SAFER ROAD WORKS

A FIELD GUIDE FOR USE ON SAMOAN ROADS

2021

THE INDEPENDENT STATE OF SAMOA
MINISTRY OF WORKS,
TRANSPORT & INFRASTRUCTURE

Published by:
Ministry of Works,
Transport and Infrastructure
The Independent State of Samoa
First printed 2021

Field Guide prepared by:
Road Safety International.

This field guide is available for download on www.mwti.gov.ws

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FOREWARD

There is growing global concern about the safety of road workers and the travelling public at road work sites. Too many serious crashes occur in road work sites, with research showing the risk of serious injury in a work site is up to five times higher than on other parts of the road network. In Samoa, we recognise that road safety is important for everybody. This field guide has therefore been prepared to help make our road works as safe as practical for everybody.

It is an "easy-to-use" reference to guide engineers, contractors, supervision consultants, road workers and others to improve road safety at road work sites across our country. It is a small, ready-to-use document that offers current, practical advice about road safety for road work sites. It emphasises:

- The need to plan work sites in advance (using traffic management plans), in line with Safe System principles.
- The "four zone" concept for designing, implementing, and reviewing traffic management plans (TMP's).
- Consistency in signing work sites.
- Attention to the safety of road workers, as well as of road users.

Inside this field guide are instructions that are to be followed at road work sites across Samoa, along with some practical safety tips. This guide is an essential tool for safer road works in our country. I commend it to you; put it to good use at all road work sites.

The Honorable Minister of Works
Papaliitele Unasa Niko Lee Hang
Ministry of Works, Transport, and Infrastructure
Independent State of Samoa

CHAPTER 1

THIS FIELD GUIDE

1.1 ABOUT THIS FIELD GUIDE

This field guide is a short, practical guide for use at road work sites in Samoa. It covers typical traffic management arrangements for the types of road works commonly undertaken in this country.

The first chapter outlines the field guide and offers background reading, explaining why safety must be improved at work sites and briefly outlining the Safe System approach to road safety. The Safe System approach has been embraced by major donor organisations such as the World Bank, the UN and WHO, as the best way to achieve national road safety targets. It requires all stakeholders to review their approach to road safety and to recognise that some new safety initiatives are needed.

The second chapter explains the elements of a safe work site, such as the signs and devices that are to be used at Samoan work sites. This chapter introduces multi-message signs to Samoa and explains how they are to be used.

Chapter three explains traffic management plans (TMP's). It introduces the zone concept, outlining the four zones that are used at a typical work site. The zone concept is a fundamental part of this field guide, offering a simple but practical concept for designers and contractors to apply as they design, and implement, their traffic management plans. The chapter explains, step-by-step, how to design a TMP. As the length of the zones are based on the speed limit at the work site, this chapter offers tables to use to establish the length of each zone. It also includes a case study that takes readers step-by-step through the design of a typical TMP.

Chapter four offers a step-by-step approach to preparing a safe road work site. It takes readers through the planning, installation, operation, and removal stages of a work site. It also reminds contractors of the need to maintain documents recording the use of signs at a work site, along with any incidents at the site, for possible later use such as with police enforcement or with legal action.

Chapter five has eleven generic TMP's for use in Samoa. Many work sites are quite similar, and this series of generic TMP's will assist contractors (and others) to save time as they install consistently good quality traffic management at their road work sites. Road users respond best to consistent signage; these templates will help to achieve this.

Chapter six has two forms – the first is a Work Site Hazard Assessment for use when planning the traffic management at a work site. The other is a Daily Work Site Safety checklist for use by the safety officer during the twice-daily safety inspections. Keeping records of each inspection, the findings of each and the remedial action taken, is necessary in case of later questions about police enforcement or for later legal challenges (such as after a crash, or alleged damage to a vehicle in the work site)

Chapter seven gives instructions for traffic controllers. It is an LTA requirement that all traffic controllers have undergone approved training before commencing work.

1.2
THE NEED FOR ROAD SAFETY AT WORK SITES

Road safety at road work sites is an important but often neglected part of road construction and road maintenance in Samoa. In a small island nation, with generally low traffic volumes until recent times, it has been common to undertake road works with minimal signs and warnings. But as traffic volumes have increased, the need to manage work sites to minimise congestion as well as to maximise safety has also increased. International research has shown that the risk of a serious crash at a road work site is up to five times higher than on other road sections. It is timely to now work towards improved safety at road work sites across this country.

Road safety at road work sites can be improved at little cost. The signs, delineators, traffic control devices and the temporary safety barriers (if used) will cost at the beginning, but they can be reused at many subsequent work sites. Spread over the life of these devices, their cost is small, while their impact on safety is great.

The guiding principles of an efficient and safe work site are to:

- Warn approaching road users of the road works ahead.
- Guide the road users safely through, past or around the works.
- Provide a safe working environment for the road workers.
- Provide minimum inconvenience for the travelling public.
- Provide minimum inconvenience to the work at the site.

This field guide has been prepared to influence the design and operation of safer road work sites in Samoa. It is for use by government engineers, contractors, designers, road workers, supervision consultants, police, and others.

INTERNATIONAL RESEARCH HAS SHOWN THAT THE RISK OF A SERIOUS CRASH AT A WORK SITE IS UP TO FIVE TIMES TIMES HIGHER THAN ON OTHER SECTIONS OF ROAD.

1.3 SAFE SYSTEM PRINCIPLES

The Safe System is the guiding approach to road safety now used by international stakeholders and major development banks in their global efforts to improve road safety and reduce road trauma. It is based on the premise that road crashes are both predictable and preventable, and that it is possible to move towards zero road deaths and serious injuries.

This requires a fundamental rethink of the governance and implementation of road safety policy. The Safe System marks a shift from a focus on crash reduction to the elimination of death and serious injury. The core Safe System principles are:

- Fatal and serious injuries on the road are not acceptable. Road users have the right to travel safely, and this right must not be traded for other gains (such as traffic capacity or efficiency).
- Humans are fallible, they do not make correct decisions all the time. Human error is inevitable, which means that crashes are inevitable.
- Humans are vulnerable. As roads users, they have limited tolerance for energy in a crash before a fatal or serious injury results. Fundamental to the Safe System is minimizing energy transfer in collisions so that harm is minimised.

For a road work site in Samoa, the Safe System requires approaching drivers to be alerted to the works in sufficient time to slow to an agreed safe speed, and to comply with all the requirements displayed on the signs at the site. It is essential that speeds are managed through road work sites as high speeds lead to high energy transfer during a collision, and this leads to an increased risk of death or serious injury.

The Safe System also requires road workers to be instructed in the essentials of personal road safety, and to be visible to approaching drivers by wearing high-visibility gear.

Integrated within this approach is the need for engineers at road work sites to put themselves “into the shoes of the road user” and to empathise with their needs. An experienced engineer designing a TMP, or the safety officer setting out the signs and devices in a TMP, will always ask “What will the road user make of this? Will they understand and react correctly in time?”. If the answer is anything but a definite yes, they will continue to work until the situation is totally understandable to all.

1.4
RESPONSIBILITIES AT ROAD WORK SITES

The Land Transport Authority, consulting firms, and contractors have a responsibility to provide a safe working environment for their employees. They also have a responsibility for the safety of all other persons moving through or around road work sites under their control.

Employers must therefore ensure their supervisors and workers are professionally trained, and are provided with the correct equipment, protective clothing, and resources to permit them to carry out their work in a safe manner.

Employers shall:

- Be aware of their legal responsibility to provide safe and convenient travelling conditions for the public, and safe working conditions for personnel and machinery under their control.
- Note the provisions in this field guide, and act on them.
- Ensure that personnel involved in traffic control are aware of their responsibilities.
- Inform other stakeholders, especially local police, about the road works before they are set up.
- Inform road users of the road works. For long-term work sites information about the expected duration of the works should be posted well in advance so road users can anticipate possible effects (such as delays) and make decisions about using other routes (if any).
- Establish a position (called the safety officer) who is to be responsible for occupational health and safety as well as road safety matters during the period of the road work. This is mandatory for long-term road works.

ROAD WORKERS SHALL:

- Read this field guide and act on the relevant provisions in it.
- Wear the protective clothing provided for their safety.
- Take responsibility for their own safety by looking out for risks.
- Take care of the safety of other personnel and visitors to the work site.
- Engage only in work practices that do not put themselves or any other person at risk.
- Follow the lawful instructions of their employer in carrying out the safety requirements of this field guide.
- Immediately report any deficiencies or shortcomings with the safe operation of the traffic management plan to the safety officer.

ROAD USERS SHALL:

- Comply with all regulatory signs at the road work site.
- Take heed of all warning signs.
- Comply fully with the legitimate directions of traffic controllers.

CHAPTER 2

ELEMENTS OF A SAFE ROAD WORK SITE

Regardless of the size of the project, and how long the road works are expected to last, the key road safety elements of a safe work site are:

- Safe speeds (Section 2.1)
- Safe signs (Section 2.2)
- Safe delineation (Section 2.6)
- Safe traffic control devices (Section 2.7)
- Safe workers. All shall wear a high visibility vest while on site. For work after dark, the vest shall be fitted with reflective strips.
- Safe work site management. A safety officer, working for the contractor, shall be responsible for road safety at the work site.
- Safe road users, including pedestrians, disabled pedestrians, and bicyclists (Section 2.8)
- Safe set up and removal of each TMP (Sections 4.3 and 4.7)

2.1 SAFE SPEEDS

A 30km/h roadwork speed limit shall apply at all road work sites across Samoa, while work is proceeding.

POSTED SPEED LIMIT	BUFFER ZONE	ROADWORK SPEED LIMIT
Up to and including 30km/h (urban areas)	N/A	30km/h
Up to and including 56km/h (rural areas)	N/A	30km/h
Regardless of the posted speed limit, where 85%ile operating speeds are well above 56km/h	56km/h	30km/h

Table 1: Speed limits to be used at Samoan road works where workers are on or near the road.

When the work has ended for the day, or for the week, and the work site is closed, it is said to be in "after care" mode. At these times, workers are not on or near the road, and "after care" conditions shall apply. The speed limit during "after care" shall be 30km/h for all road work sites, unless the engineer directs otherwise.

POSTED SPEED LIMIT	BUFFER ZONE	ROADWORK SPEED LIMIT DURING AFTER CARE
Up to and including 30km/h (urban areas)	N/A	The existing speed limit
Up to and including 56km/h (rural areas)	N/A	40km/h
Regardless of the posted speed limit, where 85%ile operating speeds are well above 56km/h	56km/h	40km/h

Table 2: Speed limits to be used for "after care" at Samoan road works (when work has ended, and workers are not on or near the road)

During "after care", the speed limit may be raised to 40km/h, provided the road surface is suitable for these speeds. If the road surface is uneven, slippery, or too rough and vehicle speeds need to be managed, the engineer may direct the road work speed limit to be retained.Additional warning signs should be used to explain this to drivers.

During "after care" times, all "Roadworker" signs should be removed (or covered) as they are not relevant when workers are not on the site. Consistent application of signs is vital to establish trust with the road users.

Roadworker warning signs should only be displayed when workers are on-site.

To leave them out at other times brings disrespect for this sign and eventually for other road signs as well.

2.2
SAFE SIGNS

Road signs are important devices at road works. They should be used consistently and correctly as drivers take in 90% of the information they need through their eyes. It is therefore vital to give careful attention to the type of sign used, its condition (reflective, clean, and undamaged), and its location according to the TMP. If a sign is missing, damaged or non-reflective it is to be replaced immediately.

Signs and delineators are used to warn, inform, guide and control drivers/riders through road work sites. The signs used at road works must comply with current Samoan sign standards. The Samoan sign standards are based on Australian and New Zealand Standards, particularly AS 1742 (Parts 1-14) which is the Manual of Uniform Traffic Control Devices.

The contractor shall:

- Use only reflective signs, with Class 1 reflective sheeting for legends/ symbols and Class 2 reflective sheeting for background.
- Preferably use multi message frames and signs.
- Place signs correctly and safely. Exact locations shall be in accordance with the approved TMP. Signs shall be placed at least 1m clear of traffic paths.
- Ensure that all signs satisfy the 6C's of good signage (see the table later in this field guide).
- Ensure that existing signs and line markings that may give contradictory guidance or warnings, are covered, or removed before work commences.
- Ensure that all road work signs are within the driver's line of sight. They must not be blocked by trees, grass, works vehicles, machinery, or other obstructions.
- Not allow any sign to obscure a driver's view of another sign, or to restrict sight distance for drivers entering from side roads or private driveways.
- Check to be sure that signs will not divert traffic into wrong or dangerous paths.
- Check the correctness and condition of each sign twice every day (at the beginning and the end of the shift).
- Never cause drivers/riders to disobey road rules by using signs incorrectly. Ensure, for example, that traffic diversions do not force drivers and/ or riders to cross double lines, or to disobey regulatory signs.
- When the work is finished for the day, place the site into "after care" by removing (or covering) all signs that are not needed.
- When the site is in "after care", return the road to the posted speed limit if the road surface is adequate.

2.3

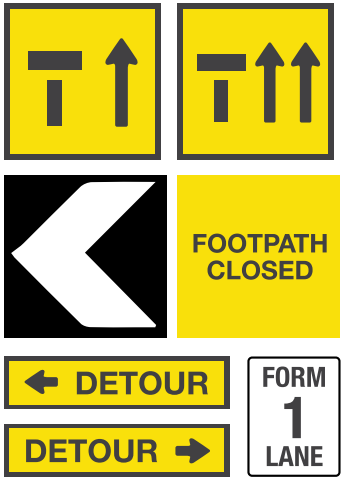
SIGNS FOR USE AT SAMOAN WORK SITES

Regulatory signs – these signs require compliance by drivers and are enforceable by police. Failing to comply with a regulatory sign can lead to fines, and sometimes cancellation of a driver's licence.

Warning signs – these signs warn of unexpected hazards on or near the road ahead. They are typically used in road work sites to warn of changed conditions ahead.

Some of the warning signs used at Samoan road works. These examples are for use in modular multi-message frames

Traffic instruction signs – give instructions to drivers and others on where to go and what to do. They are not regulatory and cannot be enforced but they offer useful instructions that assist road users.



Some of the traffic instruction signs used at Samoan road works.

2.4
MULTI MESSAGE SIGNS

Multi message signs are lightweight modular steel frames into which plastic coated road signs are inserted according to the requirements of a TMP.

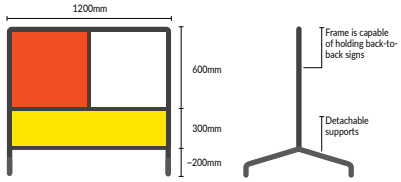
The frames are 1200mm wide and 900mm high and are designed to have two 600mm x 600mm square signs placed along the top with a 300mm x1200mm sign along the bottom.

The frames have detachable legs which can be widely spread apart to provide support in windy conditions. Multi-message signs offer a lightweight option along with flexibility and speed in changing the safety messages.

The plastic-coated signs are thin and lightweight. The multi-message sign frame is deep enough for back-to-back signs to be inserted so that warnings, speed limits and other messages can be presented to drivers from two directions. This means that the rear of the multi message signs on the approach to a worksite may serve the drivers from the other direction.

Multi-message signs are simple, practical, and easy to use. They have become the most common type of sign at road work sites in Australia and New Zealand, and they are now authorised for use at road work sites in Samoa.

They are the recommended type of road sign for use at road work sites as well as for other intermittent occasions (such as festivals) where temporary road signs are needed.



Dimensions and arrangement of a multi message frame for use with multi message signs

2.5
HOW TO USE MULTI MESSAGE SIGNS

Consistency is an essential feature of road work sites. Once drivers become accustomed to seeing the same sign for the same traffic situation, they can respond more quickly and more correctly. Consistency in signage is something engineers should strive to achieve everywhere on the road network, and at road works especially.

- Multi-message signs shall be 1200x900mm modular signs.
- Duplicate signs (each side of the road) are to be used on divided roads, and all roads that have operating speeds above 60km/h.
- When in use, all three cells of the frame shall be filled.
- Regulatory signs (usually speed restriction signs) are to be placed in the upper cell, and closest to the road.
- Warning signs are placed in the other upper cell.
- The first multi message sign in a series shall have a pair of orange flags fixed to the top of the frame to aid conspicuity.
- The reverse side of the multi message frame may be used to provide information to road users from the other direction.
- Each frame shall be fixed to the ground (with weights if necessary) to minimise the risk of being blown over.

THE SIX C's OF GOOD ROAD SIGNS

TO BE EFFECTIVE, ALL SIGNS AT ROAD WORK SITES SHOULD CONFORM TO THE SIX C'S OF GOOD SIGNAGE.

SIGN MUST BE	SIGN REQUIREMENT	CONTRACTOR TO ENSURE
Conspicuous	Each sign shall be readily seen.	That all signs can be seen by approaching drivers. This requires signs to be reflective, in good condition, and suitably located.
Clear	Each sign shall be clear and easy to read.	All signs are to be kept in good, clean condition.
Comprehensible	Each sign shall be easy to understand.	All signs comply with Samoan standards (or Australian/NZ standards if local ones do not exist).
Credible	Each sign shall be believable to road users.	No sign shall be used that does not show a credible (believable) message.
Consistent	The same signs shall be used for the same situation at all road works across the country.	That only standard signs are used at road work sites, allowing drivers to quickly understand the message and act correctly. Consistent sign colour, shape, and message reduces driver reaction times, improves driver understanding and increases safety.
Correct	The sign shall be the correct sign for the situation. (Some warning signs appear similar but have different meanings).	That only correct signs are used. If the correct sign is missing, get one quickly and install it.

2.6 SAFE DELINEATION

Contractors shall ensure that:

- The work zone and taper zone (if any) shall be clearly delineated with reflective devices including soft plastic bollards, guide posts, hazard markers and other approved devices.
- Plastic bollards 1m high, with Class 1 reflective bands are the preferred delineator to delineate the traffic path into, through and out of the work site. Alternatively, plastic traffic cones, at least 450mm high, with Class 1 reflective bands may be used.
- All signs and delineators that are used at night shall be reflective with at least Class 1 grade reflective words and symbols on a Class 2 grade retro-reflective background. All sign faces are to be maintained in clean, undamaged condition.
- All tapers are to be installed according to the TMP. Drivers and/or riders need long tapers that allow time and distance for them to diverge.
- No alternative paths for road users shall be allowed. Any possible optional routes are to be closed off with delineators and signs.
- All delineators shall be maintained in good, clean condition.

Objects such as concrete blocks, rocks, oil drums, or tree branches are hazardous and must not be used for delineation at road work sites.

Figure 6: Typical delineators for use at work sites

2.7 SAFE TRAFFIC CONTROL DEVICES

Contractors shall ensure that:

- All regulatory signs and traffic control devices used comply with current Samoan road rules and/or Samoan national standards.
- A traffic management plan is designed, and approved by the client, prior to work commencing.
- Machinery, vehicles, stock piles of gravel, sand, steel bars or any other materials are not stored inside the "buffer zone" around the work zone.
- The road is swept clear of sand, mud, and gravel. This is especially important if the speed limit will be returned to the normal limit during "after care".
- Dangerous items (such as concrete blocks, tree branches, or star pickets) are not used at the work site.

2.8
SAFE ROAD USERS, INCLUDING PEDESTRIANS AND BICYCLISTS

Pedestrians and bicyclists are legitimate road users. They are to be considered and accommodated at all work sites.

Where pedestrians, including people with disabilities, must move through or around a work site, they shall be provided with suitable temporary footpaths and crossings. Temporary footpaths are to provide an all-weather path on an alignment that is suitable for the pedestrians (including those in wheelchairs). The footpath should be away from moving traffic and separated from it by the work zone. It should not have any "squeeze points" that could restrict the movement of disabled pedestrians.

If speeds are restricted to 40km/h (or less), pedestrians may alternatively be separated from moving traffic by plastic delineators and a lateral width of at least 1.5m.

If a clearance of at least 1.5 m between the traffic and the pedestrians cannot be achieved with plastic delineators, and/or the speed of traffic is above 40 km/h, a correctly installed safety barrier shall be used to shield and protect the pedestrians. This is especially important on roads that serve schools or are used by many children daily.

Bicyclists are also vulnerable road users; they need a smooth surface on which to ride, with no "squeeze points". In low traffic volumes it is often acceptable to allow bicyclists to ride in the traffic lane.

However, as traffic volumes increase this will bring with it increased risk. Therefore, it is desirable to assist bicyclists to use the pedestrian path if possible. This may mean widening the path (to a minimum of 3m wide) to allow for both users. The path will need to have a compacted all-weather surface.

During the twice daily site inspections by the safety officer, the surface of the path should be inspected to assess its suitability for bicyclists and the disabled. The inspections should also ensure that the work zone, signs, machinery or materials do not create sudden "squeeze points" for bicyclists or those in wheelchairs.

CHAPTER 3

TRAFFIC MANAGEMENT PLANS

3.1 WHAT IS A TRAFFIC MANAGEMENT PLAN?

A traffic management plan (TMP) is a plan that shows clearly all of the signs, barriers, barricades and other devices that are to be installed and maintained at a work site for the duration of the works.

It is prepared by the contractor and must be approved by the client (or the representative of the client) before it is implemented and before the works may begin.

A TMP should be prepared by a person who is suitably experienced and competent in traffic management, with solid experience in road works including the type of TMP required. Consultation with workers who have experience working on trafficked work sites is also helpful in ensuring that a practical and appropriate TMP is prepared.

A TMP should be prepared for all road works – both short-term and long-term (See Section 4.1). The amount of time and resources given to preparing each TMP will vary according to the project; for example, a TMP for a short-term road work task will usually require much less time and resources to design than for a long-term road project.

For short-term works (both stationary and mobile), a TMP should be prepared and submitted for approval to the engineer managing the work. The TMP may be brief and it may be generic.

If the work has a number of stages, there should be a TMP for each stage that is expected to last longer than one week.

A TMP shall include full details of the signs/devices to be used to manage traffic through the work site outside normal working hours ("after care") when workers are not present. This may include the replacement of any signs that are not applicable at those times, particularly temporary speed limit signs and roadworker signs.

In developing a TMP, the contractor shall consider the staging (sequence) of the road works, and the work that is to be done in each stage. This helps the contractor to be clear about the staging of the work and the resources needed. It also causes the contractor to think carefully about what will happen to the traffic. For example, the contractor should ask:

- Will the lanes be narrowed?
- Will any lanes need to be closed?
- Will there be detours?
- Will there be any temporary diversions or by-passes?
- Will there be intermittent closures?
- Will the shoulders (or median) be used by traffic?
- Will there be a median crossover, with contra-flow operation?

A TRAFFIC MANAGEMENT PLAN (TMP) IS A DRAWING (OR SERIES OF DRAWINGS) SHOWING THE TRAFFIC CONTROL DEVICES PROPOSED FOR USE AT A WORK SITE, TOGETHER WITH A LIST OF THE WORKS PROGRAMMING STATING THE DAYS AND TIMES THE WORK SITE WILL OPERATE.

3.2
TRAFFIC MANAGEMENT PLANS MUST BE APPROVED

Contractors shall submit a TMP to the client (either the LTA or the Government's Evaluation Committee) at least ten working days before the expected commencement of the works (or of a significant new stage of work). In this time the client shall assess the TMP, meet (if needed) with the contractor's safety officer to discuss the TMP and either approve or reject the TMP. If a TMP is rejected by the client, it shall be revised as recommended and quickly re-submitted for approval.

Only when the TMP is approved in writing by the client may it be installed, and the road works commence.

Prior to the work commencing, and after the TMP has been approved in writing by the client, the contractor's safety officer shall inspect the site to determine the exact location of all signs, devices and delineators for the first stage of the work.

A new road safety audit should be carried out whenever the road works advance from one significant stage to another or whenever there are major changes to the present traffic management plan. In general, this means that a new safety audit should be undertaken when the road works require a significant change for a period of at least one week. Significant may mean a change from one side of a road to another, or any new arrangement that will require a changed TMP.

3.3
THE ZONE CONCEPT

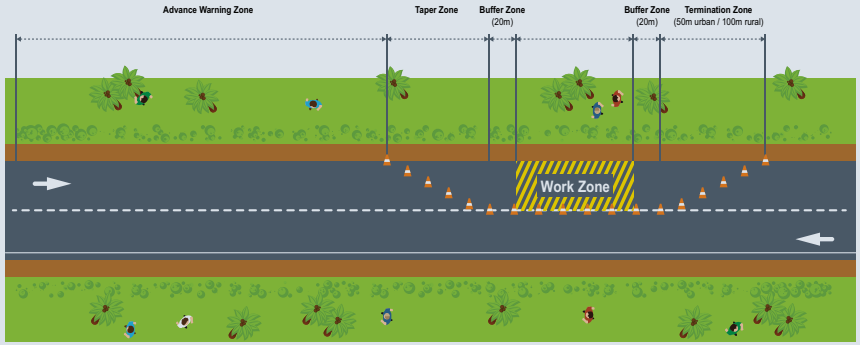
The zone concept is a method of breaking a work site down into four individual zones. Each one has a particular purpose to guide and control road users as they approach, pass through and depart a work site. The four zones are detailed in the next table. The length of each zone depends on the approach speed of vehicles.

The 'zone concept' breaks a work site down into four separate zones, providing a simple, clear way to think about the traffic management plan.

A TMP shall show clearly that these four zones have been considered during the design of the TMP. It shall show that signs, delineators, and other safety devices have been planned around these four zones.

THE FOUR ZONE CONCEPT

ZONE	PURPOSE OF THIS ZONE
Advance warning zone	To alert drivers and/or riders to the road works ahead, and to instruct them how to safely proceed. The signs shall advise of speed restrictions, lane closures, lane narrowing's, traffic controllers and more.
Taper zone (Used only where there is a need to direct traffic into another lane).	To guide drivers and/or riders into the correct lane in which to pass safely through or by the work zone. If the work is not causing any change to the traffic path this zone is not necessary.
Work zone (This is the zone where the work is being carried out – it can range from a few metres up to several kilometres long)	To control drivers and/or riders through the area where the work is taking place at a speed and in a lane that is safe for them and the workers. A buffer zone is included within this zone that serves as a buffer surrounding the workers. It is always 20m in front of the work zone and 1.2m along the side of the zone.
Termination zone	To inform drivers and/or riders that they have departed the work zone, to inform them of the speed limit that applies on the road ahead, to either thank them for driving carefully through the works, or to remind them to always drive safely. This zone is always 50m long where the normal posted speed zone is 40km/h or less, and 100m long in higher speed zones.



Diagrammatic representation of the four zones at a road work site.

3.4 THE ADVANCE WARNING ZONE

The function of an advance warning zone is to give advance warning to drivers and/or riders of the road works ahead. Drivers/riders need to see the signs, understand the road conditions ahead and know what is expected of them to safety move through or past the work site.

A common failing is to place advance warning signs only a few metres in advance of the works. This is inadequate and unsafe. The advance warning signs must be located well in advance of the works site so that drivers and/or riders are given adequate time to recognise the work site and to slow down (and to diverge if necessary).

Any speed reduction required at any work site must be implemented and achieved within the advance warning zone. The length of an advance warning zone is therefore dependent on the operating speed of traffic on the approach to the start of the zone, along with the response that is required from a driver by the end of the advance warning zone (to pass through the work zone at/below the road work speed limit, or to stop at the direction of a traffic controller).

On roads where sight lines to the advance warning signs may be obscured (due to horizontal or vertical curves, or vegetation, or parked vehicles), it is good practice to place "early warning" signs ahead of the start of the Advance Warning Zone. These "early warning" signs alert drivers to the regulatory signs that commence the Advance Warning Zone. They are a standard distance of 50m ahead (in urban areas) and 100m ahead (in rural areas) of the Advance Warning Zone.

EARLY WARNING SIGN

APPROACH OPERATING SPEED KM/H	DESIRED SPEED OF 30 or 40km/h	DESIRED 0km/h (STOP)
30	30	75
40	30	75
50	30	75
60	60	100
70	120	160
80	170	225

Table 3: Minimum length of the advance warning zone

Any speed reduction required at a work site must be implemented and achieved within the advance warning zone.

3.5 THE TAPER ZONE

The taper zone is the section of the work site where drivers are directed away from their normal path of travel. If no diversion is needed at a work site, this zone is not necessary and the advance warning zone leads straight into the work zone.

Drivers/riders must enter the taper zone (or if there is no taper zone, the work zone) at or below the posted road work speed limit.

The road work speed limits in Samoa (unless otherwise approved by the client) are 30km/h at work sites while work is proceeding, and 40km/h at work sites during “after care”.

If no diversion of traffic is needed at a work site, a taper zone is not necessary. In such cases, the advance warning zone leads straight into the work zone.

Any taper that is needed to guide drivers to a new travel path clear of the worksite is to be provided fully within the taper zone. The full length of the taper should be visible to approaching motorists.

There are two types of tapers:

- A diverge taper shifts a line of traffic sideways when it does not need to merge with another line of traffic travelling in the same direction.
- A merge taper shifts a lane of traffic sideways where it must join (merge with) another line of traffic travelling in the same direction. A merge taper requires a longer distance because drivers are required to combine two lanes of traffic into one.

The length of a taper depends on the width of road that is to be closed.

APPROACH SPEED ENTERING THE TAPER ZONE (KM/H)	DIVERGE TAPER (M)	MERGE TAPER (M)
Less than 45	50	80
46-55	50	100
55-65	60	120
65-75	70	140
75-85	80	160

Table 4: Recommended lengths of taper zones

NOTE:

The taper zone lengths are based on:

- Width of lane to be closed typically 3.5 m;
- Diverge taper length equivalent to 1.0 m/s lateral shift;
- Merge taper length equivalent to 0.6 m/s lateral shift; and
- 85th percentile operating speed of traffic (not speed limit) as it approaches the taper zone.

3.6
THE WORK ZONE

The work zone is where the work is carried out and where there is the greatest risk of a vehicle coming into direct contact with workers or work equipment. This zone may range from just a few metres in length (for culvert works) to several kilometres in length (for resurfacing work).

It includes the work area plus a small surrounding area (called the buffer zone) that should be kept clear of machinery, materials, moving traffic and roadside hazards. The buffer zone is an area (20m in front of and 1.2m beside the work zone) between the vehicles and the workers at the work zone. The buffer zone offers one last "buffer" in case an errant vehicle leaves its defined path and travels towards the work zone. The buffer zone is kept free of materials and machinery to minimise the risk of collisions in such situations.

Vehicle speeds must be controlled past the work zone to further reduce the risk that a vehicle may inadvertently enter the work zone.

If the work involves excavations more than 2m deep, and if these excavations are within 3m of a traffic lane, suitably installed removable safety barrier should be used to shield the excavations from errant vehicles.

3.7
THE TERMINATION ZONE

The termination zone is where traffic resumes normal operation after passing the work zone. This zone advises road users that they have reached the end of the work site and that they may return to their normal driving conditions. Signs are used to inform drivers of the ending of the road work speed limit and of the start of the next speed limit (usually returning to the posted speed limit).

A standard termination zone length of 50m (in urban areas) and 100m in rural areas shall be used in Samoa.

3.8
HOW TO DESIGN A TRAFFIC MANAGEMENT PLAN

Designing a traffic management plan comes down to three tasks:

1) Agreeing the type of traffic control to be used (Give Way sign, traffic controller, signals?)

2) Establishing the length of the zones, and

3) Correctly using the correct signs for each zone

An experienced member of the contractor's team (usually the contractor's safety officer) will make decisions on each of these issues and use these to design a TMP for the road works.

The designer will use the four-zone concept and will consider a wide range of questions before finalising the TMP, including:

- The times for conducting the works (day or night operation).
- The road work speed limit to be used (Section 2.1)
- The zones to be used. Will a taper zone be required?
- The length of each zone (based on the approach speeds), and whether nearby features (buildings, side roads, vegetation) will complicate the start/end of each.
- The need for traffic controllers (number and location) for each stage of the work.
- Provision for large (long) vehicles.
- Provision for pedestrians (including the disabled), and bicyclists.
- Access to abutting properties and businesses?
- Potential for stationary traffic to queue back into conflict areas (such as onto a narrow bridge).
- Arrangements to address and monitor the risk of end-of-queue collisions due to a build-up of traffic at work sites.

- After care arrangements at the work site (when workers will not be present at the site).
- Emergency contact details, including local police, ambulance, and the client's project manager.
- Traffic volume and approach speed – higher speeds and higher volumes generally increase the risk at a site.
- Will road geometry reduce sight distance? Will it increase the risk of "surprises" for road users?
- Sign type and placement. Will all the signs satisfy the 6C's of good signage?
- Are there any conflicting signs or markings that need to be covered or removed?
- What delineation will be necessary to clearly show drivers/riders where they must travel, with no options.
- Will the works allow enough remaining width to permit adequate lane widths?
- Can roadside hazards be removed or shielded?
- Will safety barriers be needed? If so, can they be correctly and safely installed?
- Have workers been trained in worksite safety? Do they have high visibility vests to wear? Are traffic controllers correctly equipped?
- Construction entry and exit points. How will these be closed to non-work traffic?
- Detour signing, if needed.

3.9
A CASE STUDY

Each traffic management layout is measured from the work zone along the road towards approaching traffic.

- First, measure a consistent buffer zone (20m) back from the work zone.
- From there, add on the required length of the taper zone (if one is needed).
- Then add on to that the required length of the advance warning zone.

Here is a case study showing how to establish the lengths and layout required for a TMP.

A culvert is to be constructed across a two lane, two way rural road, where the 85%ile operating speed is around 70km/h. The work will close half of the highway at a time (for approximately 2 weeks each side) and will require traffic in one direction to diverge by 4m and give way to on-coming traffic.

Because of the traffic volumes on this road, and the limited road reserve, it is decided to use two traffic controllers to provide positive control during the single lane operation.

From Tables 3 and 4 (above) the following lengths will be needed for each zone for the first direction:

Buffer zone – 20m

Taper zone - 70m

Advance warning zone – 160m (as some drivers will need to stop to comply with the traffic controller, and to let traffic from the opposite direction pass).

Total length of the roadwork for the first direction = 20 + 70 + 160 = 250m (measured out from the culvert works).

In addition a 100m termination zone (beyond the culvert works) will be necessary.

The signs needed for this first approach are:

Advance warning – to warn of a traffic controller ahead, a 30km/h speed restriction and prepare to stop.

Taper zone – enough traffic cones/ bollards to show the taper from the left side of the road to the centreline.

Termination zone – end road works, the speed limit for the road ahead, and a note to thank drivers for driving safely.

From Tables 3 and 4 (above) the following lengths will be needed for each zone for the second direction (which will not require a taper zone as traffic from this direction will not need to change lanes):

Buffer zone – 20m

Taper zone - 0m

Advance warning zone – 160m (as some drivers on this second approach will need to stop to comply with the traffic controller.

Total length of the roadwork for second direction = 20 + 0 + 160 = 180m measured out from the culvert works.

In addition a 100m termination zone will be necessary.

The signs needed for this second approach are:

Advance warning – to warn of a traffic controller ahead, a 30km/h speed restriction and prepare to stop.

Taper zone – not needed on this approach as traffic does not need to change lanes to pass the work zone.

Termination zone – end road works, the speed limit of the road ahead, and a note to thank drivers for driving safely

CHAPTER 4

PREPARING A SAFE ROAD WORK SITE

The following diagrams show typical setting out details for common road work situations in Samoa. They have been prepared as "ready-to-use" TMP's for the most common types of road works on Samoan roads.

EFFECTIVE, EFFICIENT AND SAFE TRAFFIC MANAGEMENT OF A WORK SITE INVOLVES:

PLANNING
Will the works be long term, or short term?
What options are there for managing the traffic?

DESIGN
Preparing a TMP, and having it approved.

INSTALLATION
Setting up the approved TMP on site and checking it for compliance.

OPERATION
Operating the work site safely and in accordance with the approved TMP. Twice daily checking of the signs and devices.

REMOVAL
Removing all the signs and devices.

DOCUMENTATION
Keeping good records of the inspections and any incidents or collisions.

4.1 PLANNING

This is a critical element of good work site traffic management, because it means that the correct equipment, personnel, and associated safety issues are considered prior to the work commencing. The main aim in planning is to minimize any disruption to traffic or the road works, while providing a safe environment for all.

There are four types of road work:

- Very short-term works – works which take no longer than five minutes to complete.
- Short term works – sites where a traffic management plan is required only while work personnel are in attendance and is generally limited to the duration of a single work shift or lesser period where road conditions are returned to normal.
- Long term works – sites where a traffic management plan is required to operate both day and night and may be left unattended (at night or on weekends).
- Mobile works – works which entail vehicles moving along the roadway continually at a speed significantly lower than other traffic and obstructing or partially obstructing traffic lanes.

Planning step 1: Consider the risks

Potential risks at the work site include:

- High-speed and/or high-volume traffic through the work site.
- Narrow road, with no escape route.
- Poor advance sight distance to the work site.
- Workers close to passing traffic.
- Unshielded hazards.
- Excavations close to traffic.
- Rough, dusty or unsealed road surface (due to the road works).
- Loose material on the road surface.
- Works vehicles entering / leaving the work site.
- Bicyclists / pedestrians (including disabled) passing through the work site.

Planning step 2:

Consider possible risk control measures.

Appreciating the risks from step 1, decide how these may be eliminated or controlled. There are three measures:

Risk elimination - can the risk be eliminated by:

- closing the road for the duration of the works?
- diverting traffic away from the worksite?
- constructing a sidetrack?

Engineering controls - what engineering measures or devices can be implemented to control the risk?

- lane closures?
- increased clearance to the worksite?
- safety barriers?

Regulatory controls - what can be done to control driver behaviour through the work site?

- speed restrictions?
- signs?
- traffic cones and bollards?
- traffic controllers?
- portable traffic signals?
- delineation of the travel path?
- variable message signs (VMS)?

Planning step 3:

Decide which risk controls to use.

List the risks that will be present at the work site and determine which risk controls will be applied to address each one. Do this in consultation with those who will be working on the site or supervising the works. For most Samoan road works, the controls implemented are a combination of:

- A reduced speed limit in the work site.
- Warning signs
- Clear delineation.
- High visibility clothing for all workers.

On occasions, there may also be a need for:

- Lane closures, traffic diversions and/or detours.
- Safety barriers (if there will be deep excavations or if workers will be within 1.5m of moving traffic).

Depending on the works being undertaken, the next decision usually relates to how the traffic can best be managed:

- Through the work zone
- Adjacent to the work zone
- Via a detour or sidetrack (temporary road) around the work zone.

The safest approach is usually to close the road and to direct traffic to use a detour or at least to travel along a side track (temporary road). This approach is usually also the most expensive, but it is worth considering for large, long-term road projects.

If the work is short term, then generally the traffic will be managed adjacent to or through the work zone. Taking traffic through the work zone is usually the most hazardous. If this option is used, care must be taken by all works personnel to ensure the safety of people in and around the work zone.

When these fundamental decisions are settled, a traffic management plan is developed for each major stage (lasting one week or longer) of the works.

4.2 DESIGN

A traffic management plan (TMP) is a plan that shows clearly all of the signs, barriers, barricades and other devices that are to be installed and maintained at the work site for the duration of the works. Full information about the four zones at a work site, and how to design a TMP, is given in chapter 3 of this field guide.

4.3 INSTALLATION

The safety officer shall ensure an adequate supply of multi-message frames, signs, plastic bollards, traffic cones, delineators, and Stop/Go batons as well as all the required personal protection equipment (especially reflective safety vests) that will be needed at the site. Most of these may already be available in the contractor's depot, but some may not. And a ready supply of replacement devices (to replace damages or stollen devices) is a good insurance policy especially for large, long-term works.

All road work signs are to be in place before work starts. Signs should be placed where drivers can see them and where they will not be obstructed from view by vegetation, structures, machinery, or parked vehicles. They should:

- Not cause a hazard to traffic
- Not adversely affect pedestrian traffic
- Not obscure a driver's vision
- Not adversely affect adjacent properties or businesses
- Not cause confusion with any other permanent signs. Some permanent signs may need to be temporarily removed or covered to avoid this.

Signs erected on posts shall generally be at the following heights (measured from the underside of the sign):

- Rural - 1.5 metres above the roadway
- Urban - 2.2 metres above the kerb, or footpath

Signs should be installed approximately 1m. from the edge of the road (or from the edge of the traffic lane).

Before work commences, and to ensure the correct spacing of each device, all the required signs and delineators are set out along the footpath (or road side) in accordance with the approved traffic management plan. This helps to minimise the time taken to complete the setting up once the first signs are placed onto the road. It also serves as a final check that the location for each sign will allow clear conspicuity of the sign for approaching drivers and riders.

When all signs and delineators are in the correct order, and at the correct distance from the work zone, begin moving them onto the road. Start with the signs that are furthest from the work zone and move in towards the work zone.

- Begin by placing the advance warning zone signs onto the road. This give a level of security as the remaining signs are put into place.
- Place the signs for the taper zone (if required) and/or the start of the work zone.
- Install all delineators required for the taper and the work zones.
- Place any other warning and/or regulatory signs including termination and end of temporary speed zone signs.
- Cover any permanent regulatory signs that conflict with the traffic management plan.
- Check all side roads and place an advance warning sign some 50m (more if high speeds are common on the side road) in advance of the intersection to alert drivers of the road works on the main road.

As soon as the traffic management plan is implemented, it must be inspected to ensure that it is set up as approved. This inspection should take place before any work commences on site. If changes are required, these shall be made immediately. The safety officer is responsible for this initial inspection, and he/she should "step into the shoes of the road user" and look for safety concerns – signs that are missing, signs that are wrong, tapers that are too short and items that are hazardous. Where the signage will be used at night, another inspection shall be done after dark on the first night.

The safety officer should drive through the site to check the setting up and to be sure:

- traffic controllers are equipped and in place.
- the work site has the correct 30km/h speed limit.
- Symbolic Roadworker signs are shown only when road workers are onsite.
- Symbolic Traffic Controller and Prepare to Stop signs are used in combination if a traffic controller will be stopping traffic.
- If traffic is not going to be stopped, the symbolic Traffic Controller and Prepare to Stop signs shall be removed. Instead, place a symbolic Roadworkers sign in the multi-frame with a 30km/h work site speed limit sign.
- The 5m typical spacing for traffic cones (or bollards) applies.

The signs and devices are then to be checked twice each day (before and after work) for effectiveness and correctness. For example, the safety officer needs to check they are still in their required position and are clean enough to remain readable. Are any signs missing? Any rectifications or replacements needed must be made straight away.

4.4 ROAD WORKS HIDDEN AROUND CURVES

Where a work site is located around a curve, one or more of the zones should be extended towards on-coming traffic so that the signs are positioned where drivers/riders can clearly see them, be alerted to the works ahead and to the correct path to take. Usually this is best done by ensuring the advance warning zone begins on a straight section of road with good visibilty. If a lateral shift is needed, the taper zone should also start on the straight and extend as necessary to lead into the work zone.

4.5 OPERATION

The contractor's safety officer is responsible for twice daily inspections of the traffic management signs and devices. Any findings (about missing signs, damaged tapers, or other issues) shall be recorded in the Daily Worksite Safety Inspection Form provided in chapter 6 of this field guide. The safety officer shall ensure that any cleaning and replacing of damaged signs is undertaken on the same day to ensure continued effectiveness. Missing signs shall be replaced straight away.

The road surface on which traffic is travelling through or around the worksite shall also be inspected to ensure it is kept in a safe operational condition. Similarly, paths used by pedestrians, the disabled and bicyclists shall be inspected to ensure they remain operationally adequate for these vulnerable road users.

Large projects involving long term works often involve changing circumstances within the worksite, requiring a need for modifying the zones, removing a sign or a series of signs. This may be either temporary change, or a more permanent setting up of a new TMP. If a new TMP is required to be set up for more than one week, it shall require approval from the client prior to that stage of work commencing.

At any time when the road works stop (overnight, public holidays, weekends) all signs are to be placed into "after care" mode. Retain all necessary warning signs that warn approaching drivers of unsealed roads, single lane operation or other critical issues for the "after care" times.

During "after care", remove (or cover) any signs that are only needed when work is taking place (such as "Prepare to Stop" or "Roadworker" or "Traffic Controller Ahead" signs). Such signs shall be re-installed before work restarts.

4.6 REGULAR SURVEILLANCE

Surveillance inspections of the signs and devices should be conducted on a regular basis throughout the duration of the road works, and this shall be at least twice a day. It is best if the safety officer inspects the TMP each morning before the work commences. If any signs are damaged, or if bollards have been knocked over during the night, these need to be rectified and recorded. Written records (dates/ times/ findings/ engineers involved) are to be made and retained for future reference (see section 4.8).

The surveillance inspection should be repeated at the end of the work day (or during night-time if work is continuing). The surveillance should look at the traffic management from the road users' point of view.

SAFETY OFFICERS PUT THEMSELVES IN 'THE SHOES OF THE ROAD USERS' TWICE DAILY AND LOOK FOR SIGNS THAT ARE MISSING, SIGNS THAT ARE WRONG, TAPERS THAT ARE TOO SHORT AND ITEMS THAT ARE HAZARDOUS.

4.7 REMOVAL

The removal phase takes place once the road works have ended. The traffic management arrangements that existed while works proceeded (maybe for months at some long terms works) are removed in this phase.

The most critical safety issue during this phase is to avoid taking away necessary signs and/or delineators that may leave hazards exposed, even for a few minutes!

It is best to remove the signs and devices from the work site in the reverse order to the setting out of the site. Working in this direction provides some protection for the workers who remain on the site.

- First, remove all signs and delineators in the work zone.
- Work outwards from the work zone.
- Remove cones and other delineators from the taper zone.
- Remove all remaining signs, including advance warning and regulatory signs. The advance warning signs are the last to be removed.
- Uncover/ reinstate any permanent signs that were hidden from drivers during the works.

Signs and devices should be removed from a work site as soon as practicable after the work is finished. However, make sure that appropriate signs remain in place until all work (including loose stone removal and line marking) has been completed.

Finally, the safety officer should drive through the entire worksite to make sure all signs have been removed and that the road is safe for regular traffic use to resume.

4.8 DOCUMENTATION

The safety officer shall document the types and locations of every roadwork sign (and other devices) used at the worksite for future reference. Collisions, or damage to vehicles due to the road works or machinery, can lead to legal requests for such information even after the work is finished.

This documentation, including times of inspections or changes to work site arrangements, should be gathered, and updated regularly. A photographic record of the layout of signs and traffic control devices can be a valuable addition to the documentation.

A Worksite Safety Assessment form is included in chapter 6 of this field guide to assist with documentation of the planning stage of a work site.

A Daily Worksite Safety Inspection Form is also included in chapter 6 to assist in the documentation from the twice daily inspections.

CHAPTER 5

GENERIC TRAFFIC MANAGEMENT PLANS

The following diagrams show typical setting out details for common road work situations in Samoa. They have been prepared as “ready-to-use” TMP’s for the most common types of road works on Samoan roads.

FIGURE 1

WORKS BESIDE THE ROAD OR ON THE SHOULDER

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

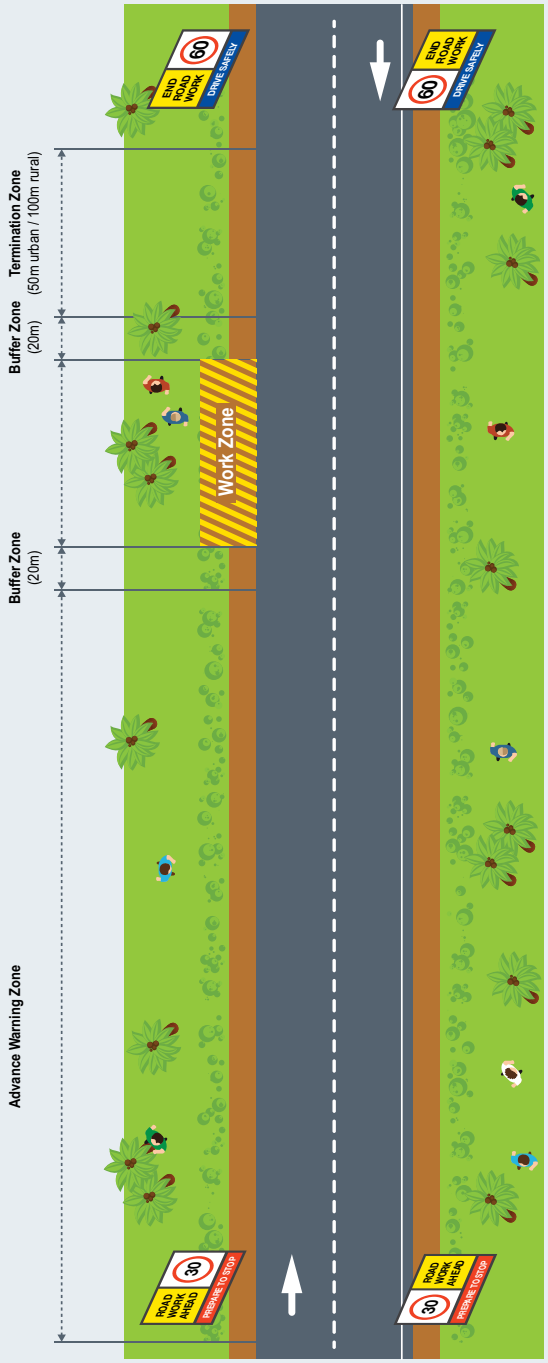


FIGURE 2

WORKS OCCUPYING ONE LANE BUT WITH SUFFICIENT ROAD WIDTH TO RETAIN TWO-WAY TRAFFIC

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

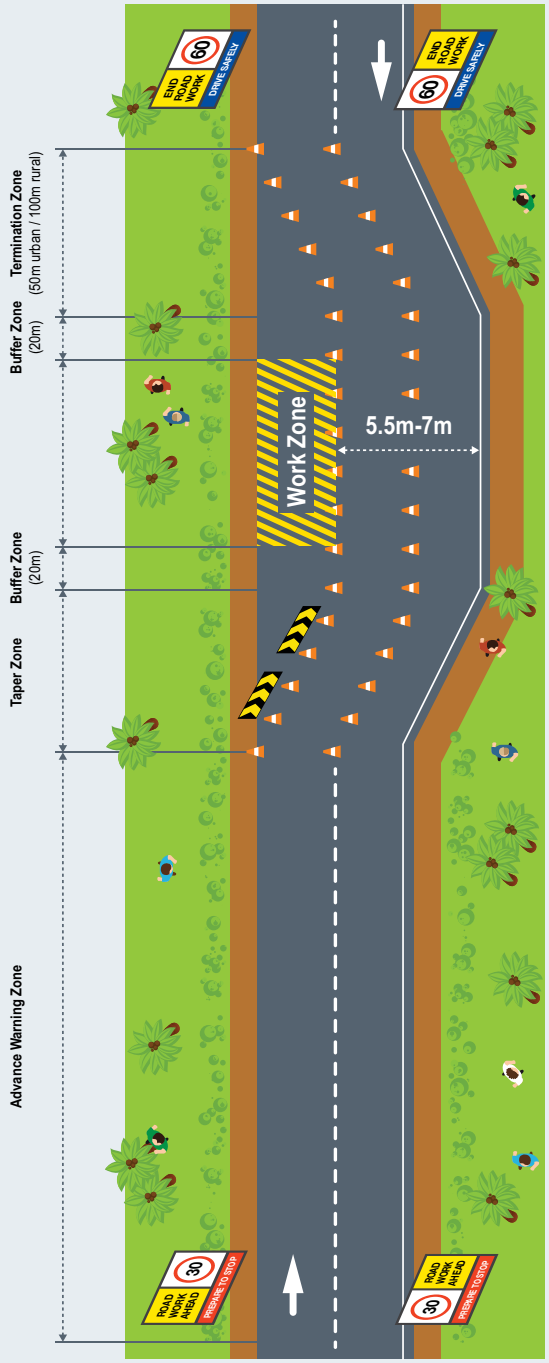


FIGURE 3

WORKS OCCUPYING ONE LANE, REQUIRING ONE LANE TRAFFIC OPERATION (GIVE WAY SIGN)

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

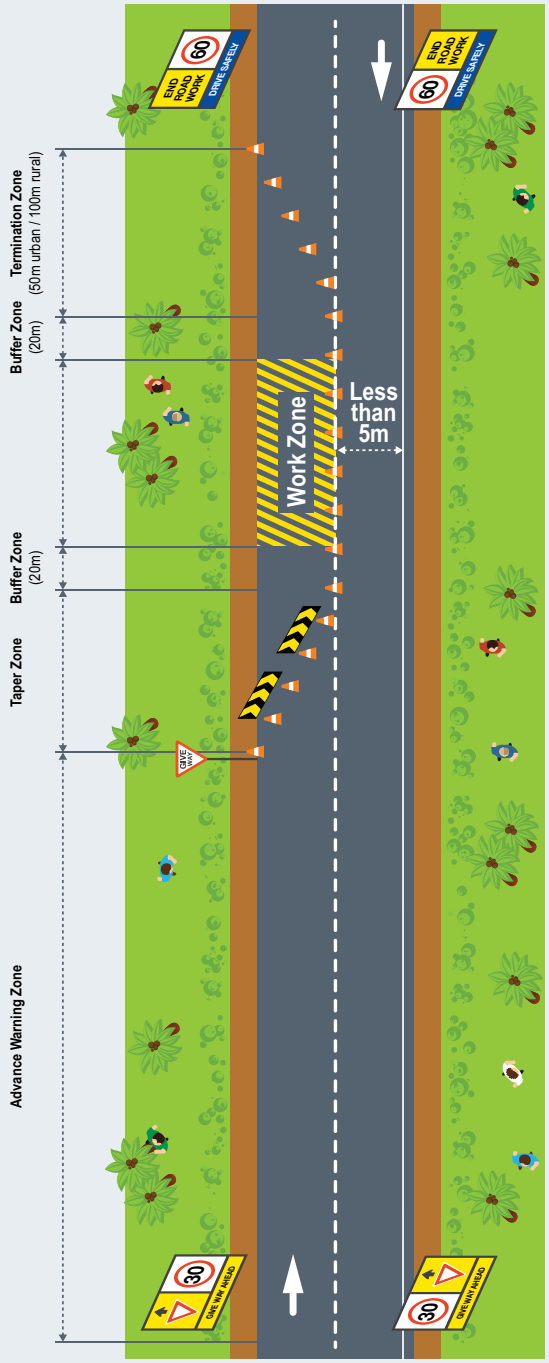


FIGURE 4

WORKS OCCUPYING ONE LANE, REQUIRING ONE LANE TRAFFIC OPERATION (TRAFFIC CONTROLLER)

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

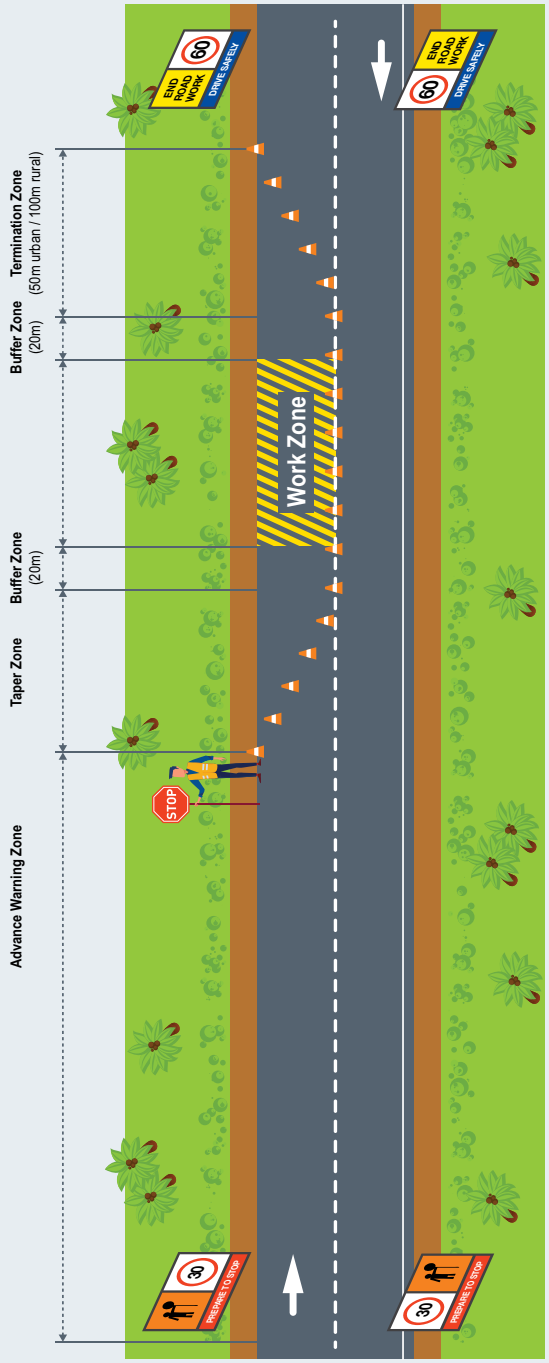


FIGURE 5

CENTRE LINE WORKING, ALLOWING ONE TRAFFIC LANE FOR EACH DIRECTION.

Centre line working shall only be undertaken with prior written approval of the LTA.

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

Trained Traffic Controllers shall control each direction of traffic at all times centre line work is proceeding.

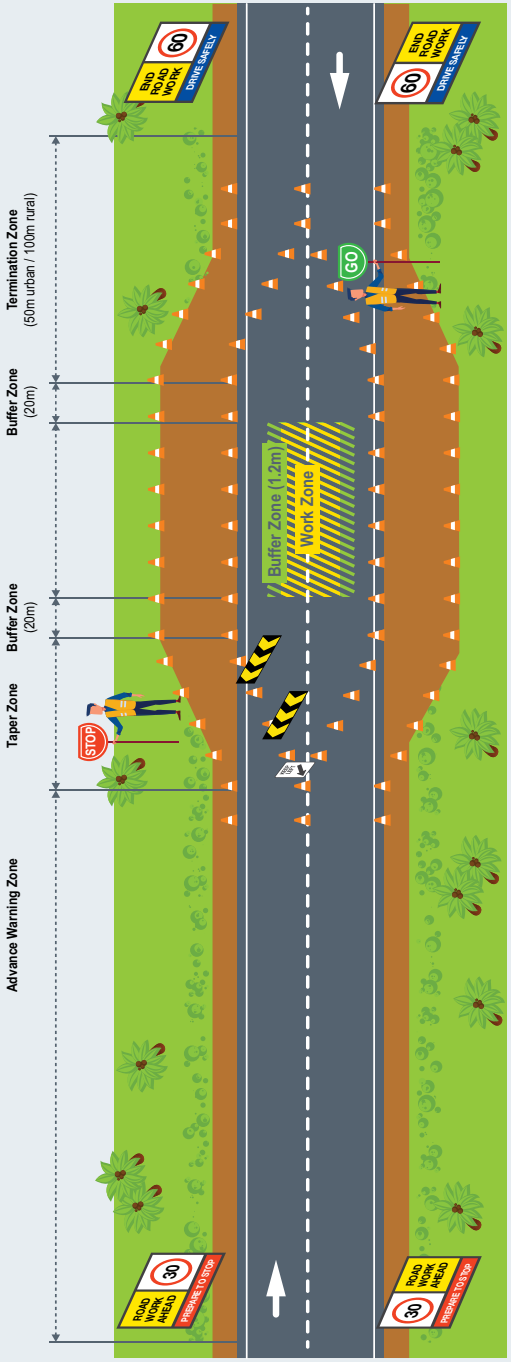


FIGURE 6

WORKS IN THE MIDDLE OF A 4-LANE UNDIVIDED ROAD

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

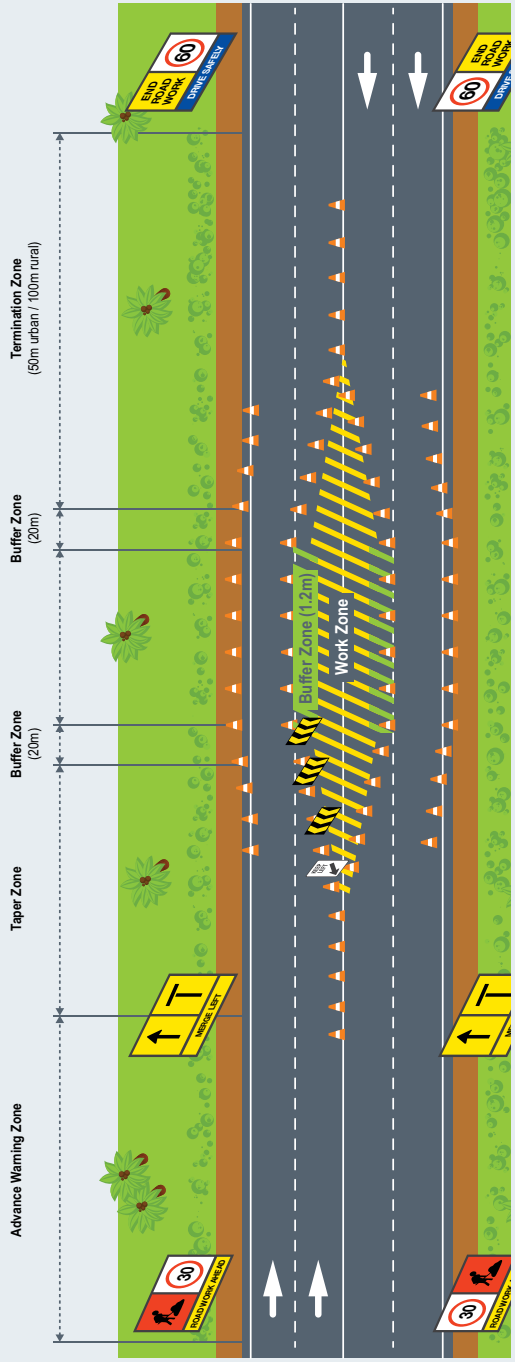


FIGURE 7

CLOSURE OF THE LEFT LANE OF A DIVIDED ROAD. (IF THE RIGHT LANE IS TO BE CLOSED INSTEAD OF THE LEFT LANE, REVERSE THE TAPER ZONE SIGNS, AND THE DELINEATION AROUND THE WORK ZONE)

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

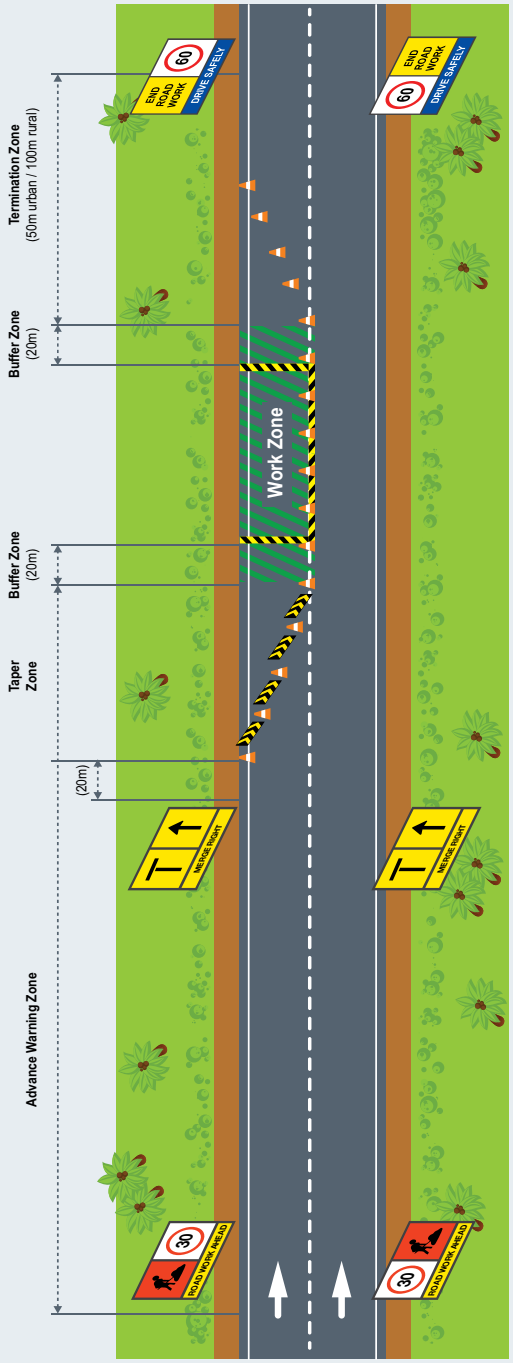


FIGURE 8

ONE-WAY SIDE TRACK DUE TO A PARTIAL ROAD CLOSURE

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

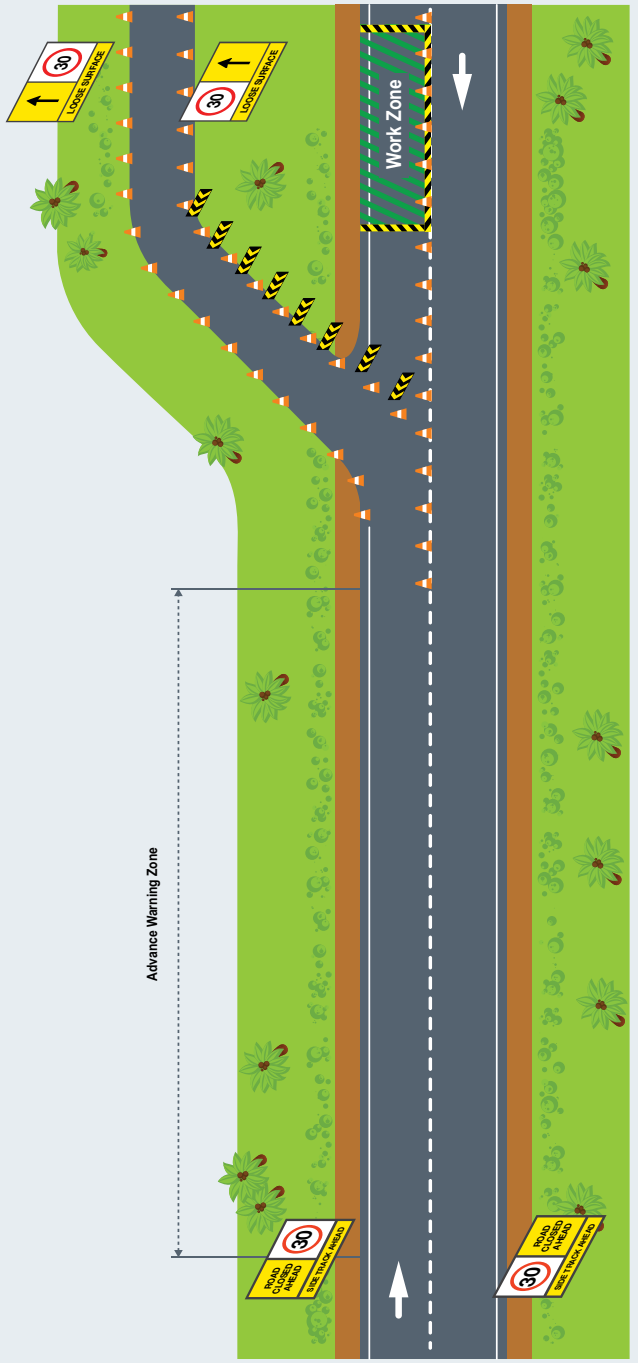


FIGURE 9

TWO-WAY SIDE TRACK DUE TO A FULL ROAD CLOSURE

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

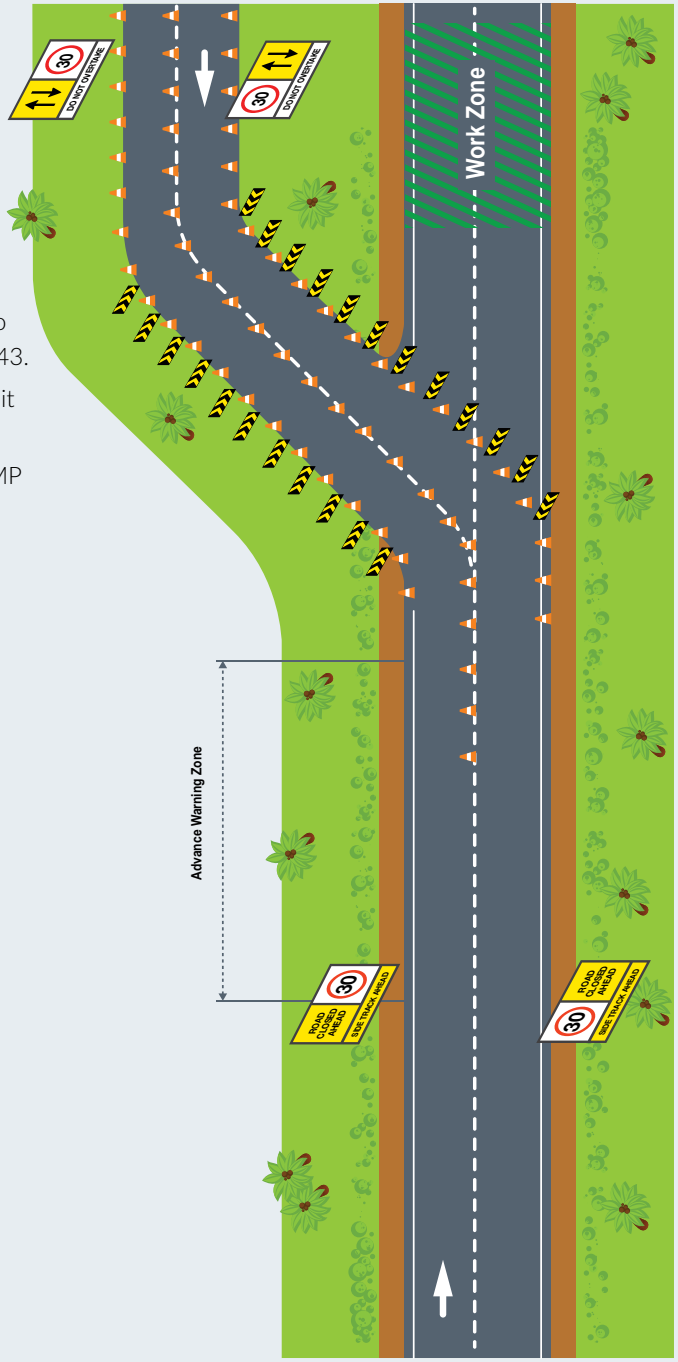


FIGURE 10

WORKS ACROSS THE ROAD

If works continue across the road at spacings less than 1km, retain this TMP for each work zone, and add reminder speed restriction signs in between the work zones. If spacings are more than 1km, end and then re-start this TMP as necessary.

For zone lengths, refer to Tables on pages 41 and 43.

The road work speed limit shall be 30km/h.

This figure shows the TMP for one direction only.

Two-way roads require a TMP for both directions.

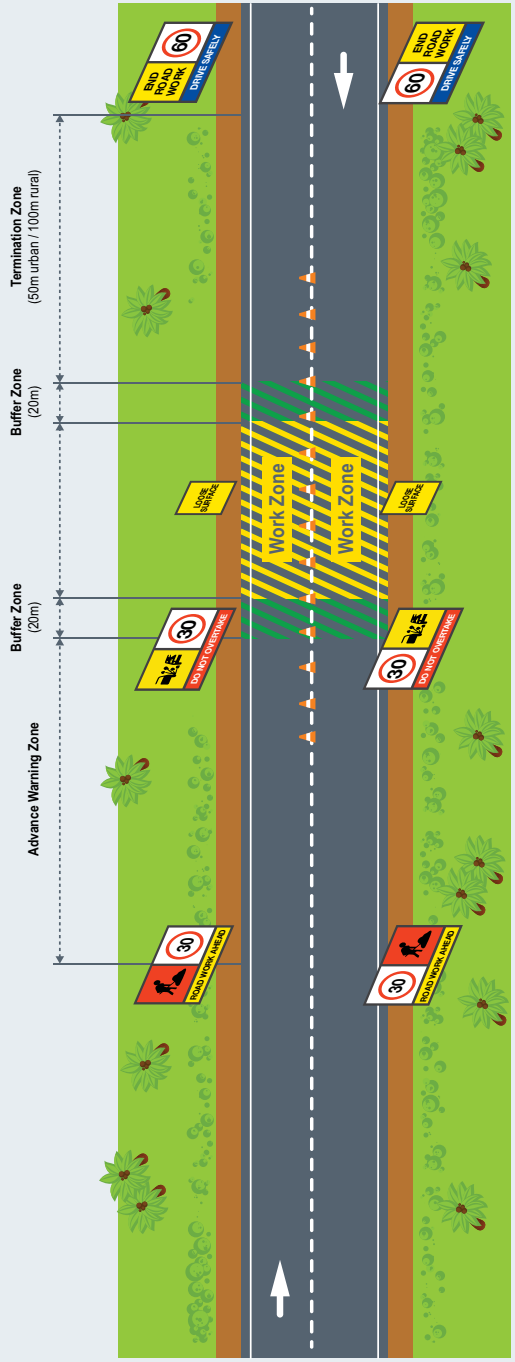
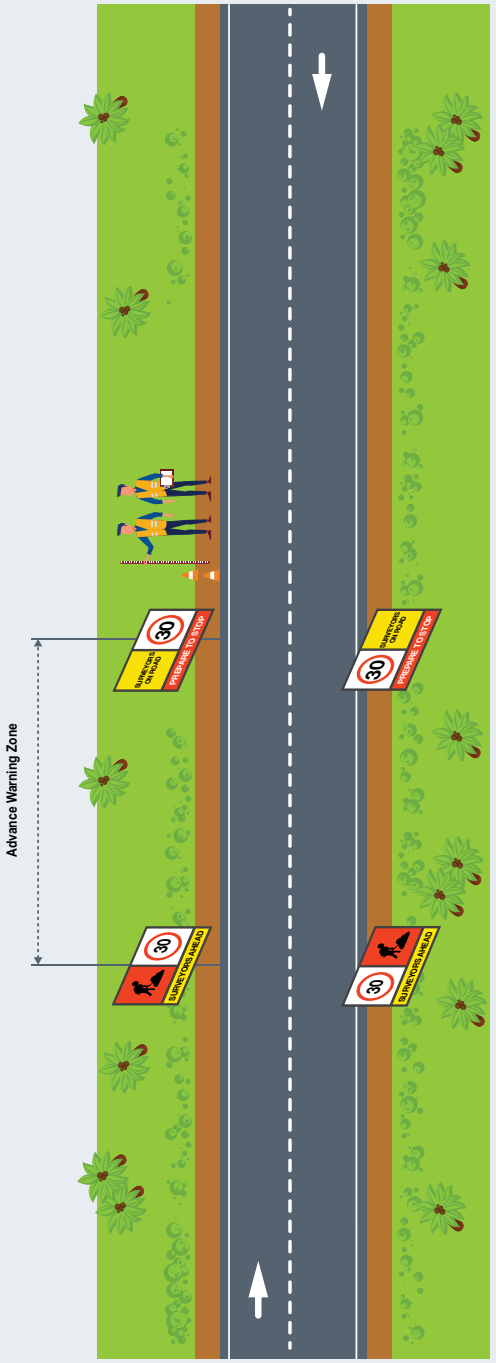


FIGURE 11

SURVEYOR'S ON ROAD

Survey instrument to be kept well clear of carriageway.

Spotter must remain within sight and hearing distance, generally not more than 2m from the reflector carrier.



CHAPTER 6

SAFETY CHECKLISTS

WORKSITE HAZARD ASSESSMENT - CHECKLIST

The Contractor is responsible for undertaking a worksite hazard assessment to determine the level of risk at the worksite, the type of TMP to be used and how particular safety hazards are to be addressed.

Work Location .....

STEP 1 DETERMINE THE WORKSITE HAZARD RATING		
Traffic volume		
Traffic speed on approach		
Clearance between workers and traffic		
Estimated worksite hazard rating	High	Low
STEP 2 REQUIRED LEVEL OF PLANNING FOR THIS WORKSITE		
Low risk – use a generic TMP (from Chapter 5 of this Field Guide)	High risk – design a site specific TMP (prepared by the Contractor)	
STEP 3 HOW WILL HAZARDS BE ADDRESSED?		
Hazard	**Present at worksite**	
High traffic speeds approaching worksite		
Poor advance sight distance to worksite (less than 200m)		
Workers close to traffic (less than 1.2m)		
Narrow road pavement		
Deep excavations (more than 2m) within clear zone		
Unshielded roadside hazards within clear zone		
High vehicle volumes that may create capacity issues for traffic control		
Build-up of traffic creating poor sight distance to end-of-queue.		
High volumes of heavy vehicles		
Trucks entering/exiting worksite		
STEP 4 HAZARD CONTROL MEASURE(S)		
Check		
STEP 5 DETERMINE THE HAZARD CONTROL MEASURES TO BE IMPLEMENTED		
Decide		
STEP 6 TRAFFIC MANAGEMENT PLAN (TMP) PREPARED AND SENT TO ROAD AUTHORITY FOR APPROVAL		
Date sent		
STEP 7 REVIEW THE TMP WHEN SET UP		
Check		
STEP 8 CARRY OUT THE WORK		

Assessed by: ..... **Approved by:** .....

Date: ..... **Date:** .....

DAILY WORKSITE SAFETY CHECK

Location ..... **Day** ..... **Date** .....

TMP Type ☐ Generic ☐ Sketch ☐ Site Specific **Time** .....

WORKSITE SAFETY CHECK		
Hazard	**Y/N**	**Action Taken**
Advance Warning Zone signs in place		
30km/h speed limit clear and correct		
Are actual traffic speeds OK?		
Taper Zone in place		
Taper correct and adequate length		
Taper of suitable bollards/cones		
Buffer Zone free of materials and equipment		
Termination Zone signs in place		
All conflicting permanent signs removed or covered?		
Equipment kept more than 1.2m from traffic lane?		
Suitable warnings in all side roads?		
All other hazards OK?		
Traffic controllers – equipped with reflective Stop/Go baton?		
Traffic controllers – wearing reflective safety vest?		
Traffic controllers – giving correct and clear instructions to road users?		
Pedestrians, including the disabled, have suitable paths available?		

Were there any incidents or accidents on this site today? ☐ Yes ☐ No

If YES, an "Accident/Incident Report" must be attached

Was the incident reported to your Manager / Office? ☐ Yes ☐ No

BEFORE LEAVING SITE EACH DAY - IS IT SAFE FOR:

☐ Pedestrians ☐ Motorists ☐ Cyclists

WORKSITE INSPECTION		Conducted by: ☐ SS ☐ Other
Conducted by:	(Safety Officer)	Inspection time

Completed by: ..... **Signature** .....

SAFETY OFFICER

The safety officer is responsible for the safety of the road workers as well as the road users at the road work site.

Well before works commence the safety officer shall complete a Worksite Safety Assessment (see above). This assessment helps to focus attention on the important risks that may arise at the work site and ensures that all safety aspects of the work site are considered during the planning, design, and installation stages.

FOR THE WORKSITE SAFETY ASSESSMENT FORM:

Keep this field guide close by and use it to assist with the Worksite Safety Assessment Form for assessing a hazard rating and designing and implementing traffic management plans.

What is the worksite hazard rating for the site? (see section 4.1 of this field guide).

Is this a low-risk or a high-risk site?

What hazards need to be addressed?

How will these hazards be addressed?

Has a traffic management plan been prepared? (see chapter 3 of this field guide).

For large projects, have the TMP's been audited by an independent auditor? The audit report and the TMP are to be submitted to the client for approval.

Do the local police know of the proposed works, and will they be able to undertake enforcement in the work site?

Are trained traffic controllers available, or do new people require training in this field? Ensure they have been trained in the use of the stop/go baton.

Are all road workers trained in safety methods?

Are they provided with reflective safety vests, boots and hats.

Does the contractor have enough bollards, traffic cones, reflective signs, and barriers to install the TMP as designed?

Does the contractor have plenty of replacement signs and cones in the depot to use if any go missing from the work site?

The safety officer is also responsible for completing a Daily Work Site Safety Checklist (see above) after inspecting the work site at the beginning and at the end of the work for the day. The Daily Work Site Safety Checklist is to be completed and signed by the safety officer as evidence that the site is being managed as planned and that there are no signs, bollards or other devices out of place, missing or damaged.

During the second inspection each day, as the work site is put into "after care" mode and just before the site is left unmanned, the safety officer should check that the site will be safe for all road users, but especially pedestrians (including the disabled), and bicyclists. Paths should be left clear of materials, with no squeeze points due to machinery or excavations. Most work sites are unlit at night, adding to the need to consider the vulnerable road users during these times.

FOR THE DAILY WORK SITE SAFETY CHECKLIST:

Keep this field guide close by and use it when inspecting the work site anytime, and especially during the twice daily safety checks.

Is the work site set up according to the approved TMP?

Is each zone long enough? See Tables 3 and 4 in chapter 3 of this field guide for the minimum lengths for each zone.

Are sufficient cones, reflective signs, bollards, and barriers being used?

Are all signs correct? Are multi-message signs used correctly?

Is the work site speed limit clearly signed? 30km/h road work speed limits are used on Samoan roads.

Are the local police aware of the road works and will they be needed to enforce speeds in work sites?

Are any signs, bollards, cones, or other safety devices missing or damaged?

What action has been taken to address the missing/damaged devices? When were the repairs/replacements made?

Are the traffic controllers (if any) performing correctly?

Are all workers wearing safety clothing and equipment?

Is the buffer zone free of machinery and materials?

Is the road swept regularly to minimise skidding and sliding issues.

Remember dust suppression for the health of the workers and those living nearby.

Never allow concrete blocks/branches/rocks or other unforgiving objects to be used for delineation.

CHAPTER 7

INSTRUCTIONS FOR TRAFFIC CONTROLLERS

A traffic controller is a person who is trained to use a stop/go baton to control traffic at a road work site. Traffic controllers have an important role at road works. They provide a warning to drivers of the works ahead, and they give positive guidance to drivers about where they must go, and when they may go there.

INSTRUCTIONS FOR TRAFFIC CONTROLLERS

Traffic controllers shall:

a) Wear high visibility clothing. This will normally be a vest, or jacket, that is fluorescent for daytime visibility and with retro reflective strips for night work. Sturdy footwear should also be worn. Employers are responsible for supplying essential safety gear.

b) Set up the "Prepare to Stop" sign at the beginning of the shift and taking it away at the end. If a controller takes over traffic control part way through a shift, he/she must check that this sign is in its correct place.

c) Stand in a position where the nearest end of the work site is visible together with the other traffic controller (who will be at the other end of the job).

d) If the traffic controllers cannot see each other, it is necessary to relocate positions so they can see each other, or to use "walkie talkies, or to engage a third controller who can see both controllers from a point closer to the Work Zone.

e) Stand facing the traffic, and just outside the path of vehicles.

f) Be able to see approaching vehicles at least one and a half times the speed limit (in metres) away. For example, if the speed limit is 30km/h, the controller should be able to see approaching vehicles at least 45 metres away, and those drivers must be able to see the traffic controller at the same distance.

f) Take care to be seen:

- At dawn/dusk (changing light conditions).
- Against low morning or evening sun on an east/west road.
- In heavy shadow on a sunny day.

g) Use the stop/go baton in a positive and clear way as follows:

i. To stop vehicles, they shall turn the baton to "stop", face the traffic, and raise their other hand into the stop position with the palm towards the traffic.

STOP THE TRAFFIC

ii. To allow traffic to proceed, they shall wait until all traffic from the other end of the work has passed, move to the side of the road, then turn the baton to "go". Turning side on to the traffic, and with their other hand, they give a "proceed" indication to drivers.

ALLOW TRAFFIC TO PROCEED

iii. To slow traffic, they show the "stop" side of the baton, face the traffic, extend their free arm, and wave it up and down (below shoulder level) steadily and firmly.

SLOW THE TRAFFIC

h) Not obstruct a driver's view of other road signs or devices, nor be hidden by one.

i) Always have an escape path ready

j) Change position when traffic has stopped, if necessary, to be clearly visible to other traffic as it arrives. But remain at the head of the traffic queue and do not permit people to congregate nearby.

l) Be responsible for changing the traffic direction if that controller is the next to stop traffic. In other words, one direction of traffic must first be stopped, and all vehicles must be clear of the work zone, before the other approach may be permitted to start up to pass through the work zone.

APPENDIX

GLOSSARY OF TERMS

ADVANCE WARNING SIGN
A sign that is placed in advance of the road works to provide advance warning to approaching traffic.

ADVANCE WARNING ZONE
The first zone encountered by drivers. It alerts them to the works ahead.

AFTER CARE
The term used for the traffic management at a work site after the work has ended (for the day, or the week, or for public holidays).

BUFFER ZONE
The zone that surrounds the work area (20m front and back, and 1.2m along the side). It is considered a part of the Work Zone.

CLIENT
The road authority responsible for the management and upkeep of the road.

CONSULTANT
The client's representative for the project.

CONTRACTOR:
The company contracted to undertake the work on behalf of the client.

DELINEATION
A general term for devices that are used to clearly define the designated vehicle path.

DIVERSION
A temporary road or lane next to the carriageway onto which traffic may be directed (like a side track).

DETOUR
An existing route onto which traffic is directed to bypass a closed work area.

EARLY WARNING ZONE
A zone (50m urban and 100m rural) that may be used in advance of the Advance Warning Zone if sight distance to the advance warning signs is poor.

LEAD VEHICLE
A vehicle used at the head of line marking works on two-way roads to give advance warning of the line marking work to traffic approaching from the opposite direction.

LONG-TERM WORKS
When a road work site is required to operate for longer than one day and may be left unattended.

MOBILE SHORT-TERM WORKS
Works that move along a road, either at a constant low speed (such as line marking) or with intermittent stopping (such as patching).

MULTILANE
Two or more traffic lanes in one direction.

ROAD USER
Any driver, motorcyclists, passenger, bicyclist or pedestrian using the road.

ROADWAY
That portion of the road dedicated particularly to the use of vehicles, including shoulders and auxiliary lanes.

ROAD WORK
Any physical work undertaken on a road or a roadside with potential to disturb traffic flow and/or safety.

ROAD WORKERS
Any person engaged in work on a road or the roadside.

SAFETY BARRIER
A physical barrier separating a work area from the travelled way, designed to resist penetration by an out-of-control vehicle and (as far as practicable) to redirect the colliding vehicle back into the travelled path.

SAFETY OFFICER
An employee of the contractor who is trained and appointed to be responsible for the installation, maintenance, and removal of the traffic management at a site, as well as for all other matters of road safety at the site.

SHADOW VEHICLE
A vehicle that provides protection to the rear of workers who are on the road.

SHORT-TERM WORKS
When the traffic management devices are required for one day or less.

SIDE TRACK
A short road constructed to take traffic away from the work zone. It may be one-way or two-way.

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 (end) of line marking works to provide advance warning of the works to following and/or approaching traffic, to divert traffic around the work area and to enable the driver to alert workers ahead of any impending danger.

TAPER ZONE
The second zone encountered by drivers. This is the zone in which drivers are directed out of their normal path of travel (if necessary) and into their correct path, at a safe speed (usually 30km/h).

TERMINATION ZONE
This is the zone where traffic resumes normal operations after passing the work area. This zone is used to advise the drivers/riders of the end of the work site.

TRAFFIC
All vehicles, persons or animals travelling on a road.

TRAFFIC CONTROL DEVICES
The signs, cones, barriers and other devices placed on or near the road to regulate, warn or guide road users.

TRAFFIC CONTROLLER
A person whose duty it is to control traffic at a work site with a stop/go baton.

TRAFFIC MANAGEMENT PLAN
A traffic management plan (TMP) is a plan that clearly shows all of the signs, barriers, and other devices that are to be installed and maintained at the work site for the duration of the works. If the work has several stages, there should be a TMP for each stage.

TRAVELLED WAY
The route through, past or around a work site.

WORK AREA
The specific area where the work is being done.

WORK SITE
An area which includes the work area and any additional length of road required for advance signing, tapers, side-tracks or other areas needed for the road works.

WORK ZONE
The area comprising the work area plus the buffer zone that surrounds the work area.

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