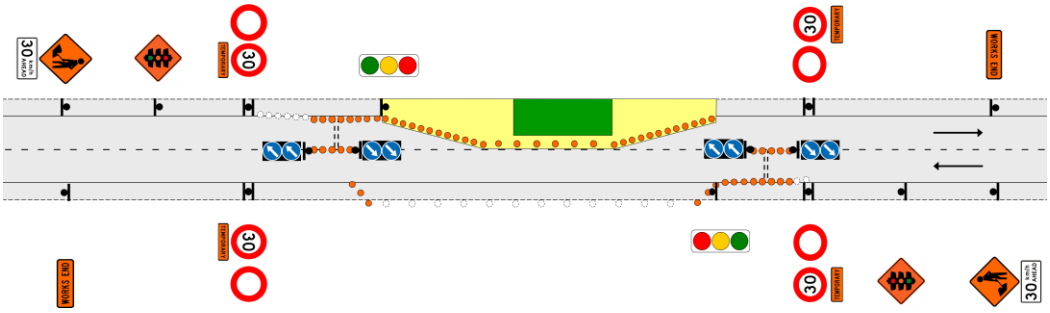


4. Unattended new seal



Note: Only one closure can be a shoulder closure.

One alternating flow closure, which includes:

Stop/go	
Portable traffic signals	

You will be assessed on a worksite requiring alternating flow control.

RISK MANAGEMENT

Category B road environments

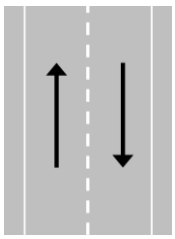
These are high speed (70km/h and more) two-way two-lane roads.

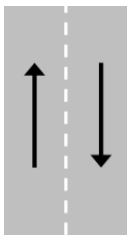
Category B includes LV, L1 and L2 high speed roads using both **type A** (smaller) and **type B** (bigger) signs (depending on requirements)

Type A

Type B

It includes roads with or without shoulders





Suggestions to identify risks at a proposed worksite

Complete a drive-through of proposed worksite.

Identify hazards for example:

- Road users travelling at higher speeds
- Wind sheer caused by heavy vehicles at high speeds
- Lack of visibility to TTM at the worksite (vertical and horizontal curves)
- Narrow shoulder and pull over areas
- Slower driver reaction time.

Pedestrians and cyclists forced closer to traffic 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.

Examples of risk management on Cat B roading environments

Hazard	Risk	Likelihood and severity	Action
Environmental factors that reduce visibility (sun glare, fog, heavy rain)	Road users do not have time to react appropriately resulting in a vehicle crash	Possible and severe – risk rating very high	Delay setup and wait for environmental factors to dissipate
Wind shear caused by heavy vehicles at high speeds	TTM workers pulled or pushed into the lane and struck by a vehicle	Possible and severe – risk rating very high	Ensure CSD and/or sign visibility distance is maintained. Utilise TSLs & positive TM. Cover in safety briefing and maintain safe distances
Road users travelling at higher speeds	Road user errors resulting in late breaking or manoeuvring resulting in a vehicle crash	Possible and severe – risk rating very high	Greater sign spacings and the use of TSLs & TTM where appropriate. Pace vehicle operations
Road users forced closer to road-side culverts and swales	Increased probability of a loss of control type crash due to small driver errors	Possible and severe – risk rating very high	Maintain maximum lane widths, introduce TSLs & positive TTM, create additional safety zones where possible
Slower driver reaction times (up to 2.5 seconds)	Road users do not have time to react appropriately resulting in a vehicle crash	Possible and severe – risk rating very high	Greater sign spacings and the use of appropriate equipment to provide advanced warning ie Variable messaging boards

Hazard	Risk	Likelihood and severity	Action
Pedestrians and cyclists forced closer to traffic	Collisions at higher speeds can cause severe injuries. Some roads have no or very little shoulder areas	Possible and severe – risk rating very high	Ensure that cyclists and pedestrians are included in the planning. The use of alternating flow should be considered if cycle and pedestrian routes are affected

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+	70/60+	80	100	120	120
B	Warning distance (m)	100/75+	120/90+	140	160	200	200
C	Sign spacing (m)	50/35+	60/45+	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+	100/60+	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			

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

** Taper length is based on a single lane shift of 3.5m.

\+ 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.

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.

POSITIONING OF SIGNS

Not enough room to install signs

You may need to position the sign in a different location. You can increase the sign spacing (shift it further away from the working space). You can't reduce the sign spacing below the minimum distance.

Extra ballast required on Cat B roads

Heavy vehicles travelling at 70km/h or more generate a lot of air movement and wind pressure. This can topple signs over. Extra ballast is required on both Type A and type B signs. Bigger signs require more ballast.

Remove redundant TTM equipment

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.

Cone placed at the base of each sign stand on the traffic side of the sign

On LV & L1 roads		On L2 roads	
	***Day-time*** • **May** have cone ***Night-time*** • **Must** have cone		**Must** have cone at all times

Location of signs

Keep signs as far left as possible. Install sign on the shoulder or berm if placing it on the carriageway will force traffic across the centreline. Do not block cycle lanes or pedestrian walkways.

Sign visibility distance

If sign visibility cannot be achieved, **the sign must be advanced up to one sign spacing.**

If sign visibility still cannot be achieved **place 2 signs.**

Covering permanent signs

All conflicting signs need to be covered.

Cover any supplementary speed advisory plates greater than the TSL.

DO NOT cover advisory speeds that are LOWER than the TSL (trucks need this information).

Cat B intersecting with Cat A roading environment

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

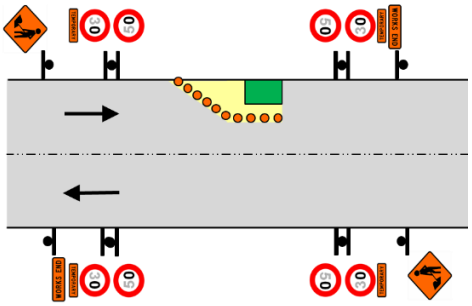
- The closure is only on the Cat B road environment
- Signs can be placed without interfering with cycle lanes, bus stops, taxi stands, loading zones and restricted parking
- Minimum footpath widths can be maintained.

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

Gated TSL signs (signs on both sides of the road)

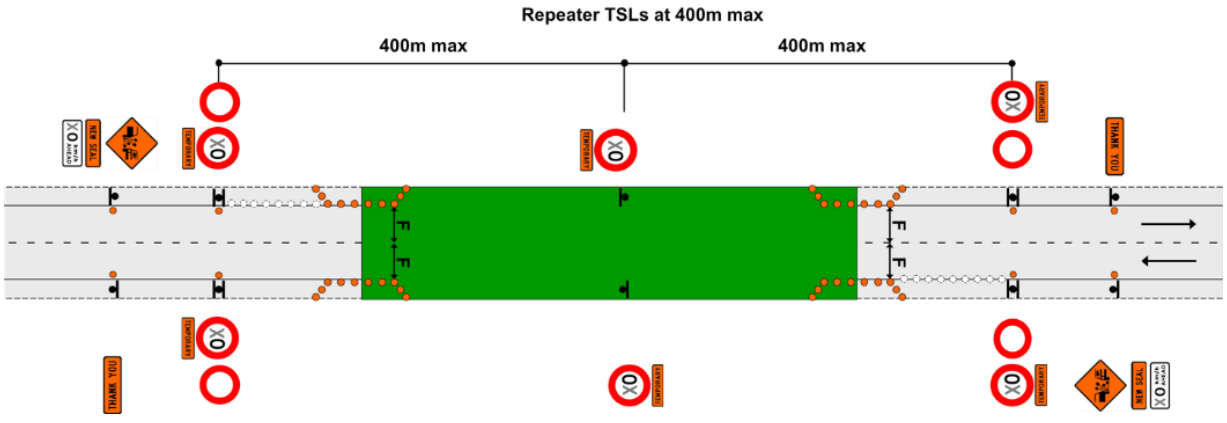
Gate speed signs at every change in speed (TSL or return to permanent speed limit).

Gated speed signs are **not required** on roads with an **AADT of less than 500 vehicles.**



Repeater TSLs at least every 400m

On long worksites TSLs are repeated at least every 400m. The repeater TSL signs are placed on the left-hand side of the road for the direction of travel and do not need to be gated.



TAPERS

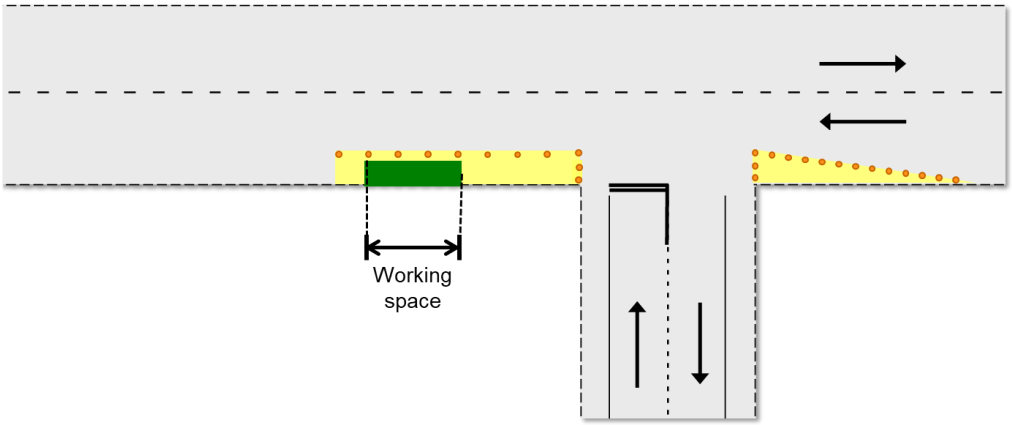
Taper visibility

Approaching traffic must be able to see the full length of taper.

If this is not possible extend taper so that at least 2/3 is visible.

Move taper to accommodate intersection

If the working space is close to an intersection and there is not enough room to install the taper without it blocking off the intersection, the taper can be installed the other side of the intersection.

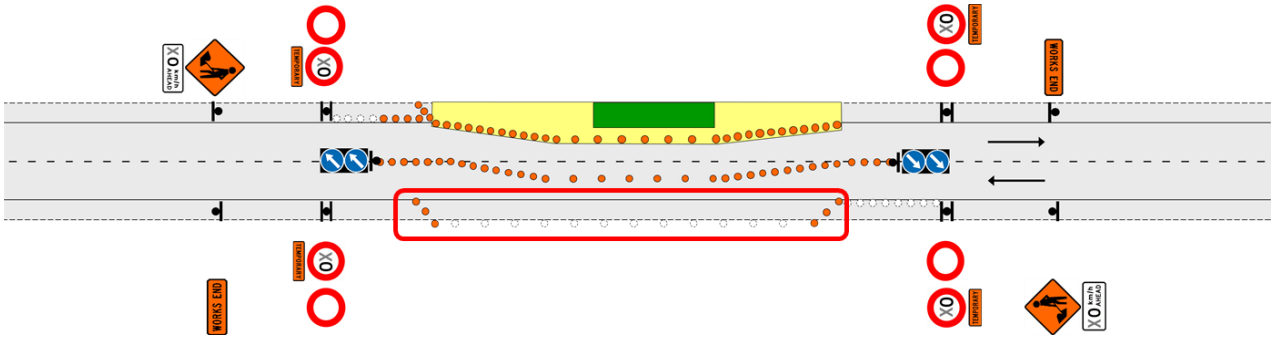


Taper reductions

Calculation of shifting tapers less than 3.5m (LV, L1 roads)				
Taper length in metres and (cone numbers)				
Closure or lane shift width	**70km/h 5m spacing**	**80km/h 5m spacing**	**90km/h 5m spacing**	**100km/h 5m spacing**
> 3.0	**Apply the full taper length**			
2.0 – 3.0	**50 (11)**	**60 (13)**	**70 (15)**	**85 (17)**
1.0 – 2.0	**30 (7)**	**35 (8)**	**40 (9)**	**45 (10)**
< 1.0	**15 (4)**	**25 (6)**	**30 (7)**	**35 (8)**

MANAGING TRAFFIC ON THE SHOULDER AND LANE

Shoulder used as temporary lane



Any shoulder used as part of a temporary lane must:

- Be safe for traffic to traverse
- Be strong enough to carry heavy vehicles
- Have enough overhead clearance
- Not have a surface drop of more than 25mm between traffic lane and shoulder
- Be delineated both sides (unless the travel path is clear).

Shoulder closure

A 10m taper is allowed where shoulder width is less than 2.5m.

Shoulder closed supplementary plate is installed if there is a marked edgeline and all TTM equipment is outside of the edgeline.

If there is no marked edgeline the STMS can infer where the edgeline would be ensuring that minimum lane width is maintained.

Passing lanes

If start of taper is less than 600m from the start of the passing lane, close the lane from the start point to the end of the working space.

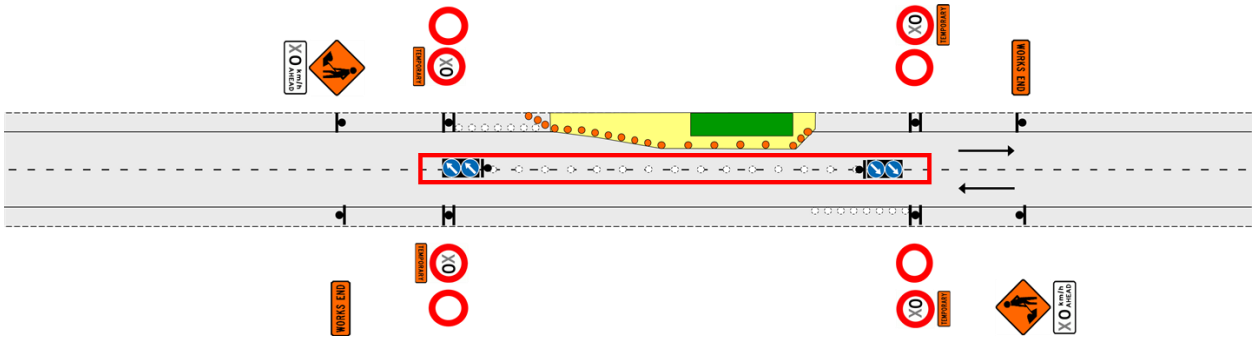
If start of taper is **more than 600m from the** start of the passing lane, a taper should be installed in advance of the working space as for a normal lane closure. If the working space needs to be extended and the taper needs to be shifted within 600m of the beginning of the passing lane, then contact the TTM Planner before taking any action on site.

If the passing lane extends for 600m or more beyond the proposed closure, then the lane should be opened.

If there is less than 600m of passing lane to travel, the lane should remain closed.

Again, If the working space needs to be extended within 600m of the end of the passing lane, then contact the TTM Planner before taking any action on site.

Separation of lanes with centre line cones



Centreline cones are used to stop road users crossing the centreline or where lanes have been shifted, form a new centreline to keep opposing traffic separated.

The minimum lane width must be maintained past the working space. Remember to calculate lane width based on the any TSL installed.

Channels of cones

If channels of cones are being set up, leave room for road users to drive through the cones (especially heavy vehicles). A 10m step in the channel may be all that is required to allow heavy vehicles to get through without knocking the cones over.

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.

When detour is no longer needed, open the road and allow traffic to proceed.

Remove the detour route signs when the detour is no longer required.

Oversize vehicles

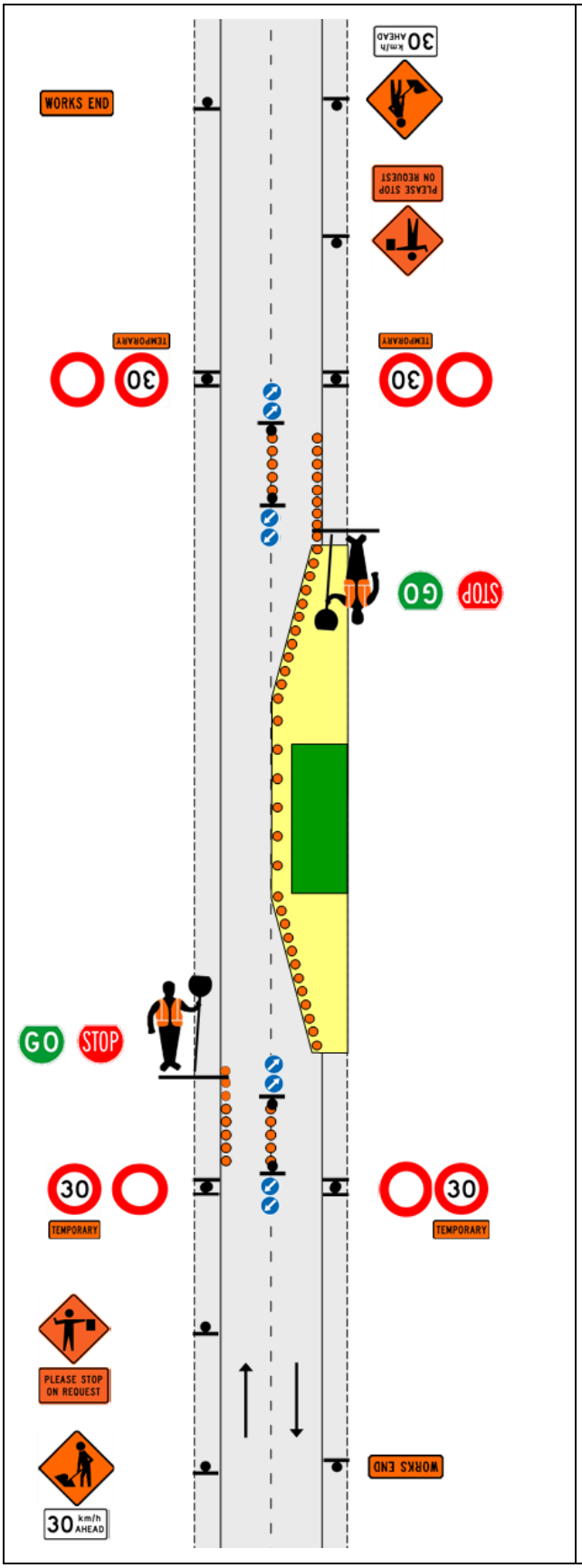
TMP should cover what STMS needs to do for worksites on oversize vehicle routes. For example, if there are going to be delays, create a park-up area and arrange for transporter to wait there until worksite has been prepared for the transporter to come through.

Suggestions for the in charge STMS

- Talk to the driver of the transporter and agree what needs to be done onsite to get the transporter through
- Stop the work activity (workers may put themselves at risk as the oversize load passes by)
- Be prepared to relocate signs and shift cones to provide more room
- Reinstate the worksite and do site check immediately after vehicle has gone through.

ALTERNATING FLOW

Summary of MTC essentials



- Extend advance warning and MTC ahead signs beyond the anticipated queue length *(drivers of heavy vehicles need to know they may be required to stop).*
- 30km/h ahead sign is recommended but optional.
- MTC ahead sign must be removed when MTC stop operating.
- TSLs gated across the road (if more than 500 vehicles per day).
- Min 5 cones each side of the cone threshold.
- Centerline cones must have RD6L signs.
- Offset centreline cones by 10m to allow heavy vehicles to manoeuvre.
- 30m taper - 13 cones at 2.5m spacing.
- Must have 30m end taper as well.
- Speed reinstatement must be gated if more than 500vpd.
- Works end sign to tell road users to return to normal driving conditions.

Briefing the MTCs

- Ensure they know the **basics of the task** (ask them questions – get them to demonstrate actions).
- Explain any specific requirements for this worksite. For example:
  - Max time paddle can be held on STOP
  - Trigger points for long queue length
  - Where they are to stand
  - Escape routes
  - Radio protocols
  - Break times.
- Explain how you want them to act (smile, wave).

Communicating with on-site personnel (MTCs)

Face to face when completing safety briefings

By 2-way radio when giving instructions at a distance

Critical safety points

Monitor speed of passing vehicles – Use positive traffic management to reduce speed to 30km/h.

Ensure the MTC is visible on the approach:

- Don't position them in shadows where visibility may be reduced
- Don't position them around a corner or over the brow of a hill where they can't be seen.

UNATTENDED AND NIGHT-TIME ACTIVITIES

There needs to be a TMD for unattended setouts. Check this when you check that the TMP is suitable for the worksite (fit for purpose). If you are going to have an unattended worksite and there is no TMD, then the TMP is not fit for purpose.

If there is a diagram in the TMP for the unattended worksite - follow it.

Unattended seal repairs

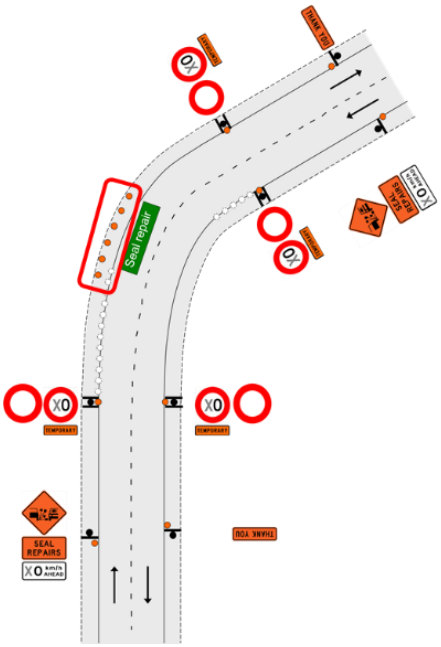
When we are doing seal repairs, we often leave a trafficable repair unattended for a period of time. This is called in unattended seal repair.

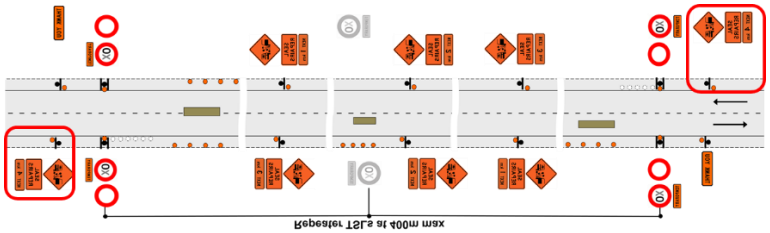
To protect the road users we install advance warning signs and usually TSLs.

However the location of theses repairs can be hard to see, especially at night.

To alert road users to the location of the hazard, we install cones on left of carriageway for the length of repair.

The cones are placed at 10m centres (or at least 3 cones, whichever is the greater).





Long worksites

On long worksites, we use the 'Next X km' plates & repeat TSLs at not more than 400m intervals.

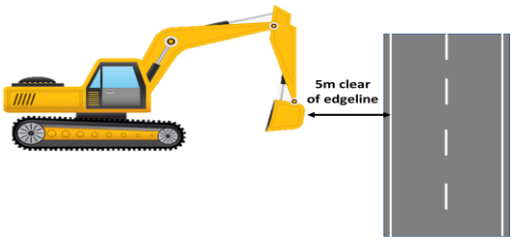
Remember that worksites need positive traffic management to encourage road users to travel at the TSL.

Plant and equipment

All plant **must** be parked:

- At least 5m outside the edgeline
- On the same side of the road as the working space.

Do not park plant or place equipment on corners where a driver could loose control and hit it.



Site monitoring of unattended worksites

The schedule for site monitoring of unattended worksites should be included in the TMP.

The schedule is based on a risk assessment however, if the risks change (eg due to high wind) the STMS may need to do additional site monitoring.

PEDESTRIANS AND CYCLISTS

Temporary footpath options – Category B road environments

Do not put pedestrians across the carriageway to a footpath on opposite side of the road

Cyclists

Some category B roads are frequently used by cyclists - they usually travel along the shoulder. When placing TTM, consider if it can be placed out of the shoulder area to allow for the safe transit of cyclists.

Do not place TTM equipment in marked cycle lanes.

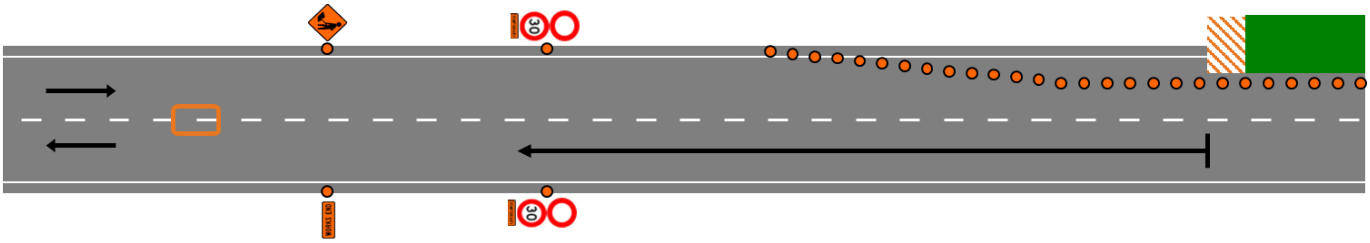
INSTALLATION PROCEDURES

Traffic count

The STMS must complete a traffic count before installing TTM.

If there are no traffic count details in the TMP, the STMS completes a visual check to ensure that the traffic volumes are not unusually high.

Calculating key layout dimensions for a worksite



TIP – **10m** from start of white line to start of the next white line

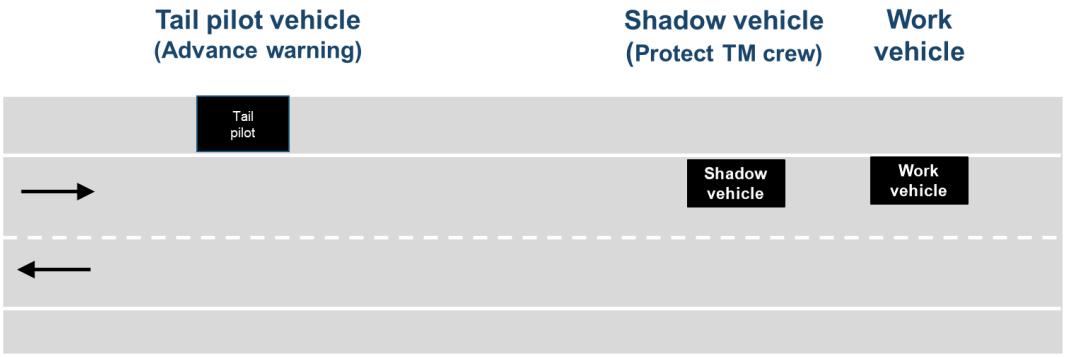
TIP – To workout where signs and cones are placed, start at the edge of the working space and work back down the road allowing space for each dimension

TIP – allow extra space in front of the working space as a contingency

Installing and removing TTM at the worksite

Follow the TTM installation/removal procedures in the TMP (and also your company's procedures for installing and removing TTM at a worksite).

Vehicles used in a mobile operation to install, maintain or remove TTM



Shadow vehicles are required for the protection of TM crew and must be used whenever risk assessment identifies a shadow vehicle is required.

Minimum requirements for use of shadow vehicle:

- Shadow vehicle is required for all mobile closures on level 2 roads when the work vehicle is within 2m of the live lane or on the live lane.
- Shadow vehicle is required for all mobile closures on level LV, level 1 roads when TM crew are required to work on the rear deck of the work vehicle (either moving or stationary) while it is in the live lane, or behind the work vehicle

Unloading and Installing TTM equipment

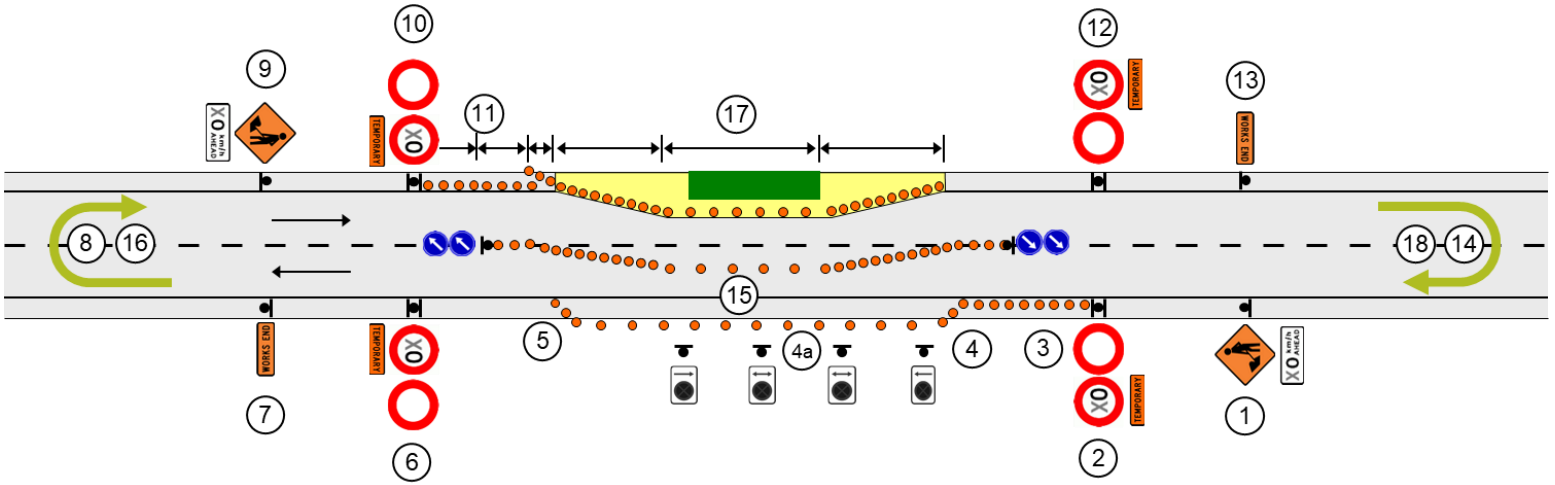
TTM equipment must be unloaded from the **non-traffic** side of a work vehicle, **or the rear** of a work vehicle with a **shadow vehicle** in place.

TTM equipment is **installed** either:

- to the **non-traffic side** of a work vehicle
- **10m in front** of the work vehicle
- **to the rear** of a work vehicle with a **shadow vehicle** in place.

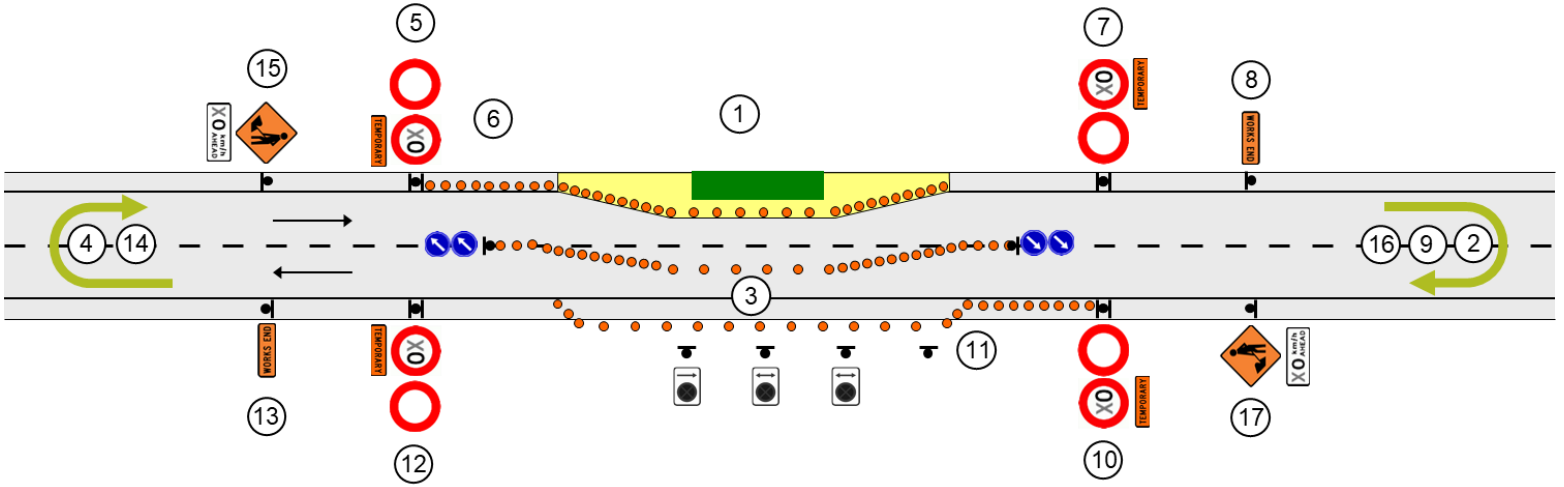
Set out on the following pages are some **OPTIONS** for installing and removing TTM at worksites.

F2.13 - TWO-WAY TWO-LANE ROAD – Traffic CROSSING road centre - Installation procedures



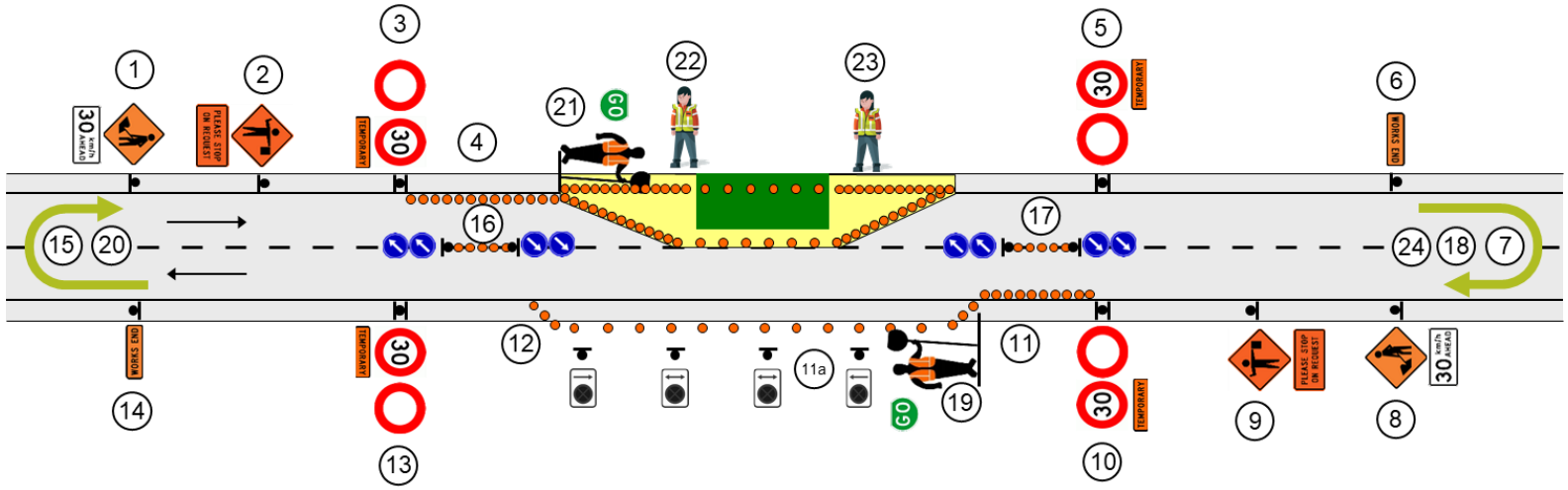
STMS completes drive through check of the worksite once TTM is installed

F2.13 - TWO-WAY TWO-LANE ROAD – Traffic CROSSING road centre - Removal procedures



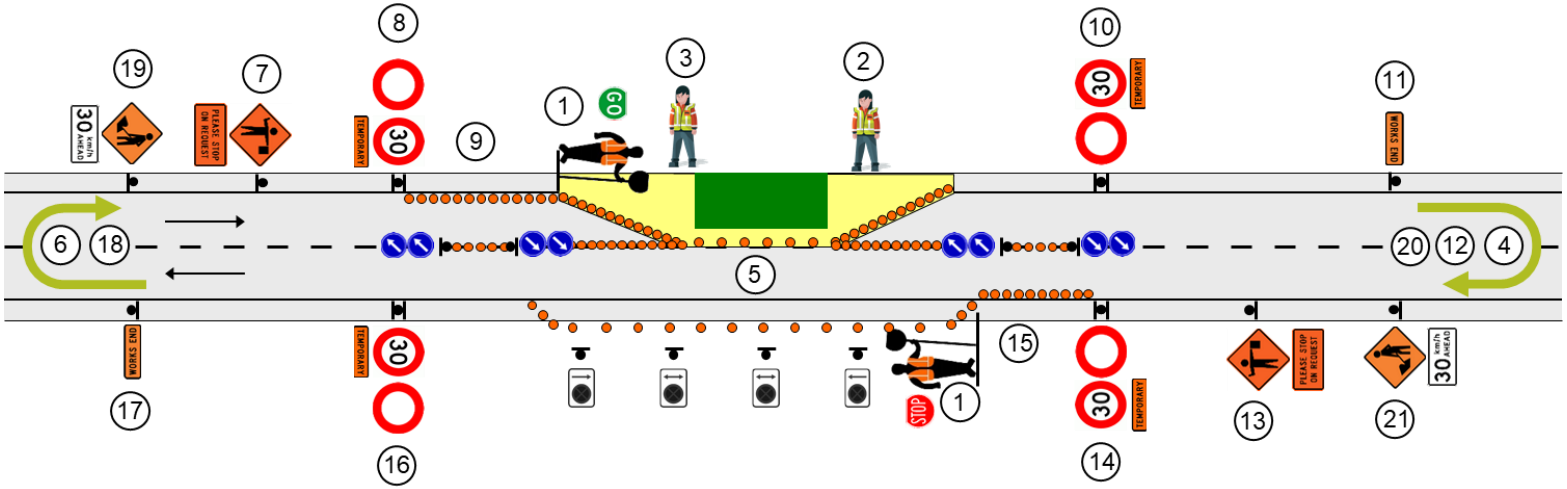
STMS completes final check of the worksite as final 2 signs are removed

F2.14 - TWO-WAY TWO-LANE ROAD – Single-lane alternating flow (STOP/GO or STOP/SLOW) - Installation procedures



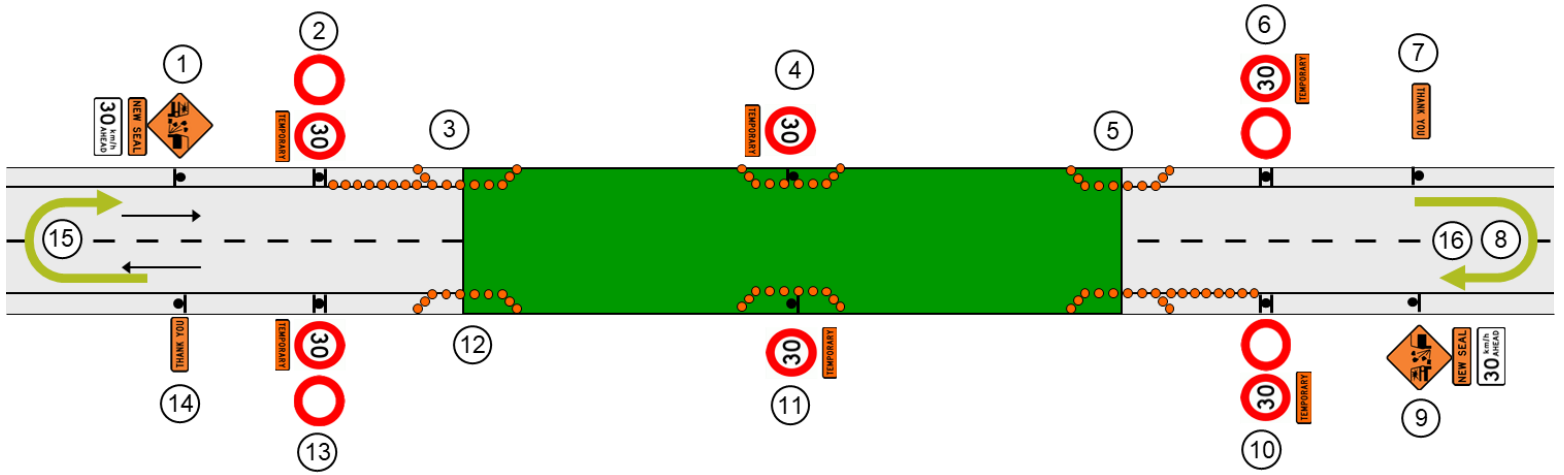
STMS completes drive through check of the worksite once TTM is installed

F2.14 - TWO-WAY TWO-LANE ROAD – Single-lane alternating flow (STOP/GO or STOP/SLOW) - Removal procedures



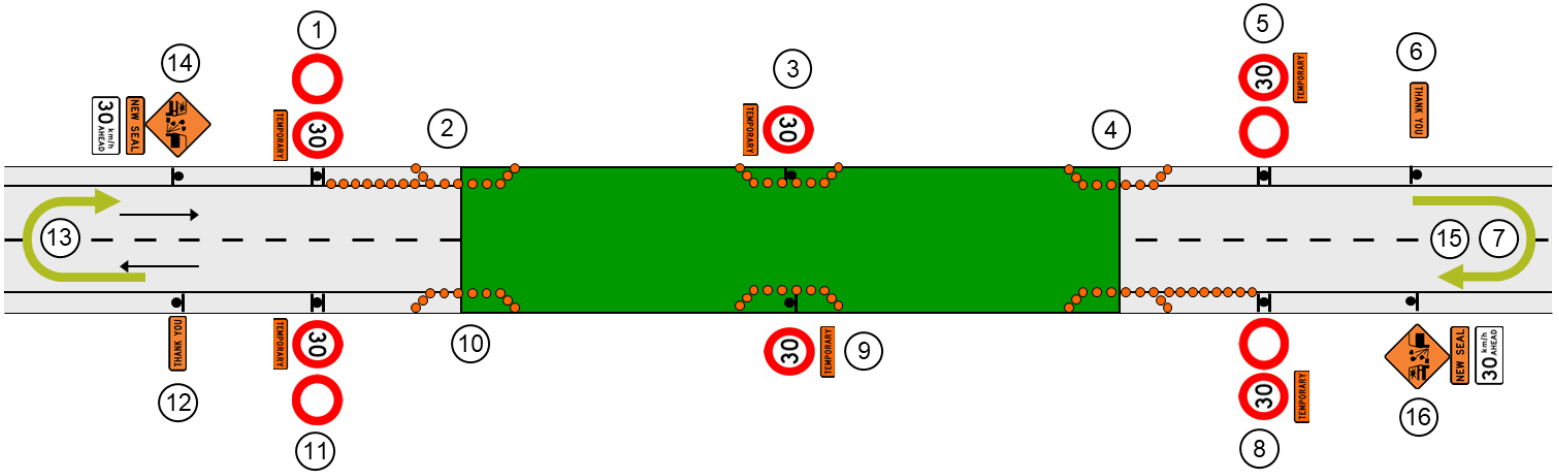
STMS completes final check of the worksite as final 2 signs are removed

F2.27 - TWO-WAY TWO-LANE ROAD – New seal (unattended and/or unswept) - Installation procedures



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

F2.27 - TWO-WAY TWO-LANE ROAD – New seal (unattended and/or unswept) - Removal procedures



STMS completes final check of the worksite as final 2 signs are removed

MOBILE OPERATIONS

Mobile operations a practising STMS Category B can be in charge of

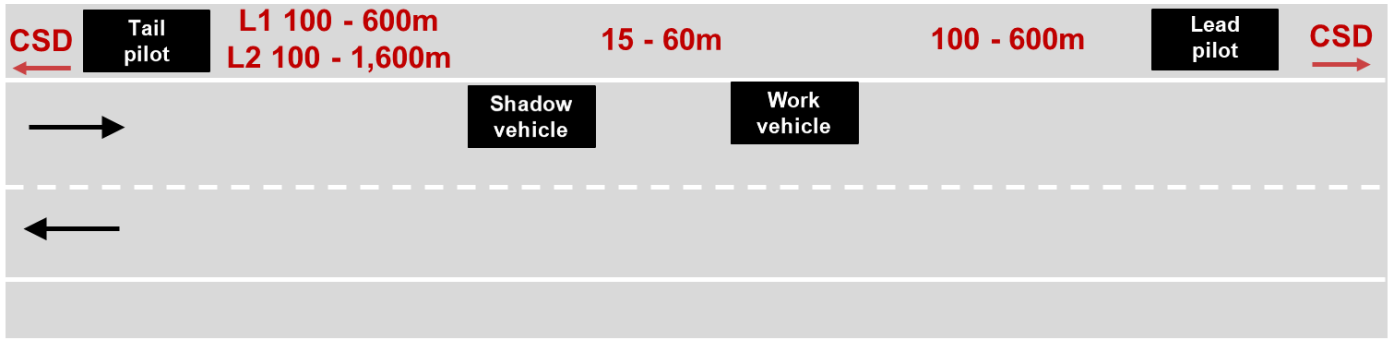
- Mobile operations to install, maintain and remove TTM on Category B road environments.
- Install, maintain and remove semi-static operations.
- TTM for any activity that moves along the road (eg mowing, road marking).

Clear sight distance (CSD) for inspections

Approaching road users must have CSD to the activity. CSD varies depending on the permanent speed.

Calculating CSD	Permanent speed	CSD
100 to 60km/h CSD = 3 x the permanent speed in metres (100km/h x 3 = 300m)	**100km/h**	300m
	90km/h	270m
	80km/h	240m
	70km/h	210m

Distances between vehicles



Options for signs and displays on work vehicles

Basic vehicle

LV, L1, L2

Horizontal arrowboard

LV, L1, L2

Light TMA

LV, L1

LAS

LV, L1, L2

Protection of workers with shadow vehicles

Workers on the back of a working vehicle must be protected by a shadow vehicle.

Workers on foot behind a work vehicle require a shadow vehicle to be in place.

Options for signs and displays on shadow vehicles

Basic vehicle

LV & L1

Horizontal arrowboard

LV & L1

Light TMA

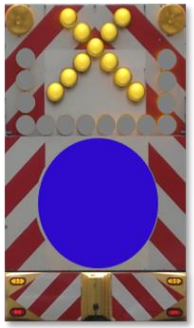
LV & L1

LAS

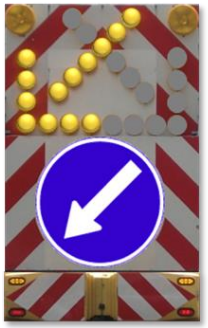
LV, L1 & L2

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

Options for signs and displays on tail pilot vehicles

Basic tail pilot

LV & L1

Light TMA

LV & L1

AWVMS

LV, L1 & L2

Static signs or tail pilot vehicles

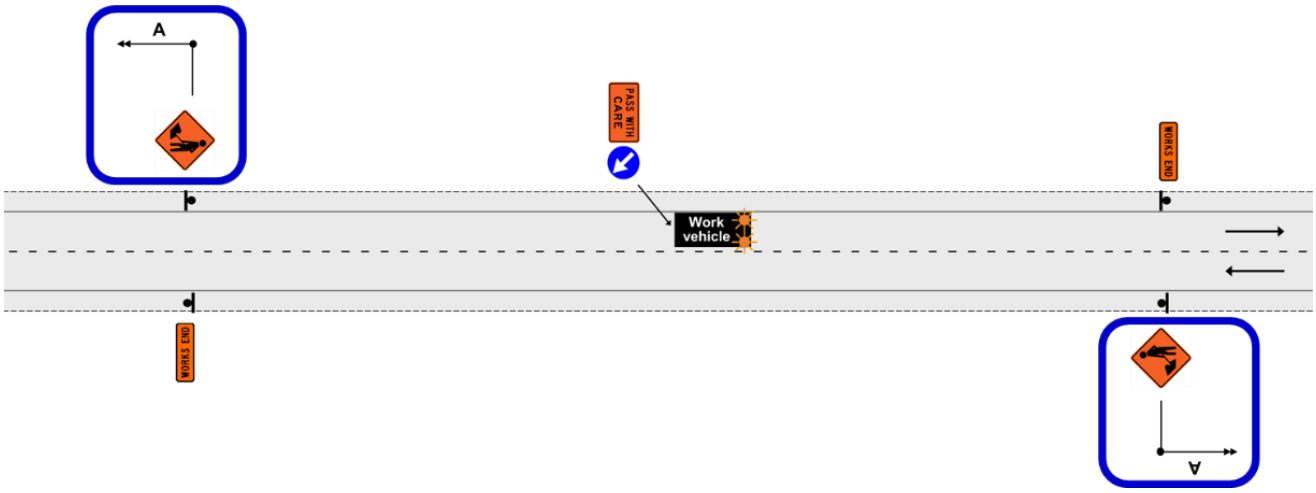
Mobile operations can utilise either:

- A tail pilot vehicle
- Static advance warning and works end signs

If the work vehicle is in the lane (or partially in the lane) and static signs are installed, every side road impacted must have advance warning and works end signs installed.

If a tail pilot vehicle is used signs on the side roads are not required.

If static signs are used, use the dimension **A Sign visibility** distance instead of CSD.



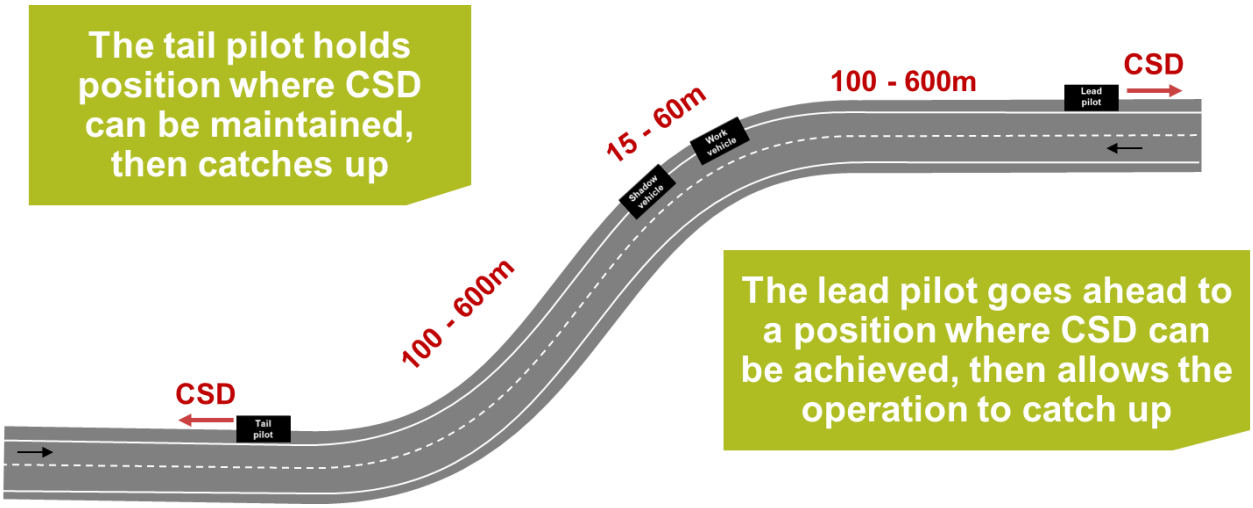
Options for signs and displays on lead pilot vehicles

Must have appropriate signage facing approaching traffic.

The advance warning sign may be mounted on the front of the vehicle or the roof of the vehicle.

Must have pass with care and RD6 mounted on the rear of the vehicle.

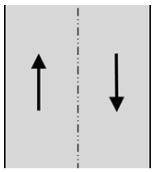
Maintaining CSD for the activity around curves or over hills - L1 road



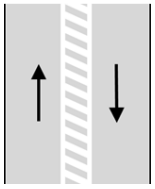
SEMI-STATIC

A semi static operation allows work for up to 1 hour. Less TTM is required (fewer signs, no TSLs).

LAS or horizontal arrowboard is used to compensate for less TTM.



Not permitted on two-way two-lane roads…



…unless the closure is on the painted flush median and traffic is directed to the left

These operations are quite rare on Category B roads as the painted flush medians are often not wide enough for the vehicles and 1m safety zones each side of the vehicles.

If you do have to complete a semi-static operation, the TMP will have to clearly state how the operation is to be completed. Discuss any issues with the TTM Planner.

CRITICAL POINTS FOR ME

Add critical points here:

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