Guide to Temporary Traffic Management Part 6

Field Staff – Implementation and Operation

Austroads

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Austroads

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Guide to Temporary Traffic Management Part 6: Field Staff – Implementation and Operation

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Abstract

Austroads' Guide to Temporary Traffic Management (AGTTM) details contemporary temporary traffic management practice for application in Australia and New Zealand. It provides guidance for the planning, design and implementation of safe, economical and efficient temporary traffic management designs. This Guide recognises the level of variability of the road environments for which guidance is provided. The guidance provided in AGTTM is intended to encourage a consistent level of planning that supports the streamlined safe progress of work. It applies to all works on roads and near roads, in addition to off road development and other activities that interact with and impact on the road environment.

AGTTM has been developed based on best practice temporary traffic management practice in Australia and New Zealand, to assist road authorities to meet their existing legislative responsibilities for workplace and public safety.

Part 6 sets out the requirements of field staff in the process of installing, monitoring and dismantling traffic management on public roads.

Keywords

temporary traffic management, worksite traffic control, risk assessment, road safety, traffic management implementer

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Edition 1.1 contains additional information regarding condition of devices and when they should be replaced, monitor and review of a Traffic Guidance Scheme, principles for removing signs and correction to errors in some diagrams and figures.

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About Austroads

Austroads is the peak organisation of Australasian road transport and traffic agencies.

Austroads' purpose is to support our member organisations to deliver an improved Australasian road transport network. To succeed in this task, we undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.

Austroads provides a collective approach that delivers value for money, encourages shared knowledge and drives consistency for road users.

Austroads is governed by a Board consisting of senior executive representatives from each of its eleven member organisations:

- Transport for NSW
- Department of Transport Victoria
- Queensland Department of Transport and Main Roads
- Main Roads Western Australia
- Department for Infrastructure and Transport South Australia
- Department of State Growth Tasmania
- Department of Infrastructure, Planning and Logistics Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- The Department of Infrastructure, Transport, Cities and Regional Development
- Australian Local Government Association
- New Zealand Transport Agency.

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1. Introduction

1.1 Purpose

Managing the risks associated with providing an optimal level of safety for persons working in or near traffic and the impact of road work on road users, road congestion and the general community, is a significant issue for road agencies and industry. Road agencies and industry have a legislative requirement as an employer of construction, operational and maintenance services to provide a safe work environment and to manage the risks of working in or near traffic through current jurisdictional Work Health and Safety (WHS) requirements, regulation, training and roadwork planning.

The Austroads Guide to Temporary Traffic Management (AGTTM) details the contemporary temporary traffic management practice of member organisations. In doing so, it provides guidance to designers in the production of safe, economical and efficient temporary traffic management designs. This Guide recognises the level of variability of the road environments for which guidance is provided. The guidance provided in AGTTM is intended to encourage the consistent planning, design and implementation of temporary traffic management across Australia and New Zealand while also supporting the streamlined safe progress of work. It applies to all works on roads and near roads, in addition to off road development and other activities that interact with and impact on the road environment.

The purpose of the AGTTM is to provide guidance and supporting material that:

- supports the ability of road agencies and industry to meet their WHS requirements and lead to improved safety outcomes at road worksites
- improves the standard of temporary traffic management in Australia and New Zealand through consistency of application which assists road users to recognise and understand temporary traffic management, thereby improving their behaviour and safety
- aims to reduce the rate of incidents occurring at worksites
- improves the ability of road authorities and industry to manage the increasing frequency and variety of activities that are being undertaken on and near the road
- allows continuous industry review to maintain best practice.

This purpose is achieved through:

- providing direction for all matters relating to the planning, design and implementation of temporary traffic management
- facilitating improved adaptation to changes in technology and practices through being reactive to changes and being able to readily include new innovations
- providing guidance focused on the users of this Guide
- providing road agencies and industry with uniform practices whilst carrying out works on or near roads.

The benefits associated with uniform guidance broadly accepted by jurisdictions and industry include:

- guidance and training that appropriately develop designers with the skills necessary to develop and deliver safe traffic management at road worksites
- reduced impost on industry working across jurisdictional borders
- improved harmonisation of road worksites across jurisdictions providing improved consistency for road users, including vulnerable road users such as pedestrians and cyclists. This is targeted at improving road user behaviour, safety of road worksites and reducing impact on road congestion and the general community.

1.2 Structure of AGTTM

The structure and content of the Austroads Guide to Temporary Traffic Management is discussed in AGTTM Part 1: Introduction. Within the AGTTM, the terminology that applies is detailed in Table 1.1.

Table 1.1: Guidance terminology

Guide	The description for the complete Austroads Guide for Temporary Traffic Management (AGTTM) including all 10 Parts.
Part	The description for the individual documents within the Guide. This document is Part 6 of the Austroads Guide to Temporary Traffic Management.
Section	The description for a numbered section within each Part of the Guide. This is Table 1.1 placed within Section 1.2 of Part 6 of the Austroads Guide to Temporary Traffic Management.

Within this Guide, reference may be made to other parts of the Austroads range of publications such as the *Guide to Road Design* and the *Guide to Traffic Management.*

In the context of the other guides within the Austroads range of publications, this Guide is restricted to matters relating to temporary traffic management practice and refers only briefly to issues more appropriately addressed in other Austroads Guides. It is recognised it is difficult, if not impossible, to discuss many aspects of temporary traffic management practice without reference to traffic management, road design and/or safety issues. The view is taken that within the AGTTM, any such advice should be brief and be supported by references to other Guides for the appropriate guidance as required.

The scope of the AGTTM is broad, addressing requirements and recommendations for protecting road workers and all road users, including vulnerable road users, from hazards, road traffic and other impacts of road works across a range of situations that may include:

- urban and rural environments
- motorways, major arterial roads, local roads, roads in built-up areas, roads in open road areas and unsealed roads
- all variations of road use by cars, heavy vehicles, public transport, motorcycles, cyclists and pedestrians
- day and night works
- changing road and weather conditions.

The structure of the AGTTM is described in Figure 1.1 and in Table 1.2.

Figure 1.1: Structure of the Austroads Guide to Temporary Traffic Management

Overview	**Part 1: Introduction**		
Planning	**Part 2: Traffic Management Planning**		
Design	**Part 3: Static Worksites**	**Part 4: Mobile Works**	**Part 5: Short Term Low Impact Worksites**
Field	**Part 6: Field Staff – Implementation and Operation**	**Part 7: Traffic Controllers**	
Support	**Part 8: Processes and Procedures**	**Part 9: Sample Layouts**	**Part 10: Supporting Guidance**

Table 1.2: Parts of the Austroads Guide to Temporary Traffic Management

Part	Title	Content
Part 1	Introduction	• Introduction to the discipline of TTM practices • Breadth of the subject and the relationship between the various Parts of the Guide • Legislative relationships • Links to related jurisdictional documentation • Definitions
Part 2	Traffic Management Planning	• Broad strategies and objectives to provide effective TTM to ensure the safety for all road users is maintained • Guidance on the safety of workers and other road users • Examples and key considerations for planning of TTM at road worksites • Process for planning and documenting TTM
Part 3	Static Worksites	• Guidance on the design of temporary traffic guidance schemes at static worksites • Process to decide what static worksite set up is appropriate to implement (including devices used)
Part 4	Mobile Works	• Guidance on the design of temporary traffic guidance schemes at mobile works • Process to decide what mobile works set up is appropriate to implement (including devices used)
Part 5	Short Term Low Impact Worksites	• Guidance on the design of temporary traffic guidance schemes at short term low impact worksites • Process to decide what short term low impact worksite set up is appropriate to implement (including devices used)
Part 6	**Field Staff – Implementation and Operation**	• **On site risk assessment** • **Installation and removal of TTM schemes** • **Operation and monitoring of TTM schemes** • **Record keeping**
Part 7	Traffic Controllers	• Training competencies • Instructions on practices • Control devices that can be used
Part 8	Processes and Procedures	• Road network classification • Powers, roles and responsibilities • Forms and procedures • Model contract specification • Training competencies
Part 9	Sample Layouts	• Example layouts of static worksite conditions • Example layouts of mobile works conditions • Example layouts of short term, low impact conditions • Example layouts for staging plans • Worked example for a multi-stage project
Part 10	Supporting Guidance	• Risk management processes • Review, inspection and road safety audit of worksites • Events • Emergency works

1.3 Scope of Part 6

AGTTM Part 6 provides guidance to implementors of temporary traffic management at road worksites. This is typically done in accordance to the Traffic Guidance Scheme (TGS).

This Part covers the principles of processes and responsibilities for field staff in the role of preparing for, implementing, monitoring, and removing temporary traffic management from site. Aspects covered in this Part for the implementation of temporary traffic management include:

- principles of implementation
- roles and responsibilities
- pre-shift activities
- pre-start activities
- installation of TGSs
- operation and monitoring of TGSs
- removal of TGSs
- unattended sites.

This Part is intended for use primarily by the TMI with responsibilities as defined in Part 8. Other competent persons and roles are also defined in Part 8.

1.4 Field Work for Office-based Staff

Office based staff would usually undertake field-based works under short term low impact practices. For further information refer to AGTTM Part 5 – Short Term Low Impact Worksites.

1.5 Application of Part 6 to New Zealand

AGTTM Part 6 describes the Traffic Management Implementer role as currently in application in Australia. Within New Zealand, the role of Site Traffic Management Supervisor (STMS) and the Traffic Controller (TC) have some overlap with this role and both have a broader set of responsibilities which overlap with some roles of the Australian qualification for a Traffic Management Designer.

AGTTM Part 6 remains applicable for New Zealand for the activities associated with site implementation and operation.

Readers in New Zealand should note the following in application of Part 6 of this Guide:

- The road categories described in Section 2.3 of this document have been based on the New Zealand CoPTTM model but vary in a number of aspects. The road categories in this document do not apply in New Zealand and readers should refer to the New Zealand CoPTTM
- The TTM Roles described in Section 3 of this document are based on the roles in the TTM industry in Australia. At the time of publication, New Zealand has not adopted these role descriptions and readers should refer to the New Zealand CoPTTM for description of the responsibilities for role in New Zealand.

1.6 Acronyms

The following acronyms are to be used in the context of this Part.

Table 1.3: Acronyms

Acronym	Description
AADT	Annual Average Daily Traffic
AGTTM	Austroads Guide to Temporary Traffic Management
ETM	Event Traffic Marshal
ITS	Intelligent Transport Systems
MMS	Multi-message signs
MTC	Manual Traffic Controller
PPE	Personal Protective Equipment
RIM	Road Infrastructure Manager – defined as controlling road authority in terms of TTM
SWMS	Safe Work Method Statement
TC	Traffic Controller
TGS	Traffic Guidance Scheme
TMA	Truck-mounted Attenuator
TMD	Traffic Management Designer
TMD-NP	Traffic Management Designer – Non-Practitioner
TMI	Traffic Management Implementor
TMI-NP	Traffic Management Implementor – Non-Practitioner
TMP	Traffic Management Plan
TSL	Temporary speed limit
TTM	Temporary Traffic Management
VMP	Vehicle Management Plan

1.7 Definitions

Refer to AGTTM Part 1 for a full list of definitions which apply to this Part.

2. TTM Principles and Road Categories

2.1 TTM Principles

A TMP and the associated TGS(s) are a legal document. Any modifications outside of approved adjustments (refer Section 6 and AGTTM Part 8) or tolerances must only be made by a suitably qualified person, preferably the TMD author.

2.1.1 Fundamentals

At all sites where TTM is in place:

- it must be consistent with the principles in this AGTTM
- there must be a TMP and associated TGS for all activities
- safety for road workers and road users must be an integral part of all activities carried out
- particular care is required to ensure that pedestrians, cyclists and other vulnerable road users are protected
- clear and positive guidance must be provided for road users
- activities must be planned to cause as little disruption to road users as possible without compromising safety.

2.1.2 Basic principles

Careful consideration should be given to the signing and delineation of the work site, no matter how brief the occupation of the site may be, so that:

- workers are protected
- TTM will be fit for purpose, suitable for the nature and duration of the work, installed, set up and used correctly
- adequate warning is provided of changes in surface condition and the presence of personnel or plant engaged in work on the road
- adequate instruction is given to road users for their safe guidance around, through or past the worksite
- adequate facilities are maintained for all path users including public transport passengers, pedestrians, cyclists and other vulnerable road users
- signs or devices must not obstruct road or path routes without an alternate being provided.

Important basic principles to be observed are as follows:

- Signs and devices must be installed by a competent person who has the necessary training, skills and experience as defined in AGTTM Part 8.
- Signs and devices must be appropriate to the conditions at the worksite and are to be used in accordance with AGTTM and jurisdictional guidelines unless a risk assessment by a competent person indicates that an alternative arrangement is satisfactory.
- Signs and devices must be located immediately prior to works commencing only for the section where works are about to commence and relocated if the work area changes location.

- Signs and devices must be placed before work begins and removed as soon as they are no longer required.
- Appropriate signs (including any aftercare signs) should remain in place until all work (including the need for any aftercare signs) has been completed.
- Signs and devices should be regularly checked to ensure they are still relevant, in good condition, clean, not faded and have good low light visibility and reflectivity, if necessary.
- Signs and devices must be inspected to ensure they remain clearly visible to road users and are not obstructed by vegetation, vehicles, plant or other signs and devices and are displayed in the correct sequence.
- Records must be kept of all signing and delineation.
- The TTM performance must be monitored for effectiveness, for example to manage traffic queues, delays, ensure drivers appear to know what is expected and that there is compliance with speed limits.
- Where works require the relocation of existing regulatory traffic control items within a TMP and TGS, they are to be relocated or reinstalled promptly in positions where they are visible and can perform their regulatory function.
- Where not identified on the TGS, the TMI is to first seek authorisation before regulatory signs or controls are modified, covered or repositioned.

2.2 Traffic Management Implementer

A Traffic Management Implementer (TMI) and their role is defined in AGTTM Part 8. The job pack is the information the TMI requires to complete their job safely. The job pack must remain onsite at all times. See Section 4.3 for details on job packs.

2.3 Road Categorisation

Roads are categorised to reflect their intensity of use (traffic volumes) and risk (traffic speed) for associated TTM practices. The categorisation of roads is defined only by the Road Infrastructure Manager. Refer to AGTTM Part 8 for more information regarding road categorisation.

3. Roles and Responsibilities

3.1 TTM Roles

Roles are defined through training of staff to meet the competency level required for TTM for different road categories. The three specific TTM roles are:

- TC – Traffic Controller who is responsible for manual control of traffic within the TTM worksite through use of a Portable Traffic Control Device or a Stop/Slow bat.
- TMI – Traffic Management Implementer who is responsible for the traffic management within a TTM worksite and TTM workers under their direction
- TMD – Traffic Management Designer who is responsible for the planning and initial risk assessment of a TTM worksite and who develops the TMPs and TGSs to mitigate the risks for implementation by the TMI.

3.1.1 Other TTM workers

Other TTM workers include any person who undertakes tasks under direct supervision of the TMI, and any person with a TTM qualification who is working under supervision on a higher category road for which they are not qualified to work (e.g. a Category 1 trained person working on any Category 2 or 3 road worksites).

A full description of the TTM roles and the associated training courses is provided in AGTTM Part 8.

3.2 Example – Career Path Progression

Based on above-mentioned categories of training, field staff can progress through the TTM industry via a structured career path. An example career path is shown in Appendix A.

Upon completion of the theory and simulated practical assessment elements of the training, field staff are classed as a Non-Practitioners (e.g. Traffic Management Implementer, Category 1, Non-Practitioner is described as TMI 1-NP). The Non-Practitioner qualification allows a person to review and inspect the works and support workers up to and including the same level of training. Examples of non-practitioners tasks, through desktop or site inspections, should include checks or reviews to make sure:

- TMP / TGS is on site
- pre-start is completed
- risk assessment is completed
- approvals are in place
- crew understand roles
- TGS installed in accordance with plan
- TGS is effective for site conditions
- records are accurately kept

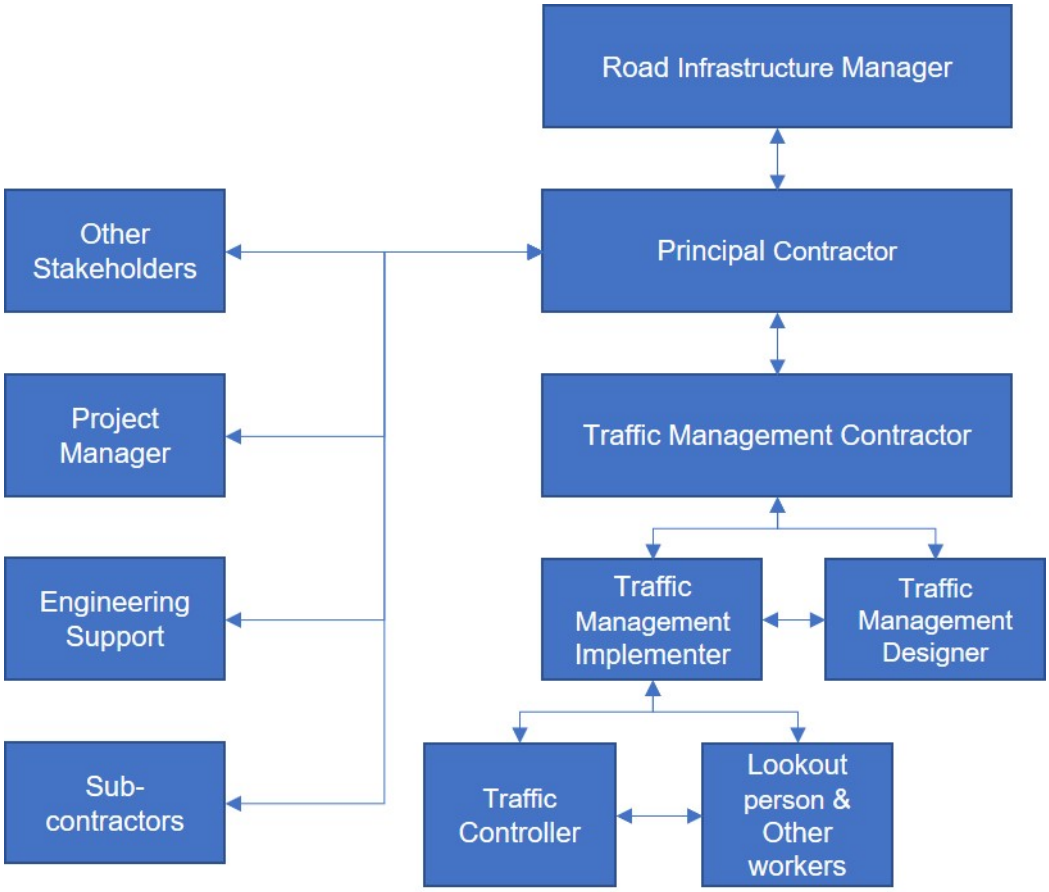
A TMI non-practitioner (TMI-NP) cannot implement a TGS unless directly supervised by a practitioner TMI with the appropriate qualification for the applicable road category.

A Practitioner (e.g. TMI 1), is someone who has gone on to complete practical field assessments, has been certified by an approved Trainer and Assessor and has received their certification from an approved training provider. A practitioner TMI may implement a TGS for the applicable road category for which they have been qualified.

3.3 TTM Relationships

The hierarchical relationships between the various organisations and individuals undertaking and accountable for TTM is shown in Figure 3.1. The Principal Contractor remains accountable for all aspects of safety at a road worksite while all parties and organisations have a responsibility for safety. All roles are described in further detail in AGTTM Part 8.

Figure 3.1: TTM relationships



3.3.1 Principal Contractor – TTM responsibilities

- Hold site-based TTM Toolbox talks with relevant TTM representation in attendance.
- Ensure they have received documented authorisation from the RIM to carry out work or activities within the road reserve or affecting the road reserve.
- Ensure those preparing/amending TMPs and TGS' are competent persons as per AGTTM Part 8.
- Ensure accurate TMPs are prepared that reflect the worksite conditions, in accordance with the practices in this Guide and any contractual requirements or RIM authorisation conditions.
- Ensure they have an approved and accepted TMP before starting any work.
- Obtain approval and timings for occupation of the worksite prior to commencing work.
- Operate in terms of the traffic regulations and the requirements of the TMP.
- Ensure that all personnel are supported in matters of safety.
- Report on incidents/crashes at worksites.
- Ensure all personnel engaged in traffic management operations are competent and hold the appropriate level of qualification for the nominated road category.
- Issue non-compliance notices to personnel engaged in traffic management as required.

3.3.2 TMD

TMD – May be an internal person within the Traffic Management Contractor organisation or may be an external person engaged directly by the Principal Contractor. The TMD is responsible for all aspects for the development of the TMP and TGS they have signed off and for ensuring that all foreseeable risks have been identified and mitigated.

3.3.3 TMI responsibilities for TTM on a worksite include:

- Where an appropriate process has been detailed by a TMD, select a generic TGS to suit site conditions, traffic volumes and work activities.
- Adjust the TGS within approved limits to suit a specific road environment.
- Modify a TGS under instruction of a qualified TMD.
- Ensure a copy of the approved TMP is always available on-site when the worksite is attended and that it is available if requested.
- Ensure the TMP and TGS are appropriate to the worksite. Where the TMP and/or the TGS is not suitable, contact the TMD to establish any necessary changes required.
- Ensure TTM personnel entering the worksite attend a TTM Toolbox Talk on the safety hazards and the safety procedures to be followed, with relevant principal contractor representatives in attendance.
- Ensure TTM personnel on site are wearing compliant high-visibility clothing.
- The TMI is to implement the approved TGS before any works commence and drive through the site before work begins to ensure that it has been implemented correctly and that it will warn, instruct and guide road users as designed.
- Be contactable by mobile phone or two-way radio at all times.
- Ensure traffic is monitored for queuing and delays and operation of the TGS is appropriate for all users.

- Ensure worksite inspections are completed as required so that:
  - there are no contradictory signs
  - there is no surplus, obstructing or distracting signs
  - the TGS fits with other traffic control activities in the area which may or may not be under the control of the TMI.
- Devices are in place at appropriate times and removed or covered when not needed.
- Damaged or defective signs are replaced or repaired as soon as practicable.

The TMI cannot amend Temporary Speed Limits without delegated authority or prior approval by the RIM or the TMD.

3.3.4 Interactions between the Principal Contractor and the TMI

- TTM toolbox talk with relevant principal representation before work commences.
- Arrange on site TTM toolbox meetings at the start of each TGS set-up, on a regular basis (e.g. daily) and at each change of a TTM measure. Use the approved TMP to explain:
  - the worksite hazards
  - site driving/parking requirements
  - the method of entering/leaving the worksite.
- Record and notify the principal contractor as appropriate of all incidents at the worksite and any complaints about the TTM and follow procedures.
- Signs required for low light guidance are inspected under these conditions.
- A trafficable travel path for all traffic and path users is maintained and clearly defined.
- Ensure that all TTM persons on the worksite obey the traffic regulations and the TGS requirements.
- Ensure any TTM changes instructed by an authorised regulatory person e.g. Police or workplace safety regulator, are made immediately and documented on the TGS, signed by the requesting officer, and the TMD is informed immediately.

3.3.5 TMI - TC/Other TTM worker interactions

- Check Traffic Controller qualifications.
- Brief TCs on how to carry out their tasks and ensure that they are suitably positioned within the TGS.
- Monitor TC performance.
- Manage fatigue and staffing breaks as required.
- Ensure signs are suitably placed by considering:
  - line of sight and sight distances
  - road user approach speeds
  - expected queue lengths
  - visibility, shady or high glare areas
  - the effects of the sun rise and sun set.
- Covered signs are inspected during windy periods to ensure the covering has not been disturbed.

3.3.6 Traffic Controller (TC)

TC – Refer AGTTM Part 7: Traffic Controllers.

3.3.7 Other TTM workers

Other TTM workers are responsible for ensuring they have a basic TTM knowledge, and only undertake TTM tasks under the guidance and direct supervision of the TMI. Other TTM workers may assist the TMI however, must not undertake any TTM tasks unsupervised which require specific TTM training.

4. Pre-Shift Activities

4.1 General

This section details the range of activities that the TMI responsible for the worksite or designated area, should undertake prior to travelling to the first worksite for the day.

4.2 Vehicle Checks

Conduct a prestart vehicle inspection in accordance with company requirements.

4.3 Job Pack Check

Ensure that the job pack contains:

- TGSs for the work activities, or a set of generic plans and the process for selecting and applying the Generic Plans, which have been signed by a TMD
- TMP(s) for the work sites
- permits/approvals
- evidence of TTM competencies for all TTM personnel are available
- SWMS
- risk assessments for each site
- record keeping requirements
- incident forms
- site contact details
- residual risk register.

4.4 Equipment and Devices

Ensure that all of the correct signs and devices are available to complete the works in accordance with the traffic guidance scheme/s. Sufficient additional devices should be available to allow for any onsite adjustments, modifications, emergency arrangement and contingency planning including:

- additional cones
- repeater signs
- additional signs for queues
- cover ups
- coverings for regulatory pavement markings.

4.5 Condition of Devices

All signs and devices are to be examined before installation to ensure they are in good condition and their performance is not impaired. The checks that are required include:

- mechanical condition
- physical condition
- items that are bent, broken or show surface damage are not to be used
- ensuring all electronic devices are in working order (e.g. radio, wands, vehicle mounted devices) and batteries charged.

Signs required to be effective at times of low light are to be checked for visibility as soon as possible after installation. Those whose retro-reflectivity is degraded either from long term use or surface damage are to be replaced. Low light-time effectiveness can best be checked by viewing the signs by vehicle headlights in dark conditions.

Signs and devices are to be free from accumulated dirt, road grime or other contamination. The below information can be used as a guide when determining whether a sign is suitable for use.

A sign is considered acceptable for use if:

- there are abrasions on the surface but very little on the lettering or symbol
- there has been no touch up of the lettering or symbol
- the message is legible and matches the approved design.

A sign is considered marginal and may be used but should be replaced as soon as practical if:

- there are many surface abrasions throughout the sign face and many are within the individual letters or symbol of the message
- the surface is marked by material (such as asphalt, bitumen, cement slurry or dirt) not obscuring the lettering or symbol
- some colour fading is evident, the background colour and reflectivity are still apparent
- the message is legible and matches the approved design.

A sign is considered unacceptable and should not be used if:

- there is material (such as asphalt splattering, bitumen, cement slurry or dirt) obscuring the lettering or symbol
- any symbols, letters or retroreflective surface area are illegible and can be misinterpreted
- there is a significant colour fading to a point where they have lost their daylight visibility
- the message is illegible and does not match the approved design.

4.6 Resources

Ensure adequate TTM personnel who hold the appropriate road category TTM competencies, are available to complete the TTM tasks required to implement, operate, monitor and remove the TTM arrangements.

5. Pre-start

5.1 General

Before commencing works, the TMI is responsible for the completion of a risk based assessment of the worksite or designated area and should work through a risk-based process as described in this section. Sample Risk Assessments can be found in Appendix B. A full description of the risk assessment process is contained in AGTTM Part 10.

5.1.1 Identify hazards

On any worksite there are potential hazards. A hazard is any aspect that can cause harm or damage to humans, property, or the environment. In the context of TTM, a hazard is focussed on any item or event that affects the safety of road workers or road users. Some examples include, traffic, overhead powerlines, uneven surfaces, plant and site vehicles.

5.1.2 Assess the risk

After identifying the critical events that can occur due to the presence of the hazard, you need to assess the likelihood and consequence of the event occurring in accordance with the procedure detailed in AGTTM Part 10.

5.1.3 Implement controls

Using the hierarchy of controls, implement measures to make the worksite as safe as practical for workers and road users.

5.1.4 Monitor and review

After establishing a TTM worksite, TMIs must monitor its effectiveness and drive through the site to ensure it is set out in accordance with the TGS and it is functional. Regular inspections should be conducted to ensure effectiveness. If the TMI found that the site set up is not effective, for example, motorists are not complying with the reduced speed limit, the TMI should contact the TMD to discuss the issue and suggest changes to the set up if appropriate.

Adjustments to the TGS may be determined and applied by a TMI, any modifications to the TGS must be approved by the TMD. All adjustments and modifications must be documented, including the reasons for the changes.

5.2 TMP and TGS Development - Residual Risk Register

During the development of the TMP and the design of the TGS for the worksite, the TMD will review the risks associated with the works and the site. Through safety-in-design principles the TMD will attempt to eliminate and then mitigate each risk through signs, devices and other appropriate controls to make it safe for all road workers and road users.

Some risk examples that should be considered and addressed during the development of the TMP are listed in Table 5.1.

All residual risks should be captured by the TMD in a register. The TMD will highlight to the TMI these outstanding risks to be reviewed and will outline the action plans required to address each risk onsite at the time of TGS set up (e.g. parked cars obstructing advanced warning lay out).

A review of the risk register is required to ensure the continued suitability of the TGS to site specific conditions.

Table 5.1: Example risk table

Safety Hazard / Risk Factors	HIERARCHY OF SAFETY CONTROLS Consider the practicability of control measures, from left to right Select the most feasible given the circumstances and level of hazard Record the reason if a higher-level control measure is not considered practical		
	Elimination	**Substitution**	**Administrative (Behavioural)/PPE**
Clearance to Traffic (clearance between the edge of a lane carrying traffic and the worksite, roadworks vehicles, equipment and pedestrians	• Road closure • Detour onto other roads • Side-track past the works	• Safety barriers • Lane closure adjacent to work area • Vehicle-mounted attenuators	• Speed reduction • Warning signs / VMS • Delineation of travel path
High speed through worksite	• Road closure • Detour onto other roads • Side-track past the roadworks	• Safety barriers • Lane closure adjacent to work area • Portable traffic signals • Vehicle mounted attenuators	• Speed reduction • Warning signs / VMS • Traffic controller • Temporary road humps and rumble strips
Poor advance sight distance to worksite (<200 metres)	• Road closure • Traffic diversion past the works	• Vehicle mounted attenuators • Lead and/or tail vehicle(s)	• Extra advance warning signs / VMS • Speed reduction • Delineation of travel path
Poor observance by motorists of directions / instructions	• Road closure • Traffic diversion past the works	• Lane closure adjacent to work area • Portable traffic signals	• Speed reduction • Police presence on site • Extra signs / VMS • Temporary road humps and rumble strips • Re-assessment of information provided
Narrow pavement width with no escape route (<2.9 metres width)	• Road closure • Traffic diversion past the works	• Portable Traffic Control Device	• Speed reduction • Delineation of travel path
Presence of workers at the worksite	• Road closure • Traffic diversion past the works	• Safety barriers • Increased separation from vehicular traffic • TMA	• Speed reduction • Warning signs • Delineation of travel path and worksite
Excavation adjacent to traffic	• Road closure • Traffic diversion past works	• Different construction method • Safety barriers	• Speed reduction • Delineation of travel path
Onsite vehicles/plant Movements		• Designated paths VMPs • Exclusion Zones	• Limit Reversing • Forward in/out VMPs only

5.3 On Site Safety Analysis and Risk Assessment

A site-specific risk assessment must be completed prior to works commencing considering:

- the action plans for the residual risks from the TMP
- the site conditions
- existing traffic management infrastructure such as electronic devices and ITS
- the installation procedure
- the operation of the TGSs once implemented
- the removal procedure
- the possibility of the setup being left unattended.

The risk assessment needs to be relevant to:

- the volume of traffic - (likelihood)
- the speed of the traffic - (consequence)
- the duration of work - (exposure to risk)
- the type of work - (proximity to traffic).

The risk register and site-specific assessment are to form part of the TTM toolbox talk.

5.4 TTM Toolbox Talks

5.4.1 TTM staff

All persons involved with TTM activities must be briefed/inducted by the TMI and have this documented on the site records. Appendix C provides an example TTM toolbox talk. The toolbox talk for TTM staff is used to explain the:

- key aspects of the TMP
- identified hazards
- TTM requirements for the worksite
- Safe workplace requirements and limits.

5.4.2 Construction workers/visitors

All people arriving on-site must receive a worksite induction before proceeding around the worksite. The approved TMP is used to explain:

- the worksite hazards
- site driving and parking requirements
- the method of entering and leaving the worksite
- clearances to live traffic
- go/no go areas.

For these other workers and visitors, briefings are required:

- at the start of each set-up
- on a regular basis (e.g. daily)
- at each new phase of the works.

6. TGS Installation

6.1 General

TTM measures must be installed, maintained and removed in a planned and safe manner. Prior to commencing, the TMI must check and review the approved TMP / TGS, the worksite and the proposed activity to ensure they are complementary and are appropriate. This section provides best principles and practices guidance.

The TMI must check the road environment, especially the "on the day" traffic flows, to ensure that it is at an appropriate level for the TTM intended. A 5-minute count of traffic should provide an appropriate estimate of volumes to reference against values recorded in the TMP or the TGS.

If the worksite and the approved TMP and TGS are not complementary, before occupying the worksite the TMI must determine whether they can:

- make compliant adjustments (e.g. lengthen taper within tolerances) to the TGS
- contact the TMD to approve relevant modifications (e.g. additional signs or distances outside of tolerances) to the TGS
- contact the relevant Road Infrastructure Manager traffic control facility to initiate actions identified on the TGS to be taken (e.g. change in the VMS, Variable Speed Limit Signs or Lane Usage Signage).

Where the TMP and TGS cannot be suitably adjusted or modified, the TMI should advise the Principal Contractor that they are not appropriate, and the works should be postponed.

All adjustments and authorised modifications are to be recorded on the TMP and TGS or on-site record.

6.2 Typical Installation Principles

Installation is typically carried out applying one of the processes in accordance with AGTTM Part 5 as "short term – low impact works" to protect the TTM staff. The examples in this section are based on limiting high risk manoeuvrers during installation including U-Turns and loops exposing workers to live traffic without protection.

Fundamental principles that should be complied with to ensure safety during this work activity are that:

- travel should only be in a forward direction on any road
- the TTM vehicle may be used as added protection considering the:
  - availability of safe park up area(s) near the signage placement location
  - line of sight to approaching vehicles
  - visibility of the worker and TTM vehicle to approaching vehicles
  - location of signage/devices on vehicle which need to be accessed
  - worker access to vehicle (e.g. not through crush zones)
  - available space on road shoulder or median

  - geometry/terrain of shoulder or median
  - distance between vehicle and travel path / shoulder drop off
  - TMI proximity to 'expected travel path while traversing between vehicle and signage location
  - likely area in which the vehicle may move if impacted
  - availability of 'gaps in traffic' or lookout
- turn around procedures must be conducted in a safe and legal manner
- TMI must face the traffic when placing devices
- all workers must know their escape route at all times
- the vehicle mounted warning device must be operating and the hazard/arrow board used as required
- all workers must wear correct PPE
- a look out person/spotter must be used for all activities where required in accordance with AGTTM Part 5
- full co-ordination of any ITS infrastructure which may assist the TGS installation
- the locations and types of devices are recorded in the diary
- the TGS is implemented as approved and a copy is available on site.

If it is considered too dangerous due to speed or volume to install the TGS using the protections defined in AGTTM Part 5, then consideration needs to be given to adopting a mobile convoy (refer AGTTM Part 4) or other controls e.g. manual traffic control to hold traffic during installation under its own TGS (refer AGTTM Part 3). A different installation sequence may need to be adopted to address any site-specific circumstances and can be approved by TMD or other authorised person.

6.3 Installation Process

The general procedure for setting up a site is to:

1. locate the work area using GPS, landmarks, side streets, chainage
2. install devices as outlined in the TGS for side streets first
3. install devices as outlined in the TGS for the non-working lane (un-affected direction)
4. install devices as outlined in the TGS for the working lane (affected direction) to complete installation
5. conduct a drive through inspection after all devices are in place and before work commences

All sign spacings and taper lengths will be noted on the TGS and should be in accordance with AGTTM Part 3.

6.4 Placement of Signs and Devices

The scenarios in this Section are designed to encourage workers to review the safest installation process. Many factors can influence the appropriate sequence for installation including but not limited to road geometry, hills, crests, curves, surface condition, lane widths, shoulder width, traffic volumes, peak traffic flows, road user travel speed, road user make up (e.g. % of heavy vehicles or cyclists), lighting and time of day, and weather.

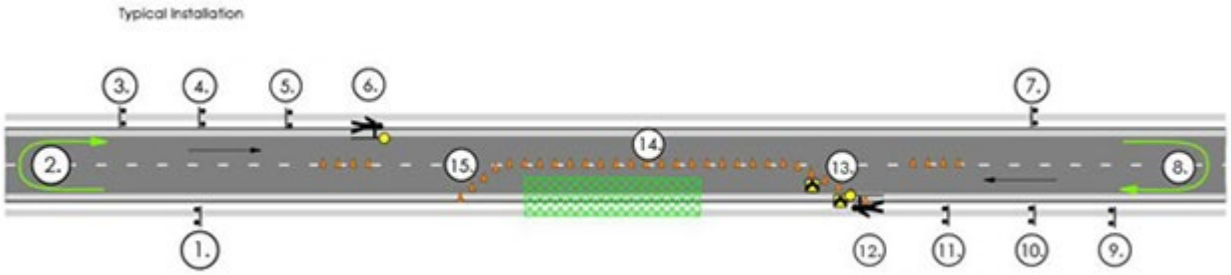
In following the scenarios in this Section, if a task is not required for the installation of the TGS then skip to the next step in the sequence. In each scenario, the circled numbers on the diagram depict the order of installation.

6.4.1 Two-way road - lane closure

Determine points of reference (e.g. beginning and end of work area, location of first cone in taper, location of TCs). The order of installation is then as follows and as depicted in Figure 6.1.

Task	Description	Installation Sequence
a.	The 'termination signs/speed reinstatement' on the 'works side' of the road is placed as the first sign when initially leaving work area.	1
	Then use the existing road network to turn where safe to do so	2
b.	Non-works approach - place signs (advance warning to termination) including the four cones on centreline of the road on the approach to the TC position.	3 to 7
	Then use the existing road network to turn where safe to do so	8
c.	Works approach - place signs (advanced signs to taper) including the four cones on centreline of the road on the approach to the TC position.	9 to12
d.	The TCs should briefly stop traffic in both directions (while the taper and delineation is deployed)	-
e.	Taper and 'work area' (lane closure) delineation to be placed in the direction of the traffic flow including any additional signs (e.g. repeater signs or 40km/h at end of taper) if required.	13 to 15
f.	Drive through the site to inspect installation is suitable for traffic.	-

Figure 6.1: Traffic control – typical installation sequence

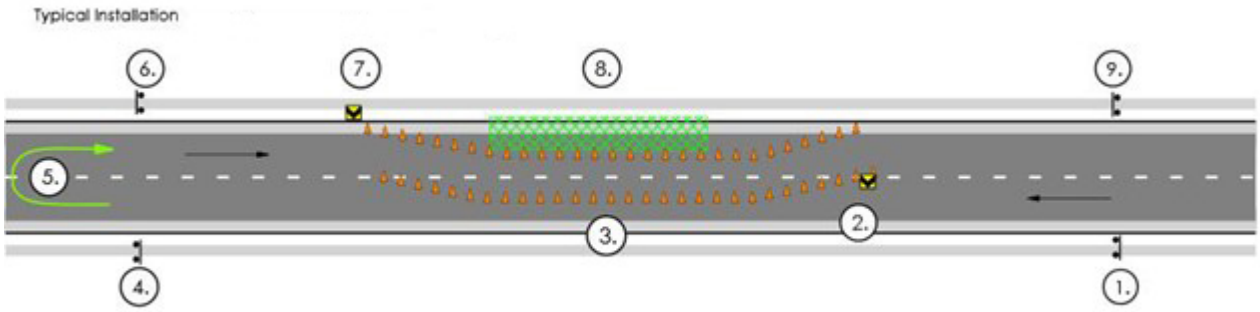


6.4.2 Two-way road (lateral shift)

Determine points of reference (e.g. beginning and end of work area, location of first cone in taper). The order of installation is then as follows and as depicted in Figure 6.2.

Task	Description	Installation Sequence
a.	Non-works approach - place signs and centre line delineation (advance warning to termination).	1 to 4
	Then use the existing road network to turn where safe to do so	5
b.	Works approach - place signs and edge of works delineation (advanced signs to termination)	6 to 9
c.	Drive through the site to inspect installation is suitable for traffic.	-

Figure 6.2: Lateral shift – typical installation sequence

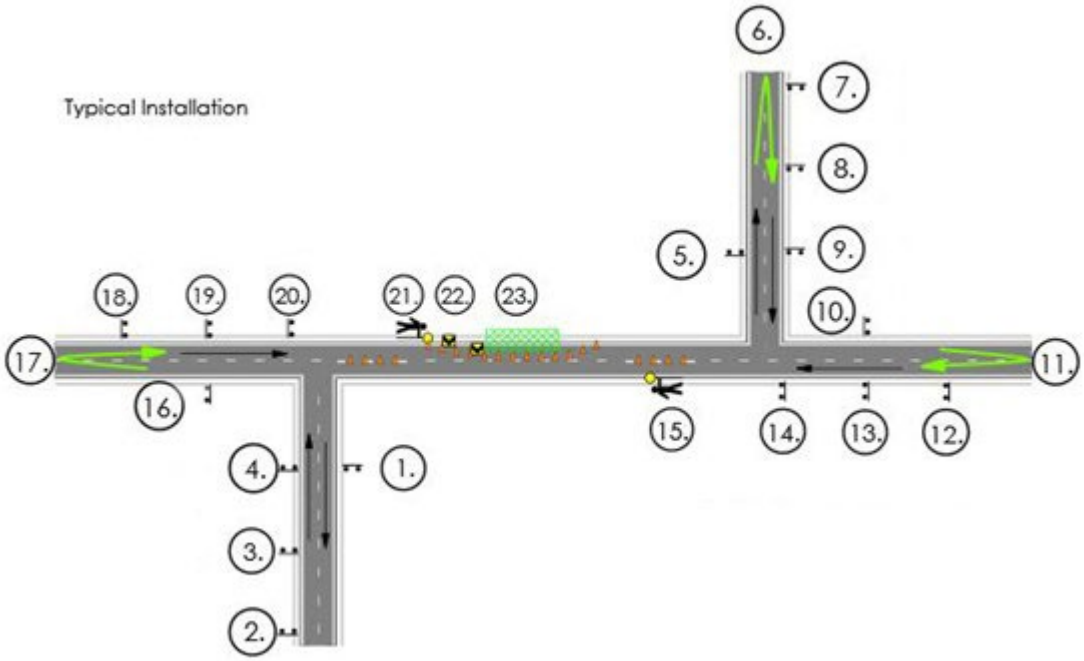


6.4.3 Two-way road - lane closure with side roads

Determine points of reference (e.g. beginning and end of work area, location of first cone in taper, location of TCs). The order of installation is then as follows and as depicted in Figure 6.3.

Task	Description	Installation Sequence
a.	Side road signage installed on side road(s) on approach to the work area in the affected direction	1 to 4
b.	Other side road(s) in order along the road to the end of the TTM in affected direction	5 to 9
c.	The 'termination signs/speed reinstatement' on the 'works side' of the road is placed as the first sign when initially leaving work area.	10
	Then use the existing road network to turn where safe to do so	11
d.	Non-works approach - place signs (advance warning to termination) including the four cones on centreline of the road on the approach to the TC position.	12 to 16
	Then use the existing road network to turn where safe to do so	17
e.	Works approach - place signs (advanced signs to taper) and TC including the four cones on centreline of the road on the approach to the TC position.	18 to 21
f.	The TCs should briefly stop traffic in both directions (while the taper and delineation are deployed)	-
g.	Taper and lane closure delineation to be placed in the direction of the traffic flow including additional signs (repeater signs or 40km/h at end of taper) if required.	22 to 23
h.	Drive through the site to inspect installation is suitable for traffic.	-

Figure 6.3: Traffic control with side streets – typical installation sequence



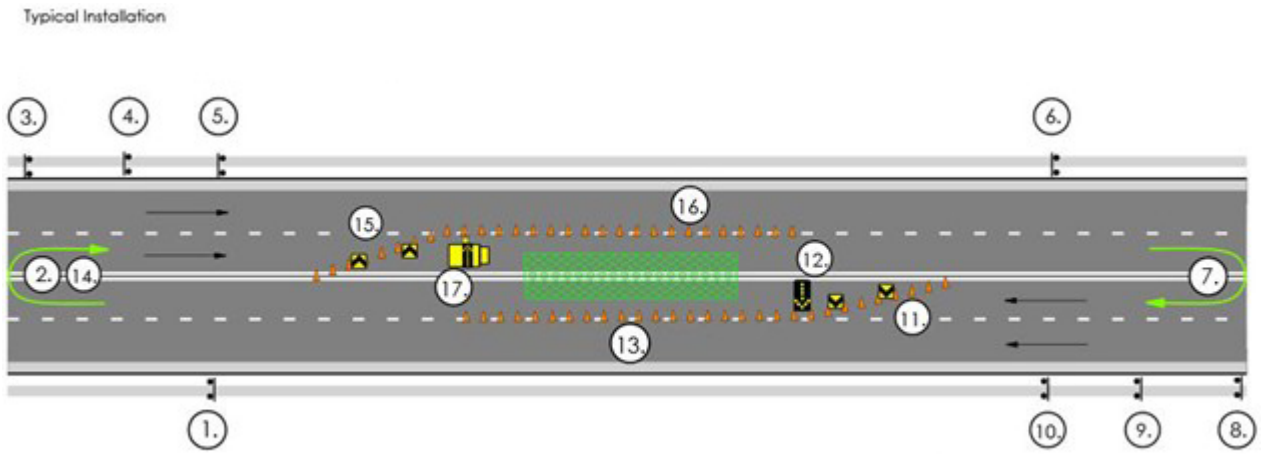
In this scenario all sign checks are performed, and breaks facilitated when an additional TC is provided.

6.4.4 Multi-lane un-divided road - lane closure

Determine points of reference (e.g. beginning and end of work area, location of first cone in taper). The order of installation is then as follows and as depicted in Figure 6.4.

Task	Description	Installation Sequence
a.	Consider the use of a shadow vehicle if risk is deemed unacceptable	
b.	After identifying points of reference, the TMI leaves proposed work area travelling with the traffic, places 'Termination/reinstate posted speed' sign on 'the first' side of roadway	1
	Use existing road network and turn where safe to do so	2
c.	Approach on the second side - places signs (Advance warning to Termination)	3 to 6
	Use existing road network and turn where safe to do so.	7
d.	First side approach - place signs (advanced signs to taper).	8 to 10
e.	Traffic management vehicle parked in the lane to be closed with arrow board indicating merge to 'non-affected' lane.	-
f.	Install taper with traffic management vehicle as cover.	11
g.	Traffic management vehicle then navigates around taper to position arrow board (if required).	12
h.	Lane closure delineation and additional signs placed with traffic management vehicle progressing down lane closure.	13
	Use existing road network and turn where safe to do so.	14
i.	Second side approach – repeat steps (d) through (h).	15 to 16
j.	Drive through the site to inspect installation is suitable for traffic. Traffic management vehicle then navigates around taper to park to protect workers, or park as approach arrow board if fitted.	17

Figure 6.4: Multilane undivided – typical installation sequence

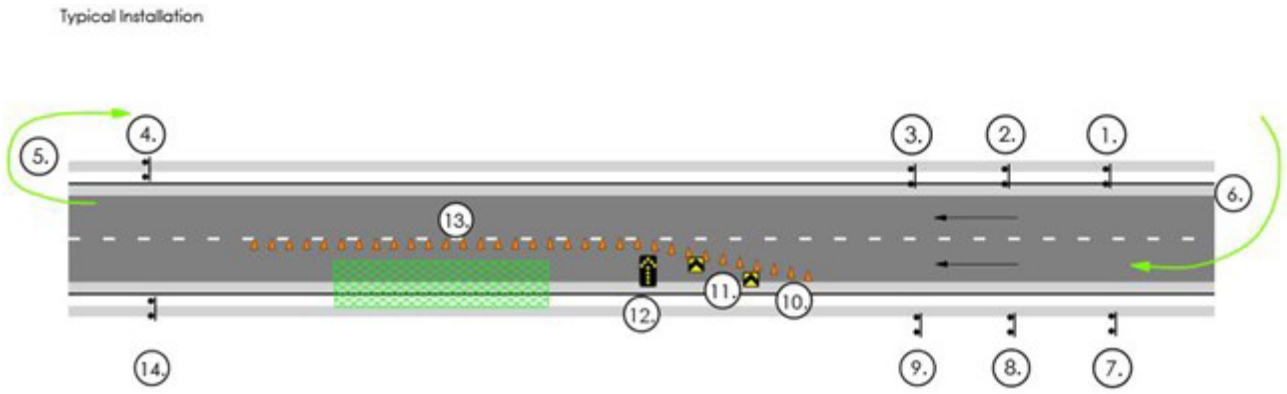


6.4.5 Multi-lane divided road - left or right lane closure

Determine points of reference (e.g. beginning and end of work area, location of first cone in taper). The order of installation is then as follows and as depicted in Figure 6.5.

Task	Description	Installation Sequence
a.	Consider the use of a Truck Mounted Attenuator if risk is deemed unacceptable.	
b.	Non-affected lane - place signs (Advance warning to Termination).	1 to 4
	Use existing road network to turn where safe to do so.	5
c.	Return to the Works approach side of the carriageway.	6
d.	Affected lane - place signs (advanced signs to taper).	7 to 9
e.	Traffic management vehicle parked 'in lane' with arrow board indicating merge to 'non-affected' lane.	10
f.	Install taper, with traffic management vehicle ending up at beginning of lane closure	11
g.	Install arrow board, use TMA or shadow vehicle as cover	12
h.	Lane closure delineation and additional signs placed with traffic management vehicle progressing down lane closure.	13 to 14
j.	Drive through the site to inspect installation is suitable for traffic.	-

Figure 6.5: Multilane divided – typical installation sequence



6.5 Positioning of Signs and Devices

Signs and devices are to be positioned and erected so that:

a. they are properly displayed and securely mounted.

b. they are within the line of sight of the intended road user.

c. they cannot be obscured from view (e.g. by vegetation or parked cars).

d. they do not obscure other devices from the line of sight of the intended road user

e. they do not become a possible hazard to workers, pedestrians, cyclists or vehicles

f. they do not deflect traffic or vulnerable road users into an undesirable path

g. they do not restrict sight distance for drivers entering from side roads, streets or private driveways

h. they are not installed using supports that could be a hazard if struck by a vehicle.

It is important that pavement markings and raised pavement markers are considered in conjunction with the placement of other delineation devices, temporary barriers and channelising barricades, to ensure road users are safely directed through the site without conflicting messages. Delineating devices (e.g. traffic cones, bollards, post mounted delineators) should be placed as per the location on the TGS as designed by the TMD, or if not noted should generally be placed as follows:

a. Edge of traffic lane to line of traffic cones, bollards or longitudinal channelising devices:

   i. 0.3m offset for posted speed limit during roadworks up to and including 65 km/h

   ii. 0.5m offset for posted speed limit during roadworks over 65 km/h

b. Edge of traffic lane to road work delineators or temporary hazard markers – 1.0 m

c. Edge of traffic lane to road safety barrier system:

   i. 0.3m for a posted speed limit during roadworks up to and including 40 km/h

   ii. 0.5m for a posted speed limit during roadworks 50 km/h to 60km/h

   iii. 1.0m for a posted speed limit during roadworks 70 km/h to 80km/h

   iv. 2.0m for a posted speed limit during roadworks greater than 80 km/h

6.6 Typical Locations for Signs

6.6.1 Long term

In open road areas and on unkerbed roads in built-up areas where signs are to be mounted on posts, they should normally be placed clear of the outer edge of the shoulder and at least 2m clear of the travelled path, whichever is the greater clearance. They should be erected 1.5m minimum above the level of the nearest edge of the travelled path to the underside of the sign.

On kerbed roads in built-up areas where signs are mounted on posts adjacent to a footpath or where vehicle parking may occur, they should be placed at a minimum of 300mm clear distance behind the kerb and erected a minimum of 2.2m above the level of the kerb or footpath to the underside of the sign, to reduce interference from parked vehicles. Where neither pedestrians nor parked vehicles have to be considered (e.g. on a traffic island or median), a mounting height of 1.5m to the underside of the sign may be more appropriate.

6.6.2 Short term

Signs mounted on portable supports used for short-term operation should generally be located as follows:

(i) In open road areas

On the road shoulder a minimum of 1m clear of the travelled path if practical.

(ii) In built-up areas

Behind the kerb if visible to oncoming traffic and not obstructing pedestrians or cyclists, otherwise on the pavement as near as practicable to the kerb without the sign becoming obscured and without obstructing moving traffic or cyclists.

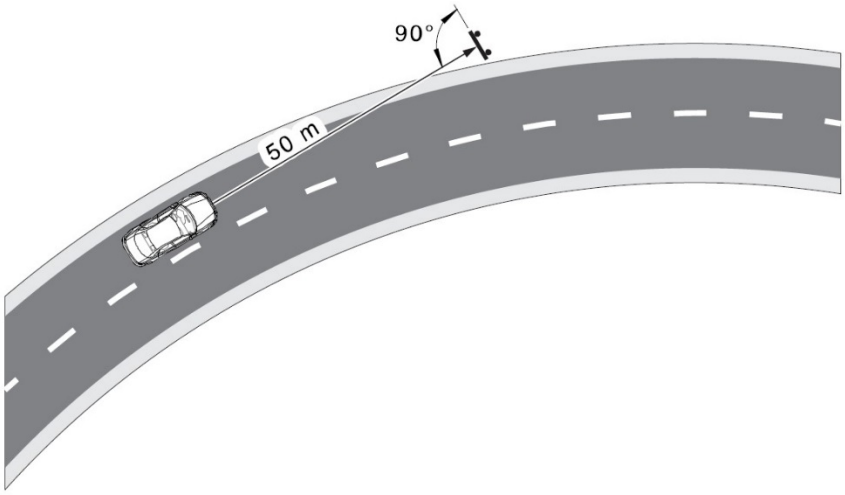
All signs on portable supports must be a minimum height of 200mm above the level of the nearest lane of traffic and must be level.

6.7 Orientation of Signs and Devices

Signs are to face towards approaching traffic approximately at right angles to the line of sight from the driver to the sign.

At curved right alignments, the sign should be placed approximately at right angles to the line of sight of a motorist 50m in advance of the sign as shown in Figure 6.6.

Figure 6.6: Placement of signs on a curve



6.8 Tolerances

Adjustments to a TTM installation are the relocation of signs and devices within approved tolerances. Any changes that exceed tolerances are classed as a modification and must be endorsed and authorised by a TMD. If signs and devices are required to be moved due to obstructions, and relocation exceeds tolerances, the TMI must contact the TMD for instruction on alternate installation methods or options.

Local constraints may not allow signs and devices to be placed exactly in accordance with the relevant TGS. Judgement will therefore be necessary to place signs and devices as close as possible to the locations / spacings indicated. Should variations to the recommended spacing be required then it is generally preferable to increase the spacing within tolerances.

a. Tolerances for placement of signs are:
    i. up to 10% less than the distances given
    ii. up to 25% more than the distances given
b. Tolerances for placement of delineation is:
    i. no minimum and up to 10% more the distances given
c. Tolerances for taper lengths are:
    i. up to 10% less than the distances given
    ii. up to 25% more than the distances given

Any sign or device location adjustments are to be marked and initialled on the TGS held on site, with the name of the person making the adjustments clearly shown.

6.9 ITS Devices

Electronic signage is a commonly integrated device on many roads and can deliver conflicting messages to the motorist during TTM activities if it is not planned for and coordinated within the TMP and TGS. Examples of conflicting messages include varying speed zoning and VMS messages. It is the responsibility of the TMD to include these devices in the development of the TMPs and TGSs.

TMIs should include this topic in the TTM toolbox talk to make sure existing ITS devices are reviewed and adjusted in accordance with the TGS prior to commencing installation.

Prior to installation, communication with responsible authority should be made to ensure that all ITS messaging to the road user is complementary with the TTM being implemented.

7. TGS Operations and Maintenance

7.1 General

A daily routine should be established that allots specific TTM tasks to TTM personnel, including TMIs, so that:

a. signs and devices are always adequate for the safety of personnel and road users
b. the surface of the travelled path is maintained in a satisfactory condition
c. plant operations are not disrupted
d. loss of production time is minimised
e. accessibility for pedestrians and cyclists is maintained.

This includes coordination of ongoing TTM activities and inspection of TTM devices as required. Sample checklists can be found in AGTTM Part 8.

7.2 Before Work Starts

The routine that should be undertaken before work starts each day on long term sites (unless risk assessed) or immediately following the installation of a TGS includes:

a. an inspection of all traffic signs and devices should be made and any deficiencies noted and corrected as soon as practically possible
b. all lamps should be checked and cleaned, if necessary
c. an inspection should be made of all safety barrier systems and any defects should be noted for subsequent rectification; for water ballasted safety barrier or containment fence modules a note should be taken of any out of position modules, low water levels and damaged modules for subsequent rectification
d. after adjustments have been made to the traffic management provisions for the day they should be checked for safety and effectiveness by an inspection drive through the job, and a record made of the signs erected and their locations
e. where there are impacts on paths adjacent to the road or of crossings across the road, the route for pedestrians, cyclists and vulnerable road users should be checked for safety, accessibility and effectiveness by an inspection walk through of the job.

7.3 During the Hours of Work

The following routine should be followed while work is in progress:

a. periodically drive through the work site (recommended every 2 hours) to check that all signs, markings and delineating devices as seen by other road users are satisfactory and in their correct position
b. attend to minor problems as they occur
c. escalate major problems to the TMD and PC as they occur
d. during work breaks (e.g. tea breaks) move personnel clear of the work area; park plant clear of traffic lanes and remove from view or cover signs such as PREPARE TO STOP or Workers Symbolic, if workers leave the site or cannot be seen

e. where there are traffic hazards or where only one lane is open to traffic, instruct traffic controllers to remain on the job and relieve them as necessary
f. reposition barriers, signs and tapers as necessary (e.g. adjust the length of single lane traffic operations as necessary to keep it to a minimum) and keep records of adjustments or modifications made and the time these occurred
g. coordinate maintenance of the travelled path with other job operations
h. monitor the TTM systems performance.

7.4 Aftercare - Worksite Arrangements Outside Working Hours

Periodic inspections of the worksite should be undertaken during after-care periods to ensure that:

a. all traffic control devices are operating effectively. It is particularly important that the devices are visible at low light in the low headlight beam of passing vehicles
b. adequate provision has been made for pedestrians (including those with disabilities) and cyclists to pass safely through the worksite, especially at times when the temporary worksite speed limits may have been removed and traffic controllers are not present to provide assistance
c. sites at or near locations with high numbers of pedestrians (especially near licensed venues) are inspected on a risk-based approach. The frequency of after-hours inspections and records is dependent on the type of traffic control devices left at an unattended site, length of time the site is unattended, the general environment around the site and the likelihood the traffic control devices will be interfered with.

Also see Section 10 for further details.

7.5 Record Keeping

Daily records should be detailed enough to enable a TMI at a point in the future (could be a significant amount of time later dependant on legal proceedings) to re-install the TTM signs and devices which were in place at a given time on a given day. This could be on the request of a coroner or other person to prove or establish the conditions and TTM which existed at a specific point in time. Video record keeping is an acceptable alternative method for recording the details of the traffic control devices on site. Records need to be retained for the period defined by the relevant jurisdiction.

On works which require the use of a traffic guidance scheme the following records are to be kept:

a. Daily records of the sign arrangement or traffic guidance scheme should be kept in a diary or in work sheets
b. As a minimum, the diary or work sheets should include:
    i. name of TMI in charge of site
    ii. date
    iii. location
    iv. identification of job (including, reference numbers if applicable)
    v. time of inspection
    vi. detail of adjustments and modifications made and by whom
    vii. name of person authorising the modifications
    viii. comments
    ix. reference number of traffic management plan or traffic guidance scheme

x. provision for hand over from one TMI to another during shift change
xi. weather conditions
xii. onsite traffic controllers (if any) and TMI details.
xiii. a checklist added to the daily diary that includes the following:
    - are signs upright, clean, visible, level & stable?
    - are taper lengths correct?
    - are speed limit signs correct and doubled up?
    - are sign spacings correct?
    - are cone/bollard alignments straight & spaced correctly?
    - are devices operating correctly?
    - have pedestrians and cyclists been catered for?
    - are lane widths adequate?
    - are vehicle queue lengths acceptable?
    - is road surface condition adequate?
    - installation and removal times?

Sample Daily Diary forms can be found in Appendix D.

7.6 Incidents

In the case of incidents (e.g. crashes, collisions), either witnessed or reported, involving the public or from which legal proceedings might arise, the actual type, size and location of signs and devices in use at the time of the accident should be recorded and the sign arrangement photographed for subsequent reporting. Details of the actual width and condition of the travelled path and weather conditions should also be recorded.

This information may be critical should legal proceedings result from an accident. In such cases, the organisation is often requested to provide details of signs and devices erected at works carried out in the distant past and which cannot be accurately answered unless detailed records are kept.

Tampering with evidence by shifting signs and devices could be seen as criminal activity and may compromise liability for all parties involved.

Where a fatal or serious injury occurs at a worksite, it is imperative that evidence of all aspects of the site and the incident is preserved until police have had an opportunity to complete a forensic examination. In these cases, contamination of the site must only occur for the purpose of saving life or rendering assistance. The site must not be cleaned or tampered with (including all traffic management devices) and crash debris must be left in situ until police and/or workplace health and safety arrive. Preserving evidence takes precedence over traffic access. Therefore, additional lane closures or complete road closure may need to be applied in order to achieve this.

Guidance on partially or fully closing a site to traffic should be sought from the TMP closure/detour contingency plan specific to that site. A sample incident form can be found in AGTTM Part 8.

The TMI needs to be aware of and have access to the emergency arrangement and contingency planning of the worksite, including resources for its implementation.

7.7 TMI Monitoring

For all works, the TMI is to:

a. have on site a copy of the TMP and TGS used

b. carry out inspections before work starts, during the works and pre-closedown of the site using the nominated checklist, noting:

   i. date and time of inspection

   ii. deficiencies identified, and corrective action taken

   iii. adjustments or modifications made to the site.

c. record start and finish times and location of the works

d. assess site conditions to ensure speed choice is still appropriate or reductions are still necessary.

e. periodically check that all signs and devices are satisfactory and in their correct position

f. keep a record of the TMP and TGS that was used

g. make these records available to authorised staff

h. inspect the site on the final day to ensure that unnecessary signs and devices are removed

7.8 Monitor and Measure TTM

At attended worksites the TMI should carry out the checklists listed in Table 7.1.

Table 7.1: Recommended inspection frequency for traffic management devices

Device	Recommended 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
Correct PPE or high visibility clothing	Continuously
Arrow board operation in mobile closures	Prior to start of operation and two (2) hourly thereafter
Arrow board operation in static closures	Two (2) hourly
Non-portable equipment	Daily

The first inspection must take place as soon as the equipment has been installed.

Monitoring the effectiveness of the TTM signs and devices and the operation of the TTM system should be continuous.

Back-up TTM equipment must be available, to minimise the potential for disruption of worksite operations.

7.9 Excessive or Inappropriate Use of Temporary Speed Limits

If during an inspection of a worksite, it is determined that there is excessive or inappropriate use of Temporary Speed Limits (e.g. leaving in place a 40 km/h Temporary Speed Limit once works have been removed or finished, or installing earlier than required),the deficiency will be recorded and must be corrected as soon as practically possible.

7.10 Excessive Signage

The TMD is to design the signage requirements to meet the TTM tasks only. Excessive use of information signage like Workman Symbolic (T1-5), Prepare to Stop (T1-18) and Traffic Controller Ahead (T1-34) should be avoided when these activities are not occurring as they may mislead motorists and influence driver behaviour towards these signs in the future. If excessive signage is found to be in use, it should be recorded and corrected as soon as practically possible.

8. TGS Removal

8.1 General

Removal of the TTM is usually considered more dangerous as crews may be fatigued, may be in a rush to get home, and often as traffic management is removed there may be no advanced warning to alert drivers to the presence of the workers. A risk assessment on each site should be taken into consideration prior to the removal process. As part of this assessment, what has been happening on site (during that road work period) should be also considered as it will represent the type of road user behaviours that have been observed in that location.

Considerations should include the:

a. duration of the roadwork

b. length of the site

c. complexity of the site

d. original speed of the road

e. speeds observed during road work

f. time of day

g. type of conditions (haze / sun glare etc.).

8.2 Typical Removal Principles

Removal is carried out applying one of the short term low impact provisions in accordance with AGTTM Part 5. The processes described in this section are based on limiting high risk manoeuvrers during removal of the TGS including U-Turns and loops exposing workers to live traffic without protection.

Fundamental principles that should be complied with to ensure safety during this work activity are that:

- travel should only be in a forward direction on any road
- recovery of devices must be done in the reverse order using the same work method as for setting out
- the TTM vehicle may be used as added protection considering the:
  - availability of safe park up areas near the signage placement location
  - line of sight to approaching vehicles
  - visibility of the worker and TTM vehicle to approaching vehicles
  - location of signage/devices on vehicle which need to be accessed
  - worker access to vehicle (e.g. not through crush zones)
  - available space on road shoulder or median
  - geometry/terrain of shoulder or median
  - distance between vehicle and travel path / shoulder drop off
  - TMI proximity to expected travel path while traversing between vehicle and signage location

  - likely area in which the vehicle may move if impacted
  - availability of 'gaps in traffic' or lookout
- turn around procedures must be conducted in a safe and legal manner.
- TMI must face the traffic when removing devices
- all workers must know their escape route at all times
- the vehicle mounted warning device must be operating and the hazard/arrow board used as required
- all workers must wear correct PPE
- a look out person/spotter must be used for all activities where required in accordance with AGTTM Part 5
- full co-ordination of any ITS infrastructure which may assist the TGS removal
- the removal of the TTM signs and devices is recorded in the diary/sign register
- conduct a final drive through of the site to ensure all devices are removed and all permanent signs are reinstated or uncovered.

If it is considered too dangerous due to speed or volume, then consideration needs to be given to adopting a mobile convoy (refer to AGTTM Part 4) or other controls e.g. traffic control to hold traffic during removal under its own TGS. A different sequence may need to be adopted to address any site-specific circumstances and can be approved by TMD.

8.3 Removal Process

The general procedure for removing a site is the:

1. work area (devices in reverse order)
2. affected side of roadway (signage in direction of travel)
3. non-affected side of roadway (signage and devices in direction of travel)
4. side roads (closure devices then signage in direction of travel)
5. detours (in direction of travel).

8.4 Removal Order for Signs and Devices

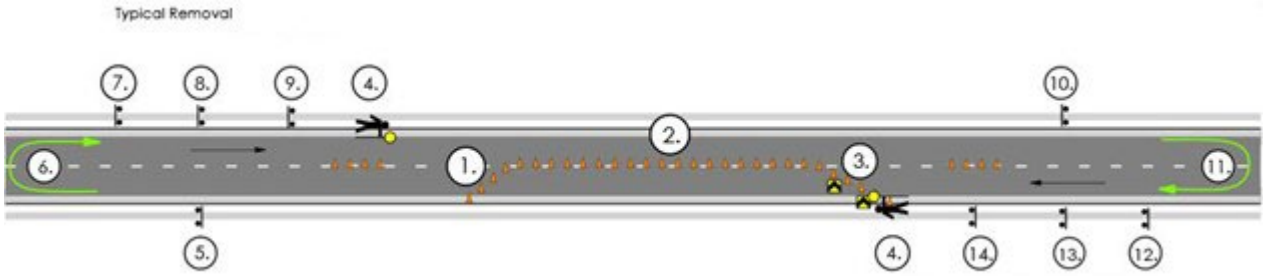
The scenarios described in this Section are designed to encourage workers to review the safest process for removal of a TGS. Many factors can influence the sequence of removal including but not limited to road geometry, hills, crests, curves, surface condition, lane widths, shoulder width, VPD, peak traffic flows, road user travel speed, road user make up (e.g. % of heavy vehicles or cyclists), lighting & time of day and weather.

In following the scenarios in this Section, if a task is not required for the removal of the TGS then skip to the next step in the sequence. In each scenario, the circled numbers on the diagram depict the order of removal.

8.4.1 Two-way road – lane closure

Task	Description	Removal Sequence
a.	TCs holds road traffic in both directions on stop	
b.	Lane closure removed, from termination area to taper, including all signs and devices within work area	1 to 2
c.	Taper removed, from center of road to edge of road	3
d.	TC operation finishes with road now open in both directions and four cones on the centerline of the road at the TC stations are removed	4
e.	Pick up signs in a single loop of work site.	5 to 14

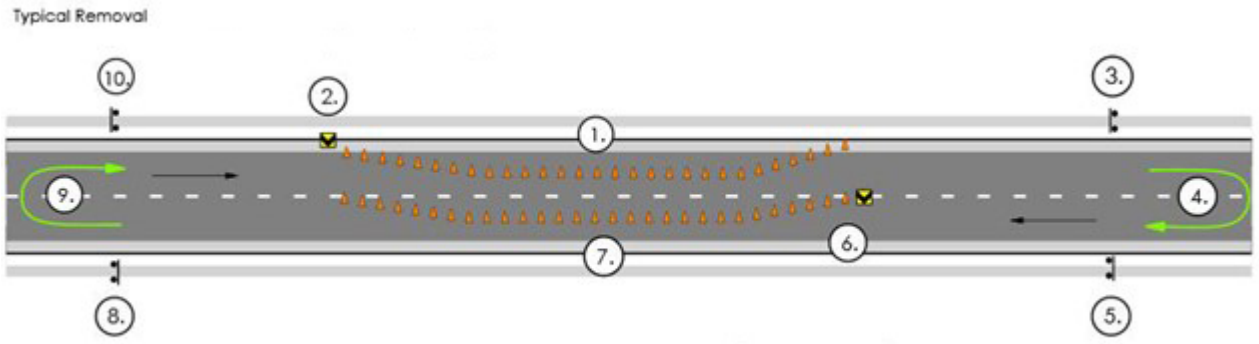
Figure 8.1: Two-way road – lane closure – typical removal sequence



8.4.2 Two-way road – lateral shift

Task	Description	Removal Sequence
a.	Works approach – remove works delineation (from termination area to taper), including all signs and devices within work area	1 to 2
b.	Termination signage removed	3
c.	Non-works' approach - signs and devices removed with flow of traffic. Works vehicle to shadow and protect workers during pick up of delineation	5 to 7
d.	Pick up signs in a single loop of work site.	8 to 10

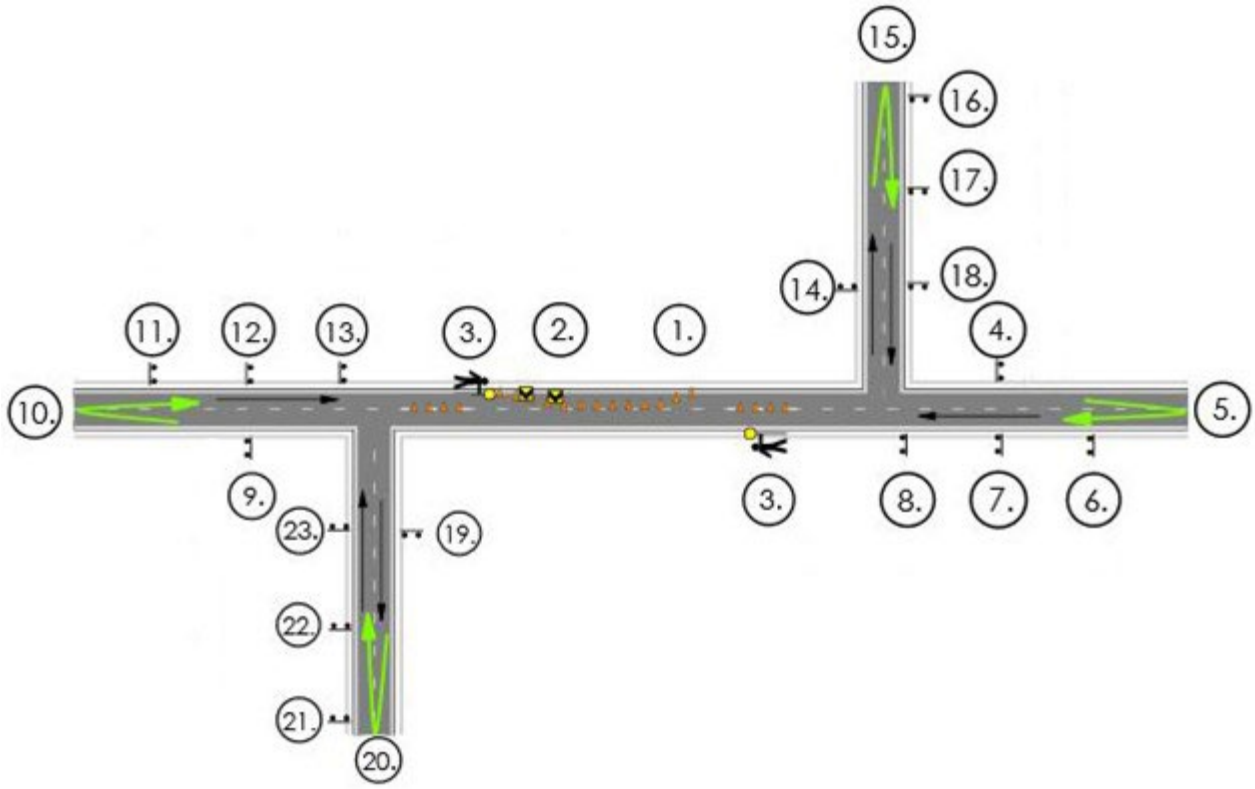
Figure 8.2: Two-way road – lateral shift – typical removal sequence



8.4.3 Two-way road – lane closure with side road intersections

Task	Description	Removal Sequence
a.	TCs holds road traffic in both directions on stop	
b.	Lane closure removed, from termination area to taper, including all signs and devices within work area	1
c.	Taper removed, from center of road to edge of road	2
d.	TC operation finishes with road now open in both directions and four cones on the centerline of the road at the TC stations are removed	3
e.	Pick up signs in a single loop of work site.	4 to 23

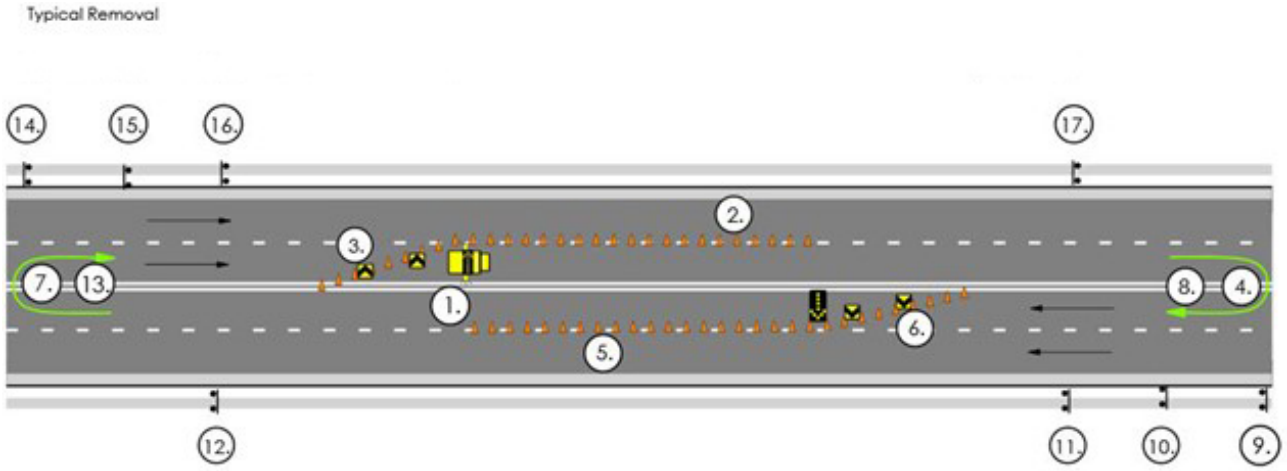
Figure 8.3: Two-way road – lane closure with side road intersections – typical removal sequence



8.4.4 Multi-lane un-divided road – lane closure

Task	Description	Removal Sequence
a.	Consider the use of a shadow vehicle if risk is deemed unacceptable	
b.	Traffic management vehicle parked in the closed lane with arrow board indicating merge to 'non-affected' lane.	1
c.	Lane closures removed, from termination area to taper, including all signs and devices within work area	2
d.	Taper is removed, from the center of road to edge of road. It is critical at this stage that the traffic management vehicle provides protection for the TTM workers removing the taper.	3
e.	Repeat steps (b) to (d) for the opposing direction where lanes are closed in both directions including removing the arrow board	4 to 6
f.	Remaining signs removed in a loop of the work site.	7 to 17

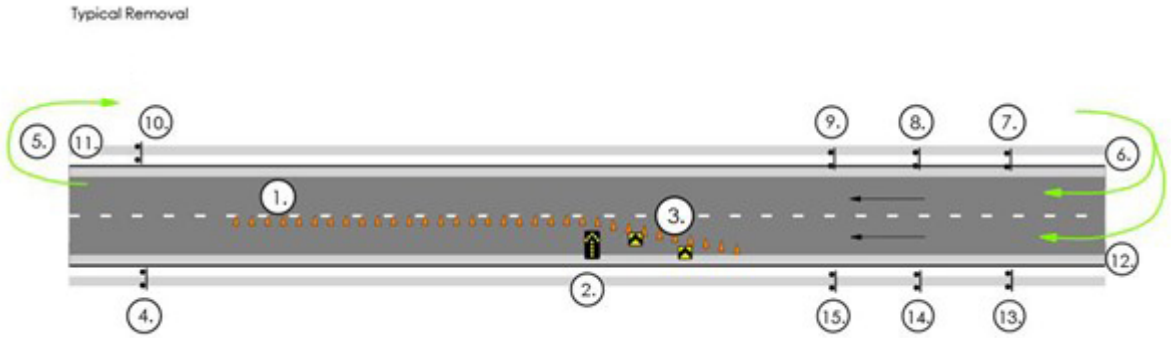
Figure 8.4: Multilane undivided – typical removal sequence



8.4.5 Multi-lane divided road – left or right lane closure

Task	Description	Removal Sequence
a.	Consider the use of a Truck Mounted Attenuator if risk is deemed unacceptable	
b.	Lane closure removed (from termination area to taper), including all signs and devices within work area – use TMA/shadow vehicle as cover in advance of taper	1 to 2
c.	Taper removed (from center of road to edge of road) – roadway open	3
d.	Remove Termination sign on the Working lane side	4
	Turn in a safe location to return to approach to the site	5 to 6
e.	Remove Non-working' lane signs	7 to 10
f.	Turn in a safe location to return to approach to the site	11 to 12
g.	Remove Working lane sign on approach	13 to 15

Figure 8.5: Multilane divided – typical removal sequence



9. Low Light Works

9.1 Activity During Low Light

Undertaking activity during low light is effective in reducing delays to traffic because traffic volumes are typically lighter than during most daylight hours. Activity at low light must be subject to careful additional planning and inspection as described below.

When planning low light-time traffic management measures, the TMD and TMI will need to consider that:

- traffic density is likely to be less and hence traffic speed may be higher
- road user's visibility of the road, the worksite and workers may be reduced
- road user's awareness may be reduced due to factors such as fatigue
- additional lighting for working spaces, TCs, 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 produce glare that could dazzle road users must not be used
- illuminated wands may be used.

All signs should have a delineation device placed at the base of each sign on the traffic side to ensure that the edge of the sign frame is clearly delineated for drivers.

9.2 Artificial Lighting

Lighting must not create a disabling glare for road users. A drive through the worksite from all approaches immediately after the lighting is installed to check for glare must be undertaken by a TMI or designated and competent worksite representative.

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

10. Unattended Sites

Specific action must be taken to ensure that traffic can proceed around, through or past a worksite safely at times when workers are not present. This is typically referred to as after-care temporary traffic management. This may include periods outside normal working hours including during low light, and at times when there are interruptions to the continuity of the work. After-care temporary traffic management at worksites should comply with the following:

- A TMP must include details of the requirements to manage traffic around, through or past the worksite outside normal working hours or when workers are not present at the site. This would include the removal or covering of any signs that are not applicable, particularly temporary worksite speed limits.
- Where a temporary worksite speed limit is necessary outside working hours for the safety of traffic having regard to the worksite conditions (e.g. rough or slippery unsealed road surface, or excavations close to the roadway), the worksite speed limit should preferably be no more than 20 km/h below the permanent speed limit, unless the risk assessment of the worksite indicates otherwise.
- Inspections of the site should be undertaken as outlined in Section 7.4.

As part of preparing the worksite to be left unattended, also consider the actions as indicated in Table 10.1.

Table 10.1: Unattended site checks

What to consider	What to do
Size of site	Reduce the extents of the worksite as much as possible.
Temporary Speed Limits	If Temporary Speed Limits have been installed, the design should consider whether these are still required or whether the Temporary Speed Limit should be changed (remember that changes to the Temporary Speed Limit must be approved).
Unsafe conditions	Notify the Principal Contractor of any unsafe conditions e.g. loose material on the road surface, plant parked incorrectly
Signs	TTM signs and devices need to remain in place and serviceable while the site is not attended, check that all signs are ballasted and positioned correctly.
Delineation	Check that all delineation devices are clean and positioned correctly.

Appendix A Sample TTM Career Path Stages

An example TTM career path is summarised below and shown diagrammatically in Figure A.1. For more details on career path progression for different temporary traffic roles, refer to AGTTM Part 8 Section 6.

Stage A – TTM worker undertakes training required to operate as a Traffic Controller and/or Traffic Management Implementer on Category 1 Roads .

Stage B – TTM worker undertakes training required to operate as a Traffic Controller and/or Traffic Management Implementer on Category 2 Roads. This typically involves more complex traffic situations which may include higher traffic volumes, higher traffic speeds and signalised intersections.

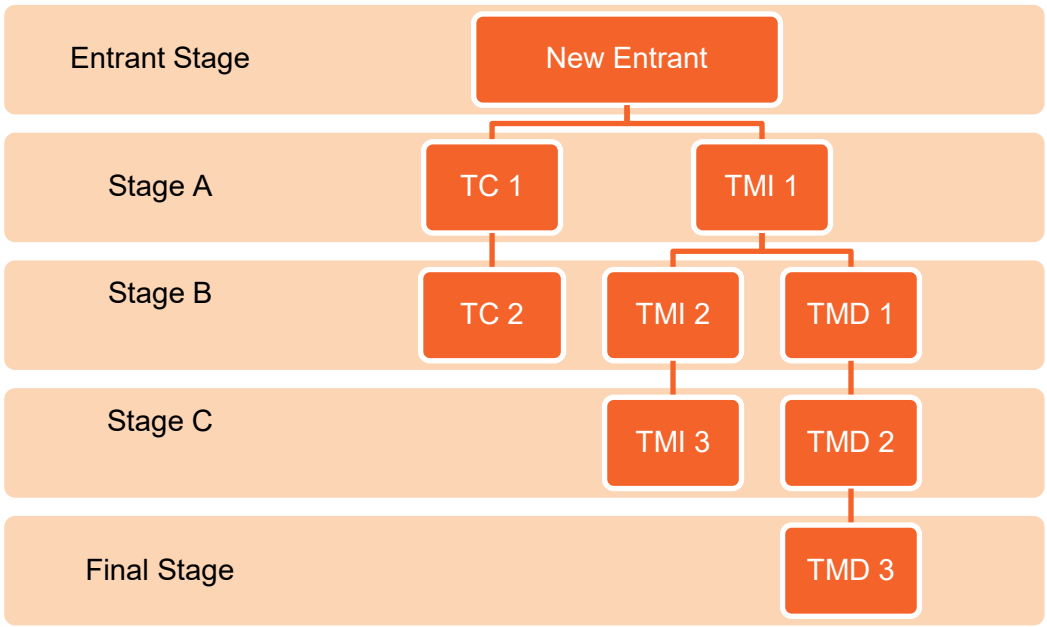
A TTM worker that has completed TMI 1 training (and has a minimum of 12 months appropriate experience in temporary traffic management) can undertake training to operate as a Traffic Management Designer on Category 1 Roads. Alternatively, TMD 1 training can be undertaken by persons with a tertiary qualification in civil engineering or road design related field.

Stage C – Traffic Management Implementers undertake training required to operate on Category 3 Roads which are typically high volume/high speed roads with a divided carriageway and grade separated interchanges..

Traffic Management Designers undertake training required to operate on Category 2 Roads.

Final Stage Traffic Management Designers undertake training required to operate on Category 3 Roads

Figure A 1: Example TTM career path stages



Appendix B Sample Risk Assessment Form

Project		**Risk Assessment completed by**	
Location/Venue		**Position**	
Date			
Describe the Activity & location			

Step 1 Identify the activity Complex or lengthy activities should be broken down into stages / alternately aspects of the activity may be listed	**Step 2 What are the hazards?**	**Step 3 Who might be harmed and how?**	**Step 4 What are you already doing?**	**Current risk rating** Refer last page (optional)	**Step 5 What further action is necessary?** Apply the Hierarchy of Controls Refer last page	**Residual risk rating** Refer last page (required)	**How will the controls be implemented?**		
							Action by	Due date	Date when completed

Step 1 Identify the activity Complex or lengthy activities should be broken down into stages / alternately aspects of the activity may be listed	**Step 2 What are the hazards?**	**Step 3 Who might be harmed and how?**	**Step 4 What are you already doing?**	**Current risk rating** Refer last page (optional)	**Step 5 What further action is necessary?** Apply the Hierarchy of Controls Refer last page	**Residual risk rating** Refer last page (required)	**How will the controls be implemented?**		
							Action by	Due date	Date when completed
Documentation and approval									
Name Please print					**Signature** **Date**				
Verified by Please print					**Signature** **Date**				

RISK ASSESSMENT RATING – Use this table to determine a risk rating considering firstly, what is the worst possible CONSEQUENCE of this hazard, and then what is the LIKELIHOOD of the risk occurring?

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Rare
Catastrophic	Very high	Very high	High	High	Low
Major	Very high	Very high	High	Medium	Low
Moderate	High	High	Medium	Low	Low
Minor	High	Medium	Low	Low	Low
Insignificant	Medium	Low	Low	Low	Negligible

Hierarchy of Controls – Use this table to determine the highest level of practical response. For each risk start with elimination and then work down the hierarchy of control recognising that lesser measures are likely to have less effect in mitigating the risk.

HIERARCHY OF CONTROLS Start at the top and work down	
Most Effective	**Elimination** **Eg.** Discontinue use of product, equipment, cease work process
	Substitution **Eg.** Replace with a similar item that does the same job but with a lower hazard level
	Isolation **Eg.** Put a barrier between the person and the hazard
	Engineering controls **Eg.** Change the process, equipment or tools so the risk is reduced
	Administration controls **Eg.** Guidelines, procedures, rosters, training etc to minimise the risk
Least Effective	**Personal protective equipment** **Eg.** Equipment worn to provide a temporary barrier

Appendix C Sample TTM Toolbox Talk

1. On Site Traffic Guidance Schemes

The employer should develop, establish and monitor a traffic guidance scheme for all applicable sites. This scheme should be communicated to all workers on site.

A traffic guidance scheme should include, but not be limited to, the following:

2. Assessment of Site Factors:

- Road alignment & Road type
- Sight distance
- Traffic volume
- Residential areas
- Weather conditions

3. Assessment of Work Procedure Factors:

- Work on roadway & work on shoulder
- Stationary site
- Continual slow-moving site
- Hours of work
- Equipment access

(Consider the above site and work procedure factors to make traffic guidance scheme decisions.)

4. Also Consider:

- Types of traffic control devices
- Spacing of traffic control devices
- Advance warning area
- Approach area
- Work area
- Traffic control person(s)

5. Emergency Preparedness

Keep safe access and egress in mind when having numerous vehicles and equipment moving on and off site. If accesses are blocked or congested, this can make an emergency evacuation difficult.

Emergency services may need to enter the site and will need to be able to do so safely.

6. On Site Traffic Control Tips

When it comes to working around vehicles, traffic and highly congested areas, there are some keys things to do and watch for:

- High visibility clothing is required at all times. Vests, Coveralls, retroreflective bands, Hard Hats\
- Designated radio two-way radio channel is checked
- Housekeeping needs to be maintained to avoid slips, trips and falls, as well to maintain safe access and egress.
- Signage is up and obeyed.
- Ensure all traffic will move safely through the site.
- If possible, avoid driving in reverse on sites. If unavoidable, have audible reverse alarms.
- Ensure all vehicles have a walk around inspection done daily to ensure lights, signals and horns work.

Where traffic is diverted onto dusty road surfaces, good visibility must be maintained by dust suppression with an approved substance.

Complete and attach TTM Toolbox Meeting Form and process as per company policy.

TTM TOOLBOX MEETING FORM

Date:_____**Project**: _____

Supervisor:_____**No. in Crew**:_____**No. Attending**: _____

Review Last Meeting:

	Names of Attendees (Signature Required)
Topics Discussed (policies, practices, procedures, hazard assessment):	
Suggestions Offered:	
Action(s) to be Taken:	
Injuries/Accidents Reviewed:	

Supervisor's Remarks: _____

_____

_____

_____

Signature: _____

Appendix D Sample Daily Traffic Management Diary

Location: _____ **Client:** _____ **Date:** _____

TMP/TGS No: _____ **Weather Conditions:** _____ **Diary Sheet:** _____ **of** _____

Start Time at Depot: _____ **Time Arrive Onsite:** _____ **Commencement of Site Setup:** _____ **Site Setup and Operational:** _____

Site Pulled Down at: _____ **Time After signs setup:** _____ **TGS No:** _____ **Time left site:** _____ **Finish time at Depot:** _____

☐ **Day Works** ☐ **Night Works** ☐ **Emergency Response** **Site Setup as per TGS ☐ Yes ☐ No (if not comment on next page)**

☐ **Attendance at Pre-Start Meeting** **Did an incident occur (if yes complete incident report form) ☐ Yes ☐ No**

I confirm that the above times of 'setup' and 'pulldown' of traffic management signs and devices are a true and correct

Name (Site Supervisor): _____ Signed: _____

Drive Through Checks (Checks must be conducted at least every 2 hours).

Time of check entered. Rule off and leave blank if the check does not apply to the site. Make a note of any issues on the next page.

Traffic Management Site Checks	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Time										
Are signs upright, clean, visible, level & stable										
Are taper lengths correct										
Are speed limit signs correct and doubled up										
Are sign spacings correct										
Are cone/bollard alignments straight & spaced correctly										

Are devices operating correctly?										
Are cyclists and other vulnerable user controls working correctly?										
Are lane widths adequate?										
Are vehicle queue lengths acceptable?										
Is road surface condition adequate?										
Is the work area clearly defined?										
Are the travel paths for both directions of traffic clearly defined? Is the work area appropriately separated from passing traffic? Check the transition at the interface of the modified alignment.										
Do the temporary works involve shoulder or traffic lane closures? If so: Are the taper lengths adequate?										
Are traffic cones, bollards upright, secure, correctly spaced and neatly aligned?										
Are centre lines/lane lines/edge lines clear and unambiguous?										
Are sight and stopping distances adequate at works, at intersections and driveways?										
Are traffic lanes clearly delineated?										
Are lighting for night-time controls operating correcting?										
Are low lights controls operational and adequate?										

No. of TTM Vehicles Onsite: _____ **No. of TTM Personnel Onsite:** _____

TTM Personnel Names & Accreditations:

	Accreditation Details (tick)				Time of Break from Stop/Slow (Traffic controllers must have a 15-minute break every two hours of constant stop/slow operation)							
Name	**TC**	**TMI**	**TMD**	**TMA**	On	Off	On	Off	On	Off	On	Off
					:	:	:	:	:	:	:	:
					:	:	:	:	:	:	:	:
					:	:	:	:	:	:	:	:
					:	:	:	:	:	:	:	:
					:	:	:	:	:	:	:	:
					:	:	:	:	:	:	:	:

Additional Comments _____

I confirm that the details contained herein are true and correct

Name: (Traffic Management Implementer): _____ Signed: _____

Austroads' Guide to Temporary Traffic Management (AGTTM) details contemporary temporary traffic management practice for application in Australia and New Zealand. It provides guidance for the planning, design and implementation of safe, economical and efficient temporary traffic management designs.

Guide to Temporary Traffic Management Part 6: Field Staff – Implementation and Operation sets out the requirements of field staff in the process of installing, monitoring and dismantling traffic management on public roads.

Guide to Temporary Traffic Management Part 6

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