

2.1 Purpose and scope

This manual is for personnel responsible for road and bridge work sites. It contains standard traffic control plans (TCPs) for a range of work activities, instructions on how to select a standard TCP for a specific work activity, instructions on how to design new TCPs and guidance for traffic control in a number of specific situations.

The purpose of this manual is to maximise safety by ensuring that traffic control at work sites consistently complies with best practice. It is also intended to help personnel to comply with the Occupational Health and Safety Act, 2000 and the Occupational Health and Safety Regulation, 2001.

For works conducted by contract, the manual complements RTA specifications G10, *Control of Traffic* and G11, *Road Occupancy Provisions*.

The principles outlined in this Manual detail the minimum treatments required. Additional signs or devices may from time to time be required at specific sites to ensure the maximum guidance possible. Extreme care is required to ensure that the inclusion of additional signs and devices improves and does not detract from the safety of a work site.

Any variations below the requirements of this manual shall only be made on the basis of a documented risk assessment.

2.2 Application

This manual shall be used on all RTA road and bridge works.

Appendix D, *Traffic control plans*, contains standard TCPs covering many work activities. Where a standard TCP does not exist for the work activity planned then an existing TCP may be modified within strict limits (see Section 4.5, *Minor modifications to TCPs*) or a new TCP is to be designed.

Not all TCPs in this manual will be applicable in every area of the State.

See Section 9, *Specific situations*, for further guidance.

In this Manual the term “Standard TCP” refers either to any TCP contained in this Manual (all of which are authorised) or a TCP, duly authorised, and contained in the Local Office Manual. The term “New TCP” refers to a TCP which does not exist as a standard TCP and which cannot be produced by minor modification of a standard TCP and will need to be designed by a person with a Design and Inspect Traffic Control Plans Certificate and, once authorised, may become a Standard TCP.

2.3 Definitions

85th percentile speed (V_{85}) – the speed at or below which 85% of vehicles are observed to travel under free flowing conditions past a nominated point.

AADT (annual average daily traffic) – the total traffic volume over the whole year, divided by the number of days in the year.

Adjacent to traffic - work which is not undertaken on trafficked lanes but immediately to the side of them and at locations where traffic from time to time might be expected to be found. For instance on shoulders, footpaths or medians.

ADT (average daily traffic) – the total traffic volume during a stated period, divided by the number of days in that period.

Advance warning signs – roadwork warning signs which have a general message, used in advance of other roadwork signs with a more specific message.

Advance warning vehicle – a vehicle used well in advance of mobile works to provide advance warning of those works, to following traffic.

Approach speed – the speed of traffic approaching the work site measured in km/h and may be the speed limit applying to the road.

Around, past and through – traffic will move either around, past or through work areas:-

Around – a work area with traffic on a detour, side track or different carriageway

Past – a work area with traffic on the same carriageway as the work area, to the side of, and not directly over the area being worked on

Through – a work area with traffic over the area being worked on with or without a pilot vehicle and may intermingle with workers or plant.

Built-up area – roadside development comprising property accesses at spacings averaging less than 100 m over distances of at least 500 m.

Competent person – a person who has, through a combination of training, qualification and experience, acquired knowledge and skills to enable that person to perform specified tasks.

Condition signs – temporary signs indicating the condition of the road surface through the work area.

Containment fencing - a physical barrier (not a safety barrier) sufficient to provide separation between the travelled path of pedestrians and the work area, but not so rigid as to become a hazard if struck by vehicles.

Clear of traffic and plant - a location where traffic and plant would not normally be expected.

Crossover (roadworks) – used where one carriageway of a divided road is closed to traffic and the traffic is transferred to the other carriageway which then operates as a two way road.

Crossover (emergency vehicles) – used to allow access from one carriageway to the adjacent carriageway for emergency vehicles (Police, Ambulance, Fire etc) and roadwork vehicles but not private vehicles.

Delineation – a general term for treatments which enhance the information needed to select the appropriate path and speed, or position, to allow a manoeuvre to be carried out safely and efficiently. In this manual, delineation refers to devices such as line marking, raised pavement markers, traffic cones, bollards and post mounted reflectors.

Determination of D – based on the speed of traffic approaching the *work site* in km/h or the speed limit applying to the road.

Device – see definition for *traffic control device*.

Dimension D – a distance expressed in metres and used for the positioning of advance signs and related purposes.

Engineer – see definition for *Project Manager*.

Footpath – the paved area in a footway.

Footway – a public way largely reserved for the movement of pedestrians.

Independent person – a person, with respect to safety inspections, who is not directly a member of a work crew undertaking short term or long term work.

Intermittent work – work which is undertaken on travel lanes, in gaps in traffic, without obstructing traffic and without compromising the safety of workers. Intermittent work may be either planned or unplanned.

Lead vehicle - a vehicle used at the head of mobile works on two way roads to give advance warning of the works to traffic approaching from the opposite direction and to enable the driver to alert following workers of any impending hazard.

Legibility distance – the maximum distance that the various types of traffic control signs or devices are clearly seen under normal operating conditions and where there is no restriction to the line of sight.

Long-term work – work requiring traffic control and taking **longer** than one work shift and where some form of traffic control must remain when the site is left unattended and may need to operate both day and night.

Maintenance Engineer – see definition for *Project Manager*.

May – indicates the existence of an option.

Mobile work – work which entails work vehicles moving continuously along the *roadway* at speeds significantly lower than other traffic. All signs and devices are either vehicle mounted or are regularly moved along the road.

Open road area – roadside development less frequent than that specified for a *built-up area*.

Past – see definition for *Around, past and through*.

Pedestrian Movement Plan (PMP) – A diagram showing the allocated travel paths for workers or pedestrians around or through a work site. The plan shall show all associated signs and devices used to guide the workers or pedestrians. A PMP may be combined with or superimposed on a TCP.

Physical works – the visible on-site activity of workers, plant or trucks.

Project Manager – the officer responsible for the selection, design, approval and implementation of the traffic control to apply on site. It may include the Engineer, Asset Engineer, Maintenance Engineer, Roadworks Engineer, Surveyor, Supervising Geotechnical Scientist or other positions usually at RTA Unit Manager level.

Remote location – a location that is generally clear of traffic but may include plant items or tip trucks. Examples of such locations are gravel pits and stockpile sites. Whilst traffic would not generally be expected at these locations care shall be taken as access to traffic may not be denied.

Road occupancy – consists of any activity likely to impact on the operational efficiency of the road network, in other words, an activity that requires the road to be used in such a way as to affect traffic flow, or an off road activity that affects traffic flow. A road occupancy may involve closure of a traffic lane or traffic lanes.

Road Occupancy Licence (ROL) – allows a proponent to use a specified road space at approved times, but does not imply permission or approval for the actual works being undertaken. For all occupancies on classified (state) roads applications are to be made to the Planned Incident Unit of the RTA's Transport Management Centre. For occupancies that impact solely on unclassified (council) roads applications are to be made to the relevant local council authority.

Road user – any driver, rider, passenger or pedestrian using the road.

Roadside - that area between the reserve boundary and the nearest road shoulder.

Roadway – that portion of the road devoted to the use of vehicles, inclusive of shoulders and any auxiliary lanes.

RTA work site – a *work site* under the control either of RTA or its contractors.

Running lane – a portion of the roadway allotted for a single line of moving vehicles.

Safety barrier - a physical barrier separating the work area and the travelled way, designed to resist penetration by an errant vehicle and as far as practicable, to redirect errant vehicles back into the travelled path.

Shadow vehicle - a vehicle which provides close up protection to the rear of workers on foot.

Shall - understood to be mandatory.

Should - understood to be non-mandatory, i.e. advisory or recommended.

Short-term work – work requiring traffic control during work taking less than or equal to one work shift and where traffic control is not required when the work is complete and where road conditions are returned to normal when the shift ends.

Sight distance – the distance between the point at which an approaching driver first sees the whole of an object (in the context of this manual the object is the traffic control sign or device) and the object itself. The desirable sight distance is sufficient to enable a driver to see, perceive, respond and react, and is usually approximately equal to 8 – 10 seconds of travel or about $2.5D$ where D is the approach speed in km/h.

Signals Technician – see definition for *Technician*.

Site Supervisor – see definition for *Technician*, for traffic signals work and *Works Supervisor* for road and bridge works.

Spotter – a person whose sole responsibility is to watch out for and warn workers of approaching traffic.

Tail vehicle - a vehicle used at the tail of mobile works to provide advance warning of the works to following traffic, to divert traffic around the works and to enable the driver to alert workers ahead of any danger.

TCP – see definition for *traffic control plan*.

Team Leader – the person on-site full time who directly manages the other workers. This includes the leader of a survey party.

Technician – a person with electrical qualifications, holding either a current Qualified Supervisor Certificate endorsed “Electrician” or an Individual Contractor Licence endorsed “Q” for electrical work, issued under the provisions of the Building Services Corporation Act 1989. A traffic signal technician is one who has the above qualifications and has had training in traffic signals operation.

Through – see definition for *Around, past and through*.

Traffic – all vehicles, persons or animals travelling on a road.

Traffic control – guidance given to road users using any signs, devices, pavement markings, signals or directions from a traffic controller to regulate, warn or guide road users.

Traffic control device – any sign, signal, pavement marking or other installation placed or erected by a public authority, authorised agent or contractor to regulate, warn or guide traffic.

Traffic Control Plan (TCP) – a diagram showing signs and devices arranged to warn traffic and guide it around, past or, if necessary through a work site or temporary hazard. The TCP shall detail the location, spacing

and sizes of all signs and devices, the location and lengths of tapers, all pavement markings and delineators, any containment or safety fencing, flashing arrow signs, portable traffic signals, variable message signs, roadwork speed zones and, if necessary, pedestrian routes.

Traffic controller - a trained person whose duty it is to control traffic at a work site. This control is normally exercised by the use of STOP/SLOW bats, but may be by manual control of traffic signals or other devices.

Traffic Management Plan (TMP) – a plan detailing work to be undertaken and describing its impact on the general area, especially its impact on public transport and passengers, cyclists, pedestrians, motorists and commercial operations. It also describes how these impacts are being addressed. May also contain detailed TCPs and VMPs.

Travelled path – that part of the roadway which is available to vehicles and which may consist of one or more running lanes.

Variable message sign – an electronic sign that displays electronically generated messages on a screen. They provide road users with information about road and traffic conditions.

Vehicle Movement Plan (VMP) – a diagram showing the preferred travel paths for vehicles associated with a work site entering, leaving or crossing the through traffic stream. A VMP should also show travel paths for trucks at key points on routes remote from the work site such as places to turn around, accesses, ramps and side roads. A VMP may be combined with or superimposed on a TCP.

Vehicles per hour (vph) – the number of vehicles in any particular hour. This can be determined from an actual hourly count or counting the vehicles during a short period (say 6 minutes) and then multiplying to make the hour (by 10 for a 6 minute count). Alternatively, if the ADT is known, experience has shown that dividing the ADT by 16 gives a useable vph. (See Section 9.14, *Vehicle inspections*, Table 9.2, Estimating ADT.)

VMP – see definition for *vehicle movement plan*.

Work area – the specific area on the road or bridge or within the road reserve where the construction or maintenance work is being undertaken.

Work site – an area of road or bridge or road reserve which includes the work area or areas and any additional length of road or bridge required for traffic control such as signs and tapers.

Work vehicle - in mobile works this is the vehicle or plant item immediately proceeding the work area and undertaking the work (such as a linemarking machine) or supporting the workers on foot behind it. For static sites it is positioned to best suit the work being undertaken.

Works Supervisor – the first person in line management who directly supervises teams of field personnel.

2.4 Training

2.4.1 General

The success of a system of traffic control at a work site depends on the knowledge, skills, cooperation and efforts of all the people with a responsibility for traffic control at the work site.

Training shall therefore be provided to all personnel with a responsibility for traffic control at work sites.

This training shall be provided to personnel who:-

- ◆ control traffic with a STOP/SLOW bat
- ◆ set up and work with TCPs
- ◆ select and make minor modifications to TCPs
- ◆ design new TCPs or inspect TCPs on any site.

Training courses have been developed as shown below. Before undertaking any of the courses it is essential that the relevance of the course to the person nominated is confirmed and that any pre-requisites have been met.

- **Traffic Controllers - *Duration 1 day***

This course provides training for staff required to control traffic at a work site, by using **STOP/SLOW** (R6-8/T7-1) bats.

This course *qualifies* the participant to control traffic, it **does not authorise** the participant to control traffic nor to set up or work with traffic control plans. The participant must ensure they are authorised to control traffic by the relevant roads authority pursuant to Roads Regulation 2008.

- **Apply Traffic Control Plans - *Duration 1 day***

This course provides training for staff required to set up and work with Traffic Control Plans (TCPs) issued to them.

It **does not** qualify the participant to control traffic with a STOP/SLOW bat nor to select or modify existing TCPs.

- **Select/Modify Traffic Control Plans - *Duration 2 days***

This course provides training for staff required to select and make minor modifications to standard Traffic Control Plans to suit work locations.

It **does not** qualify the participant to control traffic with a STOP/SLOW bat, set up or work with traffic control plans, design a new traffic control plan or to inspect traffic control plans on any work site except for routine inspections of any site for which the participant is responsible.

- **Design and Inspect Traffic Control Plans - *Duration 1 Day***

This course provides training for staff required to design new Traffic Control Plans or produce major modifications to standard plans. It also qualifies staff to inspect and report on traffic control plans on **any** work site, especially those for which they have no responsibility. (See Section, 2.5, *Traffic control safety inspections*.)

2.4.2 Audit of training effectiveness

The RTA training packages on traffic control at work sites shall be supplemented with an auditing process to ensure that managers and field staff:-

- possess a consistent level of knowledge of and commitment to safe work practices in relation to traffic control
- are aware of their responsibilities under OH&S legislation
- are aware of their responsibilities under this manual
- know that field personnel are required to select, install, maintain and remove signs and other devices on the basis of TCPs
- are aware of the procedure for modifying standard TCPs
- are utilising the training received.

2.5 Traffic control safety inspections

A traffic control safety inspection is a structured procedure whereby an independent and suitably qualified person uses a checklist to determine the level of compliance at work sites with the practices and requirements of this manual.

The overriding objectives of a traffic control safety inspection are:-

- to ensure that the work site is operating safely
- to ensure that, if required, a TCP has been provided and is on site, has been approved and has been implemented as approved
- to ensure any variations to the TCP (for instance in sign location due to shade, parked vehicles etc) are recorded on the TCP
- to highlight discrepancies and, if appropriate, make recommendations.

All work sites are subject to traffic control safety inspections.

An example of a Traffic Control at Work Sites Safety Inspection Checklist is included in Appendix E. Whilst independent inspections are to be undertaken the checklist can also be used by suitably qualified members of crews involved in any work as a further means of ensuring safe working conditions.



2.6 Liaising with external organisations

RTA will endeavour to keep its standard TCPs current by liaising with:-

- overseas road and traffic agencies (the formal liaison with the United States Highways Research Program is an example)
- other road agencies in Australia and New Zealand through the AUSTROADS liaison groups
- Local Government (Councils) and WorkCover in NSW
- Relevant Australian Standards Committees.

When new information becomes available and new techniques are developed, they will be assessed and if suitable incorporated into this manual. Any amendments to the manual will be made available on the RTA web site.

2.7 Improving public awareness

2.7.1 Aim

The aim is to improve the recognition and response of drivers to roadworks traffic control devices and Traffic Controllers at work sites.

2.7.2 Drivers' perspective

Problems in public awareness at work sites include:-

- road users may not understand the devices, particularly newer devices
- drivers do not appreciate the dangers to workers and road users if traffic control devices are not given adequate respect, attention and appropriate response, and
- drivers lose respect for signs, which are used incorrectly.

For example, if the traffic controller (symbolic) sign is displayed while there is no traffic controller present, then drivers may interpret this sign as meaning there **may** be a traffic controller ahead. This could lead to a lessening of the impact of the sign when next encountered by the drivers.

2.7.3 Methods

The following may be used to raise public awareness of work sites:-

- erecting special signs informing the public of traffic guidance schemes
- advertising on television and radio
- advertising in local newspapers and magazines
- including suitable material in RTA's *Road Users' Handbook*

- conducting campaigns with the Police to reinforce responsible behaviour on the roads especially at work sites
- presenting road safety videos and posters in public areas of RTA offices, particularly Motor Registries
- presenting training kits on road safety in schools
- including brochures with registration and licence renewals
- handing out brochures at public events such as shows.

2.7.4 Topics

The public needs to be educated in the following topics:-

- what traffic controllers do and understanding their instructions
- the meaning of advance warning signs
- the meaning of symbolic signs such as traffic controller (T1-34, T1-200-2 and T1-200-3), workers (T1-5) and lane status (T2-6)
- work zone speed limits and compliance
- longitudinal line marking operations
- night work, particularly in urban areas.

2.7.5 Ongoing advice

The media should be encouraged to advise on current and planned roadworks on an ongoing basis, providing information on the:-

- extent of the work
- location of the work
- likely delays to traffic
- need to take care in the light of changed road and traffic conditions.

2.8 Evaluation and review

Implementation of this manual will be evaluated as part of RTA's overall program of evaluations and assessment audits.

A Traffic Control at Work Sites Committee exists to assist in the review of this manual on a regular basis. Factors taken into account in these reviews include the circumstances of incidents and accidents at work sites and the results of safety audits and inspections. Feedback on the manual is welcome and encouraged and should be forwarded to the General Manager, Traffic Management Branch.

The Committee is also responsible for:-

- evaluating and approving new standard TCPs, signs and devices
- developing strategies to improve safe systems of work
- evaluating training and accreditation issues
- the consideration of work site OH&S issues.

The Committee has representatives from most areas of the RTA.

The basic criteria for the evaluation and acceptance of a new sign, device or standard TCP for general use throughout NSW are:-

- it conforms with the principles in Section 3, *General procedures* and Section 5, *Designing new TCPs*
- it has application in more than one area of the State
- other standard signs, devices or TCPs are not suitable or not effective.

2.9 Exclusions from this manual

As well as following the principles contained in this manual, some work groups may have separate documented procedures by which they operate. Such groups include the RTA Traffic Emergency Patrollers (TEPs). These separate procedures have not been included in the Manual because of the specialist activities of these groups.

2.10 Risk management

It is essential that risk management is undertaken on works to identify and analyse all hazards likely to arise during the planning, setting up, operating, changing and dismantling of a traffic control plan, followed by the determination of appropriate measures to mitigate those risks. This risk assessment process is required to be undertaken for minor routine works, mobile works and more extensive works.

The process to be followed is a four part one as detailed below.

Step 1 Identify and list the hazards to health and safety

On any work site there are potential hazards. Some examples are moving traffic, reversing plant, overhead power lines etc.

Step 2 Assess the risks arising from the hazards.

The risk of a hazard is related to the severity of a single incident, and the frequency and duration of exposure. Also, the risk is increased when more hazards are identified at a site.

The risk assessment reckoner below is used to determine the of action required by first determining the severity of the hazard (K, S, M or F) and

then the likelihood of it occurring (VL, L, U or VU). The corresponding value indicates the risk rating as follows:-

- 1 **High risk** – take immediate action
- 2 **Significant risk** – do something as soon as possible
- 3 **Medium risk** – risk control measures are required
- 4 **Low risk** – manage by routine procedures.

Severity	Likelihood			
	Very likely VL	Likely L	Unlikely U	Very unlikely VU
Death/permanent disability K	1	1	2	3
Long term illness or serious injury S	1	2	3	4
Medical and time off work M	2	3	4	5
First aid F	3	4	5	6

Step 3 **Assessment of risk control or reduction measures**

Having determined the risks and severity it is necessary to consider and decide on the risk control measures to be implemented based on the following hierarchy of controls:-

Elimination of the hazard

This could be undertaken by not proceeding with the work, through a traffic diversion by means of a detour or sidetrack, stopping traffic for short periods using portable traffic signals in preference to traffic controllers

Engineering to minimise the risk

This could involve the use of safety barriers, lane closures, portable traffic signals, crash attenuators, increased separation etc.

Administrative or behavioural measures to minimise the risk

This could involve speed reduction, warning signs, variable message signs, police enforcement, delineation etc.



Step 4 Monitor and review

Review the traffic control measures in place to determine whether or not they were effective.

2.1.1 Dimension D (AS 4.1.5)

Dimension D is related to the speed of traffic and is defined as a distance expressed in metres. It is used for positioning of advance signs and related purposes. The signs shall be placed at specific distances apart so that road users have sufficient time to read and absorb their messages or instructions.

See also Section 3.2.3, *Advance warning sign distances*.

Determination of the value of D

Case (a) No roadwork speed zone or speed zone change

Where there is no roadwork speed zone in place or no change in the pre-existing posted speed zone the value of D will be based on the pre-existing speed of traffic which will be the greater of:-

- (i) the posted speed limit in metres; or
- (ii) the estimated approach speed of traffic in metres if it is greater than (+10%) of the posted speed limit.

For instance:-

- ◆ if the posted speed limit is 60 km/h and traffic is generally travelling at about 65 km/h or less then $D = 60$ metres;
- ◆ however, if the speed limit is 80 km/h and traffic is generally travelling at about 90 km/h then $D = 90$ metres.

Case (b) 40 km/h or 60 km/h roadwork speed zones located 100 metres before start of work

Where a 40 km/h or 60 km/h roadwork speed zone begins 100 metres in advance of the work (in accordance with Section 8.2.4 (b)) then the value of D shall be based on the pre-existing speed of traffic as in Case (a) above.

The start of the work shall be the start of transition area, traffic diversion or traffic control position.

Case (c) A posted roadwork speed zone or speed zone change

Where there is a roadwork speed zone in place or a change in the pre-existing posted speed zone the value of D shall be based on the speed of the traffic in Zone X where the speed zone change is less than 200 metres from the first advance warning sign after the speed zone sign.

This is shown in Figure 2.1.

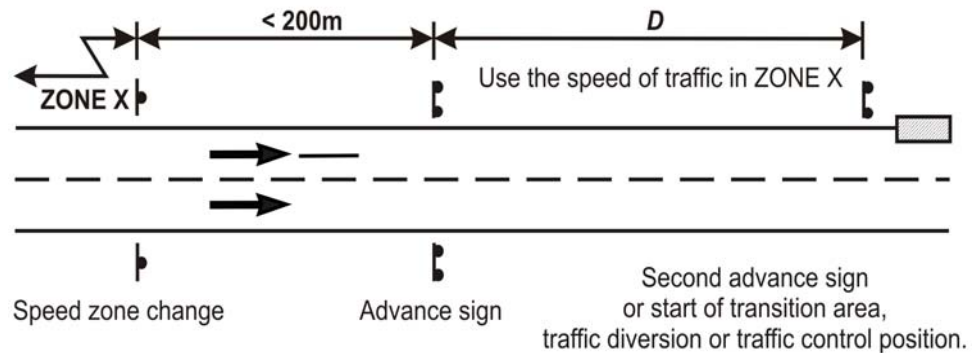


FIGURE 2.1 When the distance between the speed zone change and the advance sign is less than 200 metres, use the speed of traffic in Zone X.

Case (d) A posted roadwork speed zone or speed zone change

Where there is a roadwork speed zone in place or a change in the pre-existing posted speed zone the value of D shall be based on the speed of the traffic in Zone Y where the speed zone change is greater than 200 metres from the first advance warning sign after the speed zone sign.

This is shown in Figure 2.2.

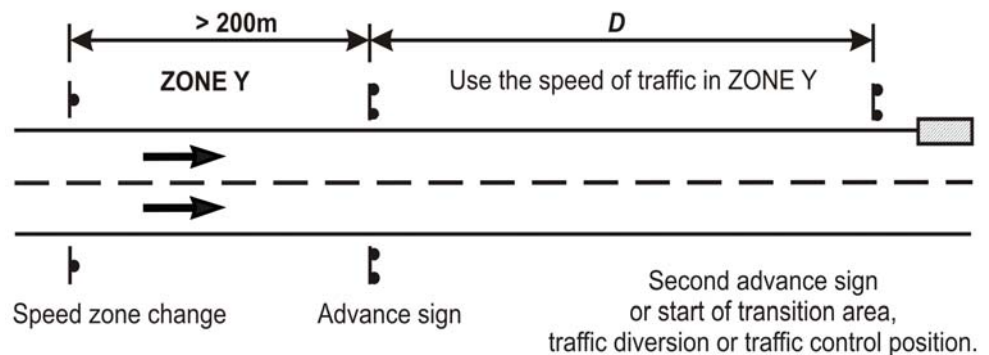


FIGURE 2.2 When the distance between the speed zone change and the advance sign is greater than 200 metres, use the speed of traffic in Zone Y.

NOTE: Having determined the values of D, based on the speed of approaching traffic above, this value shall be used to determine the any cone spacings or taper lengths as shown in Tables 5.1 and 5.2 respectively.