Manual

Queensland Guide to Temporary Traffic Management Part 3: Static Worksites

November 2023

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About this document

This document supplements the Austroads *Guide to Temporary Traffic Management Part 3 Static Worksites*, which has been prepared to assist with the preparation of traffic guidance schemes (TGSs), in accordance with Austroads best practice. It provides general information about the context and components of designing temporary traffic guidance schemes at static worksites.

How to use this document

This document is designed to be read and applied together with the Austroads *Guide to Temporary Traffic Management Part 3: Static Worksites* (AGTTM03-21 Edition 1.1). You must have access to the Guide to understand what applies in Queensland.

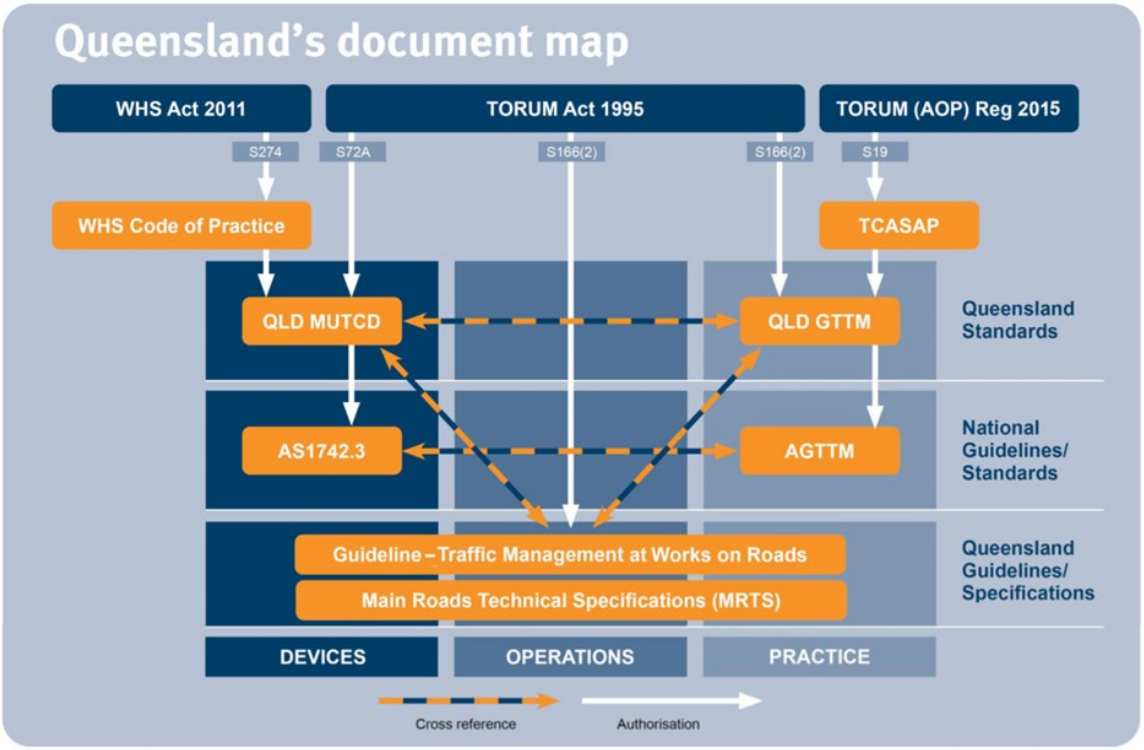
This document:

- sets out how AGTTM03-21 applies in Queensland
- has precedence over AGTTM03-21 when applied in Queensland
- has the same section and clause numbering and headings as AGTTM03-21.

The following table summarises the relationship between AGTTM03-21 and this document:

Applicability	Meaning
Accepted	The Guide section or clause is accepted.
Accepted, with amendments	Part or all of the section or clause has been accepted with additions, deletions or differences.
New	There is no equivalent section or clause in the Guide.
Not accepted	The Guide section or clause is not accepted.

A summary of the documents relevant to TTM practice in Queensland, and their links, is provided following:



References

The following references apply when reading AGTTM03-21.

Reference to…	Means
AGTTM03-21	Austroads *Guide to Temporary Traffic Management Part 3 Static Worksites*, as amended by this document: for example, a reference to AGTTM03-21 means you must refer to the *Queensland Guide to Temporary Traffic Management* (QGTTM) Part 3. Throughout AGTTM03-21, references are made to other parts of the Guide (for example, when reading Part 3 you may be referred to Part 1 for further information.) In this case, you must refer to the equivalent Part within the QGTTM. Check the applicability of the equivalent Part in the QGTTM **before** referring to the referenced Austroads Guide Part.
AGTTM	Austroads *Guide to Temporary Traffic Management*
AS 1742	Australian Standard AS 1742 *Manual of Uniform Traffic Control Devices*
Queensland (Q) series / Traffic Control (TC) signs	MUTCD (Q) series and TC signs.
Queensland MUTCD	Queensland *Manual of Uniform Traffic Control Devices* which supplements AS 1742.

Relationship table (harmonised to AGTTM03-21 Edition 1.1)

Section		Description	Applicability
1	**Introduction**		
	1.1	Purpose	Accepted
	1.2	Structure of AGTTM	Accepted
	1.3	Scope of Part 3	Accepted
	1.4	Application of Part 3 to New Zealand	Accepted
	1.5	Definitions	Accepted
2	**Design Process**		
	2.1	General	Accepted
	2.2	Risk assessment	Accepted with amendments
	2.2.1	*Risk considerations*	Accepted
	2.2.2	*Hierarchy of control – eliminate, separate or control*	Accepted
	2.3	Design steps – around, through, past	Accepted
	2.4	Design balance	Accepted
	2.5	Essential design principles	Accepted
	2.5.1	*Worksite layout*	Accepted
	2.5.2	*Worksite access*	Accepted
	2.5.3	*Signs*	Accepted with amendments
	2.5.4	*Sight distance*	Accepted with amendments
	2.5.5	*Road categories*	Accepted
	2.5.6	*Traffic volume*	Accepted
	2.5.7	*Traffic lanes*	Accepted with amendments
	2.5.8	*Lane width*	Accepted with amendments
	2.5.9	*Speed*	Accepted
	2.6	Variations to design	Accepted with amendments
3	**Around the worksite**		
	3.1	General	Accepted
	3.2	Worksite layout	Accepted
	3.3	Separate the work area	Accepted
	3.4	Road closures	Accepted
	3.4.1	*Property access*	Accepted
	3.5	Safe traffic speed	Accepted
	3.6	Safety buffer	Accepted with amendments
	3.7	Advance warning area	Accepted

Section		Description	Applicability
	3.8	Design and traffic management	Accepted
	3.8.1	*Detours*	Accepted
	3.8.2	*Detours via sidetracks*	Accepted
	3.8.3	*Contraflow*	Accepted
	3.9	Termination area	Accepted
	3.10	Vulnerable road users	Accepted
	3.10.1	*Pedestrians*	Accepted
	3.10.2	*Cyclists*	Accepted
	3.10.3	*Motorcyclists*	Accepted
	3.11	Public transport	Accepted
4	**Through the worksite**		
	4.1	General	Accepted
	4.2	Worksite layout	Accepted
	4.3	Separate the work area	Accepted
	4.4	Delineate the route	Accepted
	4.5	Safe traffic speed	Accepted with amendments
	4.6	Safety buffer	Accepted
	4.7	Traffic control and site entry	Accepted with amendments
	4.8	Advance warning area	Accepted with amendments
	4.8.1	*Intersections within the advance warning area*	New
	4.8.2	*Police performing planned traffic control duties*	New
	4.8.3	*End-of-queue protection*	New
	4.8.4	*Queued traffic ahead multi-message sign*	New
	4.9	Termination area	Accepted
	4.10	Vulnerable road users	Accepted
	4.10.1	*Pedestrians*	Accepted
	4.10.2	*Cyclists*	Accepted
	4.10.3	*Motorcyclists*	Accepted
	4.11	Public transport	Accepted
5	**Past the worksite**		
	5.1	General	Accepted
	5.2	Worksite layout	Accepted
	5.3	Separate the work area	Accepted
	5.3.1	*Road safety barrier system*	Accepted with amendments
	5.3.2	*Containment fence*	Accepted
	5.3.3	*Visibility screens*	Accepted with amendments

Section		Description	Applicability
	5.4	Delineate the route	Accepted with amendments
	5.4.1	*Traffic cones and bollards*	Accepted with amendments
	5.4.2	*Temporary hazard markers*	Accepted with amendments
	5.4.3	*Temporary kerbing*	Accepted
	5.4.4	*Shuttle flow*	Accepted with amendments
	5.5	Safe traffic speed	Accepted with amendments
	5.5.1	*Temporary speed limits*	Accepted with amendments
	5.5.2	*Temporary speed humps*	Accepted with amendments
	5.5.3	*Rumble strips*	Accepted with amendments
	5.5.4	*Speed enforcement*	New
	5.6	Safety buffer	Accepted with amendments
	5.7	Overhead clearance	Accepted
	5.8	Additional warning area and devices	Accepted
	5.8.1	*Truck-mounted attenuators*	Accepted with amendments
	5.9	Transition area	Accepted
	5.9.1	*Tapers*	Accepted with amendments
	5.9.2	*Chicanes*	Accepted with amendments
	5.9.3	*Contraflow*	Accepted
	5.9.4	*Closing the shoulder*	New
	5.10	Traffic control	Accepted with amendments
	5.10.1	*Portable traffic control devices*	Accepted with amendments
	5.10.2	*Traffic controllers*	Accepted with amendments
	5.10.3	*Site entry*	Accepted
	5.10.4	*Combining portable traffic control devices*	New
	5.11	Advance warning area	Accepted with amendments
	5.12	Termination area	Accepted
	5.13	Vulnerable road users	Accepted
	5.13.1	*Pedestrians*	Accepted
	5.13.2	*Cyclists*	Accepted
	5.13.3	*Motorcyclists*	Accepted
	5.14	Public transport	Accepted
6	**Design for additional issues**		
	6.1	General	Accepted
	6.2	Permanent traffic signals	Accepted
	6.3	Roundabouts	Accepted
	6.4	Overtaking lane	Accepted
	6.5	Shoulder as a temporary lane	Accepted with amendments

Section		Description	Applicability
	6.6	Pavement markings	Accepted with amendments
	6.7	Night works	Accepted with amendments
	6.8	Excavations	Accepted with amendments
	6.8.1	*Lateral excavations*	New
	6.9	Unattended worksites	Accepted
	6.10	Placement and Operation of Portable Variable Message Sign (VMS)	Accepted with amendments
	6.10.1	*Principles and guidance*	Accepted with amendments
	6.10.2	*Aiming distance*	Accepted
	6.10.3	*Longitudinal placement*	Accepted
	6.10.4	*Lateral placement*	Accepted with amendments
	6.10.5	*Visibility*	Accepted
	6.10.6	*Other location requirements*	New
	6.10.7	*Drive through requirements*	New
	6.10.8	*TVMS specification*	New
	6.10.9	*Display of messages on TVMSs*	New
	6.11	Clear Zones	New
	6.11.1	*Factors influencing the clear zone*	New
	6.11.2	*Determination of clear zone requirements*	New
7	**How to apply the Traffic Guidance System**		
	7.1	General	Accepted
	7.2	Pre-installation	Accepted
	7.3	Installation	Accepted with amendments
	7.4	Removal	Accepted with amendments
	7.4.1	*Redundant devices*	Accepted with amendments
	7.4.2	*Ghost markings*	Accepted
	7.5	Inspection and record keeping	Accepted

Contents

Tables

Figures

2 Design process

2.2 Risk assessment

Difference

Replace:

> It is important to note that a Design Exceptions Report shall be approved by the relevant Road Infrastructure Manager (RIM) and road authority if design exceptions are made or published standards or the AGTTM are not adhered to.

with:

> Where variations to the requirements of the Queensland MUTCD Part 3, or the QGTTM are required, they shall be documented and a risk assessment certified in accordance with Clause 1.9 of Queensland MUTCD Part 3.

2.5 Essential design principles

2.5.3 Signs

Difference

Replace the dot point:

- Signs should be placed on both sides of multilane and high-volume roads to effectively communicate relevant messages to road users. For temporary speed restriction signs, refer to section 5.5.1 for requirements to install on both sides of the road. If sign duplication is not possible (e.g. vegetation, barrier, inadequate width), the designer should document an alternative to ensure all road users are able to see signs. This may involve:
  - placing signs on high temporary frames
  - duplicating signs on one side of the road
  - closing one lane to be used for sign placement
  - use of a variable message sign (VMS).

with:

- To effectively communicate relevant messages to road users, signs should be placed on both sides of all multilane roads and should also be placed on both sides of high-volume roads. For temporary speed restriction signs, refer to Section 5.5.1 for requirements to install on both sides of the road. If sign duplication is not possible (for example, vegetation, barrier, inadequate width), the designer should document an alternative to ensure all road users are able to see signs. This may involve:
  - placing signs on high temporary frames
  - repeating signs on one side of the road
  - closing one lane to be used for sign placement, and/or
  - use of a variable message sign (VMS).

Addition

For merge tapers where the posted permanent speed limit of the road is 80 km/h or greater, the sign spacing between the lane status sign and the start of the merge taper may be increased to a distance of two sign spacings.

For merge tapers at any speed limit, where more than one lane is being closed, the sign spacing between the lane status sign and the start of the initial merge taper may be increased to a distance of two sign spacings.

A distance plate (TC2287) may be added to the lane status multi-message sign to indicate the distance from the lane status sign to the start of the merge taper.

Addition

Add the following to Figure 2.2:

> Where a sign spacing is partially within the 200 m zone after a speed limit change, use the higher speed limit in determining the relevant full spacing (even though only part of this spacing may be within this zone).
>
> Tapers which are partially within the 200 m zone after a speed limit change are to use the higher speed limit in determining the relevant full taper length (even though only part of the taper length may be within this zone).
>
> The following figures illustrate the relationship between a speed zone change and the spacing / distance applicable to signs or hazards (such as a taper).
>
> Where traffic speed is substantially different (+/- 10 km/h or more) to the posted or temporary speed zone values, refer to Section 2.5.9 for the speed value to use in the tables.

Figure 2.2(a) – Sign or hazard within 200 m of a speed zone change

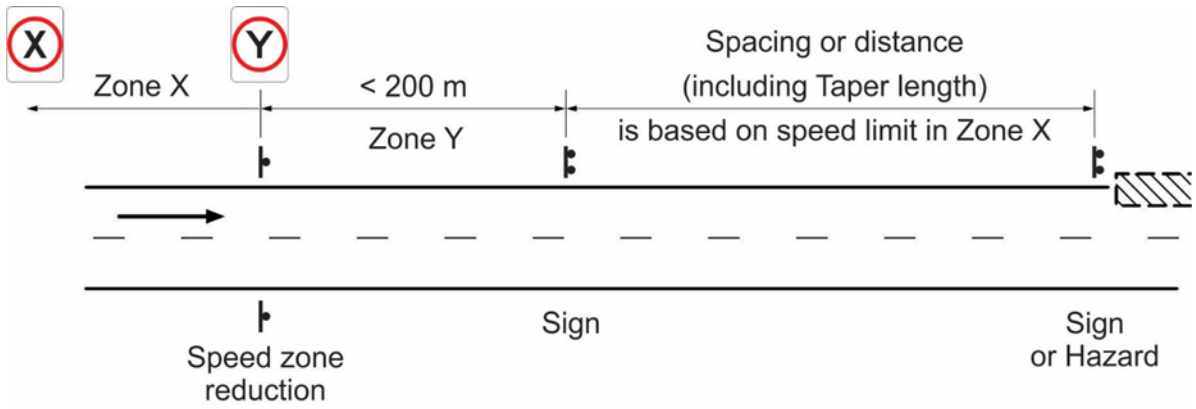
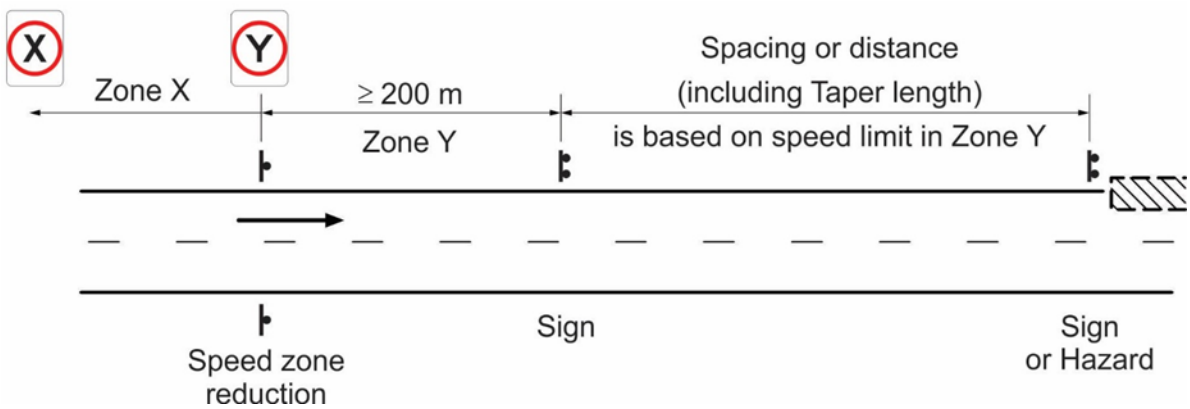


Figure 2.2(b) – Sign or hazard greater than or equal to 200 m from a speed zone change



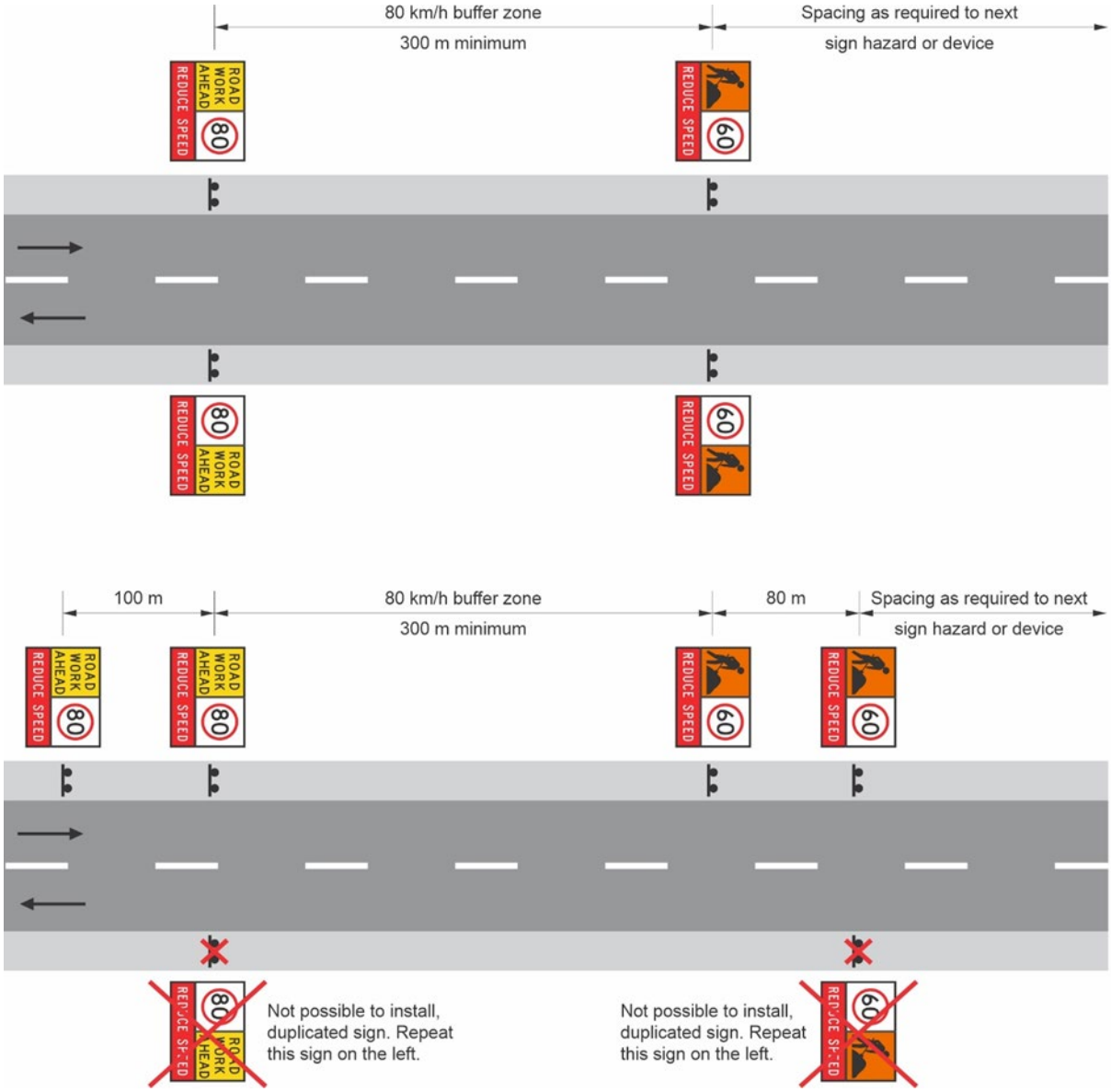
Addition

If sign duplication is not possible and the designer has chosen to repeat signs on the one side of the road, repeated signs are located a minimum of one sign spacing from the original sign.

If there are spacing requirements between the original sign being repeated and another sign, device, or hazard beyond the sign (in the direction of travel), then this spacing requirement will now apply to the repeated sign. Any spacing requirements between the original sign being repeated and another sign, device, or hazard prior to the sign (in the direction of travel), will remain as a requirement to the original sign being repeated.

See Figure 2.5.3 for an example showing signs for one direction of travel only on a two-way road. This figure does not include all traffic control devices required and is not to be used as a TGS diagram.

Figure 2.5.3 – Example showing duplicated signs and repeated signs when signs are not able to be duplicated



2.5.4 Sight distance

Addition

Add the following note to Table 2.3:

> The speed value used in Table 2.3 to determine the sight distance, shall be as per Figure 2.2 of Section 2.5.3, with the 200 m zone applicable when selecting the speed value.

2.5.7 Traffic lanes

Difference

Replace Table 2.4 with the following:

Table 2.4 – Desirable number of lanes for each direction

Mid-block (one direction) (vph)	Within 200 m of controlled intersection (one direction) (vph)^	Desirable number of open lanes for direction considered
≤ 1000	≤ 500*	1
1001–2000	501–1000	2
2001–3000	1001–1500	3
3001–4000	1501–2000	4

* Right turns out of the single lane may need to be prohibited, depending on the proportion of heavy vehicles and the volume of opposing traffic.

^ This is a controlled intersection where traffic in the directions being considered is controlled (by traffic signals, roundabout, GIVE WAY or STOP signs).

NOTE: Volumes shown in the Table may need to be reduced by the amount shown if the following apply:

- Pavement surface is rough or unsealed – reduce traffic volume by 30%.
- Horizontal geometry through the restriction is reduced to a speed value of less than 40 km/h – reduce volume by 50%.
- Volume of heavy vehicles exceeds 10 % and downward, level or easy upgrade – reduce traffic volume by 20%.
- Volume of heavy vehicles exceeds 10 % and sustained upgrades > 5% – reduce traffic volume by 40%.

2.5.8 Lane widths

Difference

Replace the entire Section 2.5.8 with the following:

Lanes carrying traffic around, through or past a roadworks site shall be as per Table 2.5. Lane widths should consider accommodating the swept path of large vehicles expected to negotiate the roadworks site.

Table 2.5 – Lane widths

Criteria	Lane width (m)
General lane widths	
≤60 km/h	Minimum 3.0*
70, 80 or 90 km/h	Minimum 3.2*
≥100 km/h	Minimum 3.4*
Curve with radius 100–250 m	Add curve widening of 0.5 m per lane
Curve with radius <100 m	In addition to the curve widening of 0.5 m per lane, consider the swept path of long vehicles (for example, buses, trams)
Two-way residential street	Minimum of 5.5 (sum both ways)
Shuttle flow operation	
Shuttle flow with active control (by traffic controllers or PTCDs)	Minimum 3.0*
Shuttle flow, without active control on residential streets, includes no control or the use of GIVE WAY and ONE WAY signs (see Section 5.4.4).	Minimum 3.0* and Maximum 3.5 to ensure vehicles take turns using a single lane

*Temporary minimum lane widths are not to be greater than existing lane widths. This minimum temporary lane width does not apply to curves of radius 250 m or less, or locations where there are fixed vertical obstructions such as fences or safety barriers within 30 cm of the edge of the lane on one or both sides. Where these conditions apply, consider widths wider than those listed previously to accommodate large vehicles. The speed to be used when considering lane width requirements is the speed limit (permanent or reduced) which is applicable to that length of road.

Consideration shall also be given to cyclists and pedestrians (see Sections 3.10, 4.10 and 5.13 for further details on traffic management regarding pedestrians and cyclists).

Where there is a change in speed limit, the minimum lane width requirements may also change with lane widths based on the applicable speed limit at that location. Changes to lane widths will apply at the change in speed limit, with the transition to the new lane width commencing at the speed limit change location. The transition to the new lane width shall occur at a rate which matches the transition rate for a lateral shift (see Table 5.7) of the same distance (the lane width change) in the same location (note the 200 m value applies to taper lengths): for example, for a lane width reduction of 0.4 m, as the lateral shift values are based on a full 3.5 m shift, the equivalent recommended lateral shift distance would be divided by approximately 8.7 (3.5 / 0.4) to establish the taper length required for the 0.4 m transition in lane widths.

As an example, a transition distance for a new speed limit (60 km/h) and lane width (3.0 m), from a 100 km/h zone with an existing 3.5 m lane width, will commence at the 60 km/h sign and transition the 0.5 m change in width over a distance of approximately 15 m, based on a 3.5 m lateral shift at 100 km/h being 100 m long (100 / (3.5 / 0.5) = 14.3).

2.6 Variations to design

Addition

Refer to Clause 1.9 of the Queensland MUTCD Part 3.

3 Around the worksite

3.6 Safety buffer

Difference

Replace the fourth paragraph:

> A safety buffer must be provided immediately in advance of the work area where the speed is 60 km/h or higher. An area 20 m to 30 m in length is generally sufficient. However, if the work area is hidden from approaching traffic (e.g. by a crest or curve), the length of the safety buffer should be extended to a point which can be clearly seen by approaching traffic. On multilane roads, this may be increased up to 100 m.

with the following:

> A safety buffer must be provided immediately in advance of the work area where the speed is 60 km/h or higher and either of the following apply:
>
> - local traffic may continue beyond the detour point towards the work area (as indicated by Figure 3.2), or
> - the work area is within 50 m of traffic at the detour point and traffic is travelling toward the work area before being detoured (see Figures 3.6(a), 3.6(b), 3.6(c) and 3.6(d) with the green zone indicating a safety buffer).
>
> An area 20 m to 30 m in length is generally sufficient: however, if the work area is hidden from approaching traffic (for example by a crest or curve), the length of the safety buffer should be extended to a point which can be clearly seen by approaching traffic. On multilane roads, this may be increased up to 100 m.
>
> On roads with a permanent speed limit (prior to any reductions for the works) of less than or equal to 80 km/h, the safety buffer may be omitted where the works (including the work area, all workers, vehicles, equipment and materials) are at least 6 m clear of traffic and is supported by a risk assessment.
>
> ***Figure 3.6(a) – Safety buffer for T-intersection***

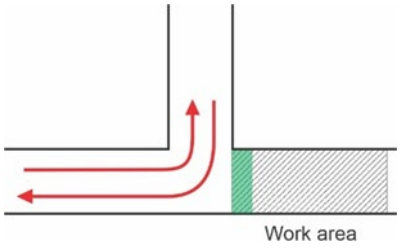


Figure 3.6(b) – Safety buffer for cross intersection

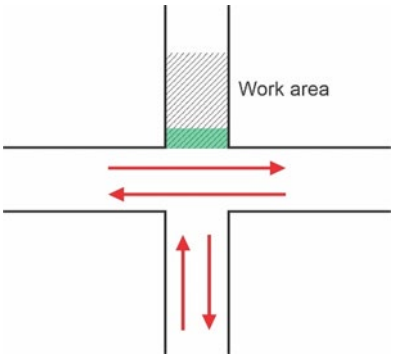


Figure 3.6(c) - Safety buffer for roundabout

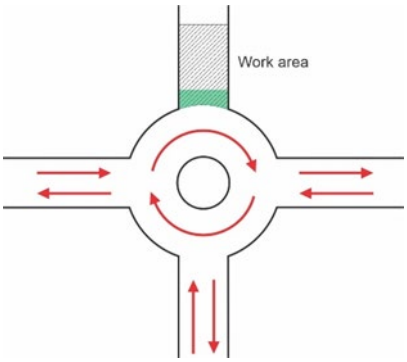
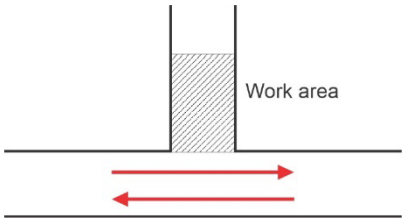


Figure 3.6(d) – Safety buffer for terminating leg of T-intersection



Note: For works areas that extend close to the traffic lanes of the continuing leg of the T-intersection, 'past' methods of control (see Section 5) may be more appropriate.

4 Through the worksite

4.5 Safe traffic speed

Addition

Additional guidance on supplementary devices to reduce speed is provided in the *Guideline – Traffic Management at Works on Roads*.

4.7 Traffic control and site entry

Addition

Refer to Section 4.8 of this document for the placement of the 60 km/h speed zone in advance of the traffic control station.

4.8 Advance warning area

Difference

Replace Items 1 through 7 with the following:

1. Identify the PTCD or traffic controller position.
2. STOP HERE ON RED SIGNAL and STOP HERE WHEN DIRECTED shall be installed where warranted in accordance with Queensland MUTCD Part 3. When used, they shall be installed 6 m before the PTCD / traffic control position in the direction of travel. A temporary STOP line may be installed using temporary removable road marking tape.
3. Four cones should be placed on the centreline spaced 4 m apart starting from the STOP HERE ON RED SIGNAL or STOP HERE WHEN DIRECTED sign position (downstream). A Temporary Hazard marker (T5-7) or KEEP LEFT sign (R2-3-Q01) may be installed at the start of the row of four cones (on both ends of the four cones) to direct traffic to the correct travel path if needed.
4. Estimate end-of-queue position (see box instructions in Austroads *Guide to Temporary Traffic Management* Part 3 Section 4.8).

   A marker (for example, a cone or bollard) should be placed on the shoulder at the predicted end-of-queue to assist the traffic controller and traffic management implementer to monitor queue lengths.
5. A PREPARE TO STOP sign shall be placed in conjunction with the Boom Barrier or Traffic Controller (symbolic) or Signals Ahead sign a minimum distance as shown in Table 2.3 from the predicted end-of-queue, not the PTCD / traffic controller position. This is the primary PREPARE TO STOP sign.

   If the PREPARE TO STOP sign is more than 240 m from the traffic controller, an additional PREPARE TO STOP sign shall be placed 120 m from the traffic controller (see Figure 4.4 and Figure 4.5). The primary purpose of this sign is to protect the traffic controller. This is the additional PREPARE TO STOP sign.

   If visibility is lost or the distance from the PREPARE TO STOP sign to the PTCD / traffic controller is more than 300 m, the use of repeater PREPARE TO STOP signs should be considered as per Table 4.4(a).

   Where these conditions are met and the additional or repeater PREPARE TO STOP signage is required, a Queued Traffic Ahead multi-message sign assembly may be used as the primary PREPARE TO STOP sign. If used, this multi-message sign assembly shall include the Queued Traffic (symbolic) (TM1 47A), QUEUED TRAFFIC AHEAD (TM1 46A) and the PREPARE TO STOP (TM1-18B), see Figure 4.8 following.

   The primary PREPARE TO STOP shall be installed in advance of the predicted end-of-queue in accordance with Austroads *Guide to Temporary Traffic Management* Part 3 Table 2.3.

Figure 4.8 – Queued traffic ahead multi-message sign assembly

Where this assembly is used, the preferred method of display is to locate the QUEUED TRAFFIC AHEAD text panel (TM1-46A) closest to traffic.

6. A ROADWORK AHEAD sign, or VMS shall be placed as per Table 4.4(b) in advance of the primary PREPARE TO STOP sign position discussed in Step 5, except for advance signs on side roads, where the requirement of Step 9 will apply.
7. Surges in traffic demand can occur so adequate monitoring of the queue shall be undertaken to minimise the risk of end-of-queue collision. If the end of queue extends beyond the estimated end-of-queue position, adequate warning of the end of queue shall be provided. The options available include:
    a) initially, when traffic queues are approaching the estimated end-of-queue position, the traffic controllers should advise the site supervisor that traffic queues are approaching their maximum length and contingency planning may need to be implemented
    b) as an interim measure, the traffic controllers may adjust their timing or give priority to one approach to minimise queuing from the key direction
    c) if adjusting timings is not successful in managing queue lengths, implement a pre-designed contingency plan to cater for the longer queue lengths being experienced – this will need to be completed by the traffic management implementer while traffic controllers continue to control traffic, and
    d) if a pre-designed contingency plan is not provided, seek urgent advice from the traffic management designer for the works.
8. The 60 km/h speed zone shall be commenced at least one sign spacing (Table 2.2) in advance of the primary PREPARE TO STOP sign. Duplicate the speed limit signs on both sides of the road and install repeater speed limit signs as required in Section 5.5.1.
9. Where intersections are located within the advance warning area (between the traffic control station and the ROADWORK AHEAD or VMS sign), see Section 4.8.1 for the signing requirements for traffic on or entering from side roads.
10. Provide additional devices and methods for avoiding end-of-queue collisions as required in Section 4.8.3.

Difference

Replace Table 4.4 with the following:

Table 4.4(a) – Maximum spacing for repeater PREPARE TO STOP signs

Speed (km/h)*	Distance (m)
≤55	60
≥56	180

* The 'Speed' value to be used for the maximum spacing for repeater PREPARE TO STOP signs is the actual posted speed (temporary or permanent) which applies (this will generally be 60 km/h but may be less) where the repeater spacing is required. If the speed limit changes within a repeater spacing, use the spacing for the lower speed limit.

Note: The 200 m zone in Figure 2.2 does not apply.

Table 4.4(b) – Minimum distance from ROADWORK AHEAD or variable message sign to primary PREPARE TO STOP sign

Speed (km/h)^	Distance (m)
≤55	30
≥56–65	90
≥66–75	140
≥76–85	240
≥86	Four times the speed (km/h)

^The 'Speed' value to be used for the minimum distance from the ROADWORK AHEAD or variable message sign to the primary PREPARE TO STOP sign is the actual permanent posted speed of the road prior to any reduction for the roadworks.

Addition

For the purpose of estimating the end-of-queue position only, replace the term

'oversized vehicles'

used in AGTTM with the term

'heavy vehicles'.

Addition

Add the following to the **'Estimate end-of-queue position'** text box:

An estimated end-of-queue position is to be determined for the approach to each traffic control station and is to be based on the maximum expected traffic flow on that approach during the time traffic control will be in operation.

The count or estimate of the number of average and heavy vehicles during a five-minute period at a site may be completed using the following in order of preference:

1. Actual five-minute count of vehicles during the peak time the site will be occupied. This five-minute count is based on the vehicles approaching the selected traffic control station from the approach to be controlled by that station (not a sum of both directions of traffic). Consideration of peak traffic flow direction may be needed.

2. If a five-minute count is not possible, use annual average daily traffic (AADT) values with hourly breakdowns and percentage heavy vehicle data. To estimate the five-minute count, select the peak hourly period during the time the site will be occupied and divide by 12 to get an estimated five-minute value. Divide this by two if the AADT is for a two-way road. Use the percentage heavy vehicles information with this value to estimate the number of heavy vehicles for this five-minute period.
3. If a five-minute count is not possible, and AADT values with hourly breakdowns are not available, use AADT values and percentage heavy vehicle data. To estimate the five-minute count, firstly divide the AADT by a factor of 10 (to get an estimated hourly count) and then divide this by 12 to get an estimated five-minute value. Divide this by two if the AADT is for a two-way road. Use the percentage heavy vehicles information with this value to estimate the number of heavy vehicles for this five-minute period.

AADT information for state-controlled roads can be located on the Queensland Open Data Portal – Traffic Census data.

Addition

Add the following to Table 4.3

When estimating the queue length, Table 4.3 uses an average vehicle length of 6 m and an average heavy vehicle length of 20 m for a five-minute stopping time (based on the five-minute traffic count) and then adjusts the multipliers for other stopping time values.

Where very long vehicles are expected (for example outback and mining routes or routes where most vehicles are towing), then to ensure estimated queue lengths are as accurate as possible, an average length per vehicle that matches the actual traffic mix expected at that location should be used.

The estimated queue length shall be at least a minimum of one average vehicle plus one heavy vehicle (of a length which may be applicable to the site). Part lengths of vehicles shall be rounded up when estimating queue lengths.

Addition

To calculate the 'maximum stopping time' value used in Table 4.3 for each approach, the Traffic Management Designer will need to estimate the likely duration of time that queued traffic will be stopped at a traffic control station. Calculating the maximum stopping time needs to include the total time from when the traffic controller stops traffic, through until the same traffic controller releases traffic for the next cycle from that approach. This would typically include the following considerations:

- the time taken for the traffic queue from one approach to pass the traffic control station and travel the length of the closure
- the time for the queue at the other end of the site to leave that traffic control station and also travel the length of the closure (this may commence at the same time as the other queue or following the completion of the other queues travel if shuttle flow is in operation)
- if traffic queues are held for a period (with no traffic traveling through or past the site), then this hold time will also need to be included

- a factor of safety may also be allowed for vehicles travelling the closure below the signed speed limit, and
- if more than two traffic control stations (one each end) are in operation, depending on the operating characteristics of the roadworks site, the time for each queue to be released and travel through the roadworks site may need to be considered and included.

The 'maximum stopping time' value will be used in Table 4.3 to determine the multipliers to be used with the number and type of vehicle (average or heavy) from the five-minute count or calculation.

Addition

Add the following note to Figures 4.4, 4.5 and 4.6:

> The duplication of the advance warning signs for a traffic control station as indicated in Figures 4.4, 4.5 and 4.6 is not a specific requirement. Signs are to be duplicated in accordance with the requirements in Section 2.5.3 and Section 5.5.1 for speed signs.

4.8.1 Intersections within the advance warning area

New

Where intersections exist within the advance warning area (between the traffic control station and the ROADWORK AHEAD or VMS sign), the following warning sign arrangements shall apply.

Where the intersection is located between:

i. the primary PREPARE TO STOP sign and the ROADWORK AHEAD sign or VMS, an additional ROADWORK AHEAD sign or VMS shall be located on the side road and should be a minimum distance of a single sign spacing from the intersection (see Figure 4.8.1(a))

ii. the predicted end-of-queue location and the primary PREPARE TO STOP sign, either:

   a) an additional primary PREPARE TO STOP sign shall be located on the side road and should be a minimum of a single sign spacing from the intersection and a ROADWORK AHEAD sign, or VMS shall be positioned in advance of this sign and should be located a minimum of a single sign spacing further down the side road (see Figure 4.8.1(b)), or

   b) an additional PREPARE TO STOP sign shall be provided as a repeater on the through road and should be located a minimum of 15 m along the through road after turning from the side road, travelling towards the traffic control station, and a ROADWORK AHEAD sign or VMS shall be located down the side road and should be a minimum of a single sign spacing from the intersection (similar to Figure 4.8.1(c), but with the end of queue located after turning from the side road towards the traffic control station).

iii. the traffic control station and the predicted end-of-queue location, either:

a) an additional primary PREPARE TO STOP sign shall be located on the side road and should be a minimum of a single sign spacing from the intersection, and a ROADWORK AHEAD sign or VMS shall be positioned in advance of this additional PREPARE TO STOP sign and should be located a minimum of a single sign spacing further down the side road (similar to Figure 4.8.1(b), but with the queue extending past the side road) or

b) an additional PREPARE TO STOP sign shall be provided as a repeater on the through road and should be located a minimum of 15 m along the through road after turning from the side road, travelling towards the traffic control station, and a ROADWORK AHEAD sign or VMS shall be located on the side road and should be a minimum of a single sign spacing from the intersection (see Figure 4.8.1(c)).

In determining the sign requirements and effects on the side road, the Designer should also consider the speed of traffic on the side road approaching the intersection, the likely queue lengths on the side road and speed limits on the through road with the following to apply:

i. if approach speeds on the side road are high, and/or the queue lengths on the side road are long, consider reducing the speed limit on the side road

ii. if traffic queues are likely to form on the side road, then sign spacings down the side road will need to be greater than those noted previously and additional signs may be required

iii. if side road speed limits are greater than 60 km/h, consider installing a repeater speed limit sign on the through road just after the intersection for traffic entering the through road from the side road – a repeater speed limit sign may be required for both directions of travel

iv. if the speed limit on the through road (prior to any reductions for the works) is greater than 60 km/h and is reduced prior to the side road, a repeater speed limit sign on the through road just after the intersection for traffic entering from the side road shall be installed – a repeater speed limit sign shall be installed for both directions of travel, and

v. the first sign spacing on the through road (for a repeater PREPARE TO STOP sign or speed limit sign for traffic turning onto the through road) may be located a minimum of 15 m from the intersection (as turning speeds from the side road will be low); however, all signs on the through road will also need to meet the minimum sign spacing requirements in Table 2.2 for the through road traffic speeds.

The following Figures (4.8.1(a), 4.8.1(b) and 4.8.1(c)) do not include all traffic control devices required and are not to be used as TGS diagrams.

Figure 4.8.1(a) – Additional ROADWORK AHEAD sign, or variable message sign located on the side road

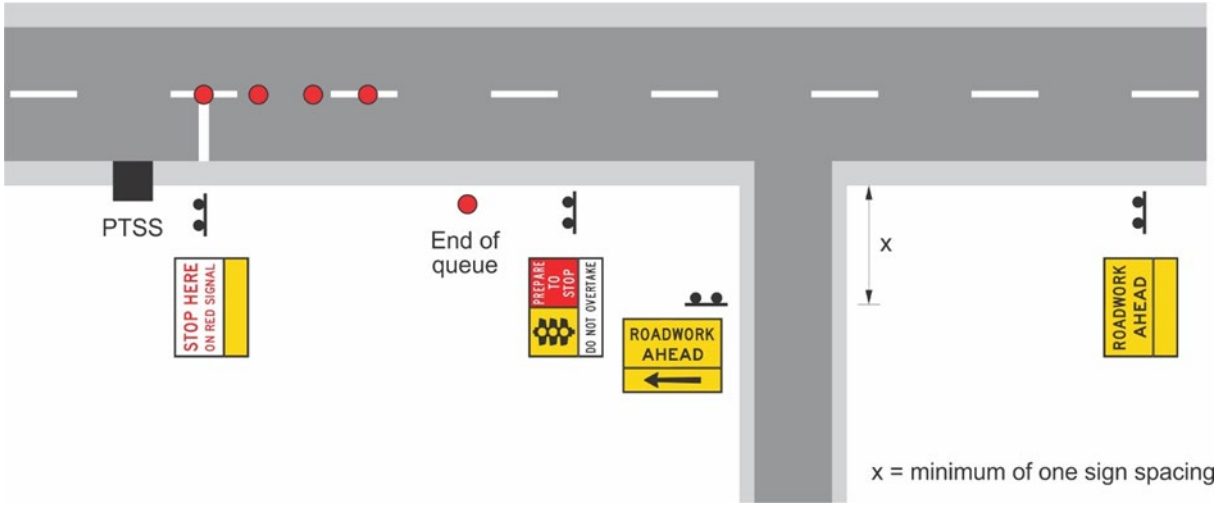


Figure 4.8.1(b) – Additional ROADWORK AHEAD sign, or variable message sign and the PREPARE TO STOP sign located on the side road

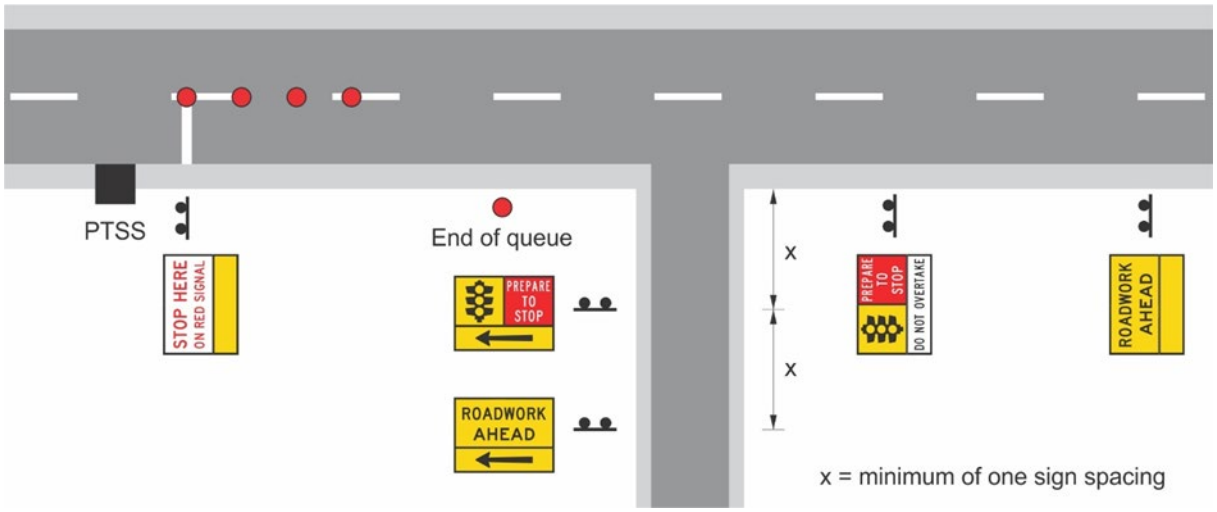
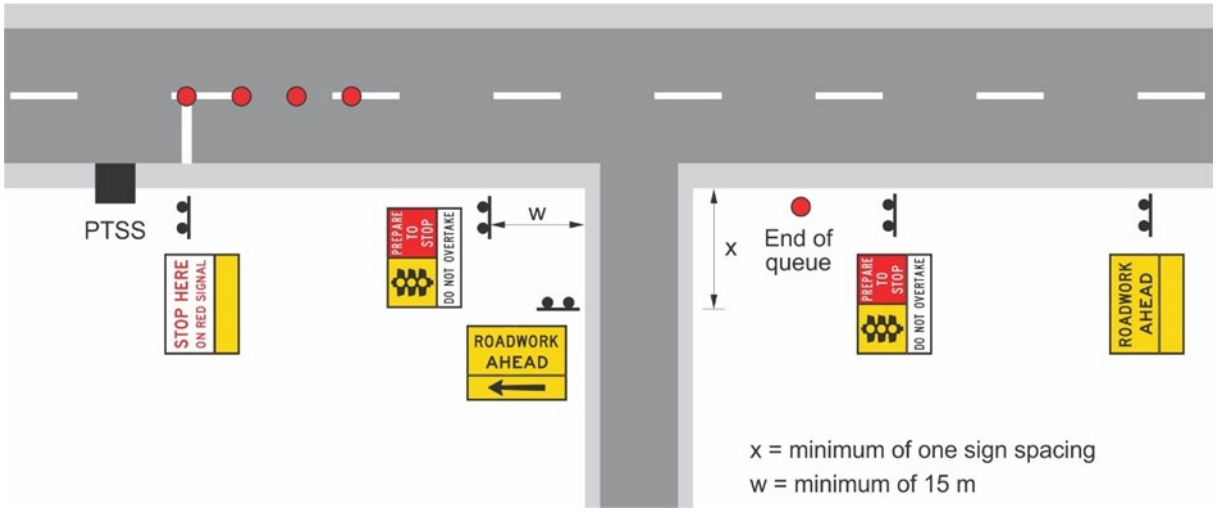


Figure 4.8.1(c) – Additional ROADWORK AHEAD sign, or variable message sign located on the side road and an additional repeater PREPARE TO STOP sign located on the through road



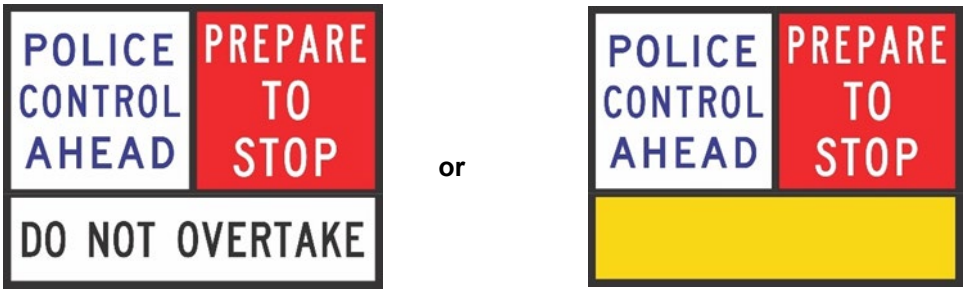
4.8.2 Police performing planned traffic control duties

New

Where Police perform traffic control duties in a planned arrangement as part of a static worksite, the POLICE CONTROL AHEAD panel shall replace the Traffic Controller (symbolic) panel or portable traffic control device panel in the multi-message signs required by Section 4.8 (see Figure 4.8.2(a)).

Both multi-message sign arrangements in Figure 4.8.2(a) are permitted in Queensland by the Queensland MUTCD Part 3; however, these are not in strict accordance with the requirements for multi-message signs in AS 1742.3 Clause 4.2.2(d).

Figure 4.8.2(a) – Police performing traffic control duties, PREPARE TO STOP sign (not at signals which are switched off)



Where Police perform traffic control duties in a planned arrangement as part of a static worksite at traffic signals which are not in operation, the POLICE CONTROL AHEAD panel shall be used with the Signals Not Operating (symbolic) panel in the top two 600 x 600 panels, with the POLICE CONTROL AHEAD panel positioned closest to traffic, and the 1200 x 300 version of the PREPARE TO STOP panel (see Figure 4.8.2(b)).

Figure 4.8.2(b) – Police performing traffic control duties, PREPARE TO STOP sign at signals (which are switched off or flashing amber)

4.8.3 End-of-queue protection

New

Traffic queues may form where vehicles are stopped or slowed by roadworks. This may be due to traffic control at the roadworks or congestion due to the roadworks, because of heavy traffic or lengthy delays, or a combination of the two. Depending on the speed of approaching traffic and sight distance to the end of a traffic queue, additional advance warning may be required to manage the risk of end-of-queue crashes.

End-of-queue risk control measures may also be considered where poor weather (for example rain or fog), poor road conditions, a downhill approach, vertical curves, night works (driver fatigue or visibility) or a slippery road surface are present.

Where traffic control is in use, end-of-queue risk control measures in accordance with Chapter 1, Clause 2 of the *Guideline – Traffic Management at Works on Roads* shall be used to manage the risk of rear end crashes in situations where either of the following apply:

- the speed limit is 80 km/h or higher (prior to any reductions for the roadworks), or
- where sight-distance to the end of the traffic queue is restricted (less than the value from Table 2.3).

End-of-queue risk control measures may also be triggered by the requirements in Clause 6.5.7 of the Transport and Main Roads Technical Specification, MRTS02 *Provision for Traffic* or nominated as mandatory control measures in Clause 5.8 of Annexure MRTS02.1.

For projects not subject to the requirements of MRTS02, the requirements in MRTS02 may be adopted.

4.8.4 Queued traffic ahead multi-message sign

New

The Queued traffic ahead multi-message sign assembly (see Figure 4.8) may be used at other locations (in addition to on approach to traffic control stations) where the temporary warning of traffic congestion is desirable.

5 Past the worksite

5.3 Separate the work area

5.3.1 Road safety barrier system

Difference

Replace the first paragraph:

> The road safety barrier system provides a physical barrier between the work area and moving traffic, designed to resist intrusion by errant vehicles and as far as practicable, redirect errant vehicles back into the travelled path. While safety barriers can be considered for all projects, this method may be inappropriate due to physical space requirements and limited edge clearances. If a road safety barrier is to be used, its design shall be based on the posted speed outside of works and not for the posted speed during works.

with the following:

> The road safety barrier system provides a physical barrier between the work area and moving traffic, designed to resist intrusion by errant vehicles and, as far as practicable, redirect errant vehicles back into the travelled path. While safety barriers can be considered for all projects, this method may be inappropriate due to physical space requirements and limited edge clearances.
>
> If a road safety barrier is to be used, its design shall be based on the speed of traffic past the barrier. In most cases, this will be a semi-permanent reduced speed limit posted at the site which generally applies 24 hours a day / 7 days a week, with other further temporary

reductions only applicable when required for works which are occurring. Where a general reduction in speed limit past the site has not been implemented, the permanent posted speed limit shall be used as the design speed for the road safety barrier design.

The requirements of Section 2.5.9 are applicable to the design speed. If the traffic speed is greater than 10 km/h higher or lower than the speed limit past the road safety barrier, the speed of traffic shall be used as the design speed for the road safety barrier design.

Speed limits past the road safety barrier shall be monitored throughout the completion of works to ensure compliance with the road safety barrier design speed.

Difference

Delete the following dot point for end treatment options:

- flaring the barrier system away from the road when the end of a barrier is further away from a traffic lane. Barrier design will provide guidance on the rate of flare.

Difference

Replace:

> End treatments are not required if the temporary road safety barrier system is flared behind a permanent road safety barrier or is outside of the adjacent clearance area and therefore not regarded as a hazard.

with:

> End treatments are not required if the temporary road safety barrier system is flared behind a permanent road safety barrier (or another temporary road safety barrier) and is outside the deflection zone requirements for that barrier system and therefore not regarded as a hazard.

Difference

Replace:

> A clearance between the road safety barrier system and the edge of the nearest traffic lane must be provided as shown in Table 5.1. These clearances are a recommendation only. There are no minimum clearances for permanent road safety barriers so the minimum for temporary systems if equally rated should be the same. Consider that road users often increase their travel speed during times the worksite is unattended.

with:

> A clearance between road safety barriers and traffic should be provided. The recommended minimum clearance between the road safety barrier system and the edge of the nearest traffic lane is shown in Table 5.1. When determining the appropriate speed to select in Table 5.1, consider the range of speed limits and vehicle speeds that may occur while the safety barrier is in place and the likelihood that road users often increase their travel speed during times the worksite is unattended.

Difference

Replace Table 5.1 with the following:

Table 5.1 – Road safety barrier system clearance to traffic lane

Speed (km/h)	Recommended minimum Distance (m)*
≤ 40	0.3
41–60	0.5
61–80	0.5
> 80	1

*Clearance is measured in front of the barrier system and not behind the barrier system in the deflection zone.

Addition

For additional guidance on road safety barriers in Queensland, see the *Road Planning and Design Manual Edition 2: Volume 3, Supplement to Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers*, with Section 6.8 of this document detailing the requirements for temporary road safety barriers.

Only road safety barriers included on the current list of products in the Transport and Main Roads *Accepted Road Safety Barrier Systems and Devices* document shall be used at roadwork sites in Queensland.

The Austroads Safety Hardware Training and Accreditation Scheme (ASHTAS) will, over time, offer courses for Safety Barrier Operative (Entry Level), Installers (Permanent and Temporary Safety Barriers), Designers (Permanent and Temporary Safety Barriers), and more. See QGTTM Part 8 Section 5.5.12 for more details.

For more ASHTAS details see the departmental web page Austroads Safety Hardware Training and Accreditation Scheme (ASHTAS).

5.3.3 Visibility screens

Addition

For additional guidance on anti-gawking screens, see the *Guideline – Traffic Management at Works on Roads*.

5.4 Delineate the route

Difference

Replace:

> If narrower edge clearance is required, obtain approval from the relevant road infrastructure manager.

with:

> If narrower edge clearances are required due to constrained geometry, the requirements of Clause 1.9 of the Queensland MUTCD Part 3 shall apply.

5.4.1 Traffic cones and bollards

Difference

Replace the first dot point

- Maximum spacing of cones and bollards must be as shown in Table 5.3

with

- Maximum spacing of cones and bollards should be as shown in Table 5.3.

5.4.2 Temporary hazard markers

Difference

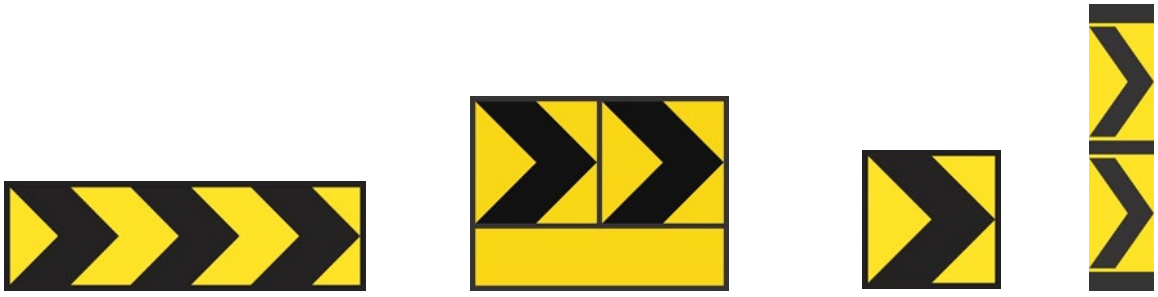
Replace the dot point:

- Repeated markers shall be spaced so they appear as a continuous line to approaching road users.

with:

- Repeated larger Temporary Hazard markers (T5-4 or 2 x TM5-5A panels in a multi-message frame arrangement – see Figure 5.4.2) shall be spaced so they appear as a continuous line to approaching road users.
- The smaller Temporary Hazard markers (T5-5 or T5-7 - see Figure 5.4.2) should be installed in a minimum group of three for a 3.0 m–3.5 m-wide taper, with one hazard marker at the start of the taper, another at the end of the taper and a third hazard marker at the approximate mid-point of the taper for approaching road users.

Figure 5.4.2 – Types of Temporary Hazard marker



T5-4 | 2 x TM5-5A panels in a multi-message frame | T5-5 | T5-7

5.4.4 Shuttle flow

Difference

Replace:

When using shuttle flow, the following are requirements and recommendations:

- Lane width should be reduced in accordance with Table 2.5. For further guidance on lane widths see Section 2.5.8.
- The swept path shall accommodate heavy and over-dimensional vehicles if required.

- Traffic control shall be provided at each end of the operation (see Section 5.10). Traffic control is not required if:
  - there is clear visibility past the work area and beyond it for at least 75 m, or to the end of the road if less than 75 m away
  - road users have clear visibility of the work area and the opposing approach for a distance greater than 150 m and either one of the following:
    - traffic volume in both directions is 40 vph or less, and the speed is 70 km/h or less, and the length of the single lane is 60 m or less
    - the length of the single lane is 100 m or less, and GIVE WAY and ONE LANE signs are provided at one end of the shuttle lane
    - it is a residential street and the length of the shuttle is 60 m or less.
- Ensure single lane section lengths are a maximum distance as shown in Table 5.4.

with:

When using shuttle flow, the following are requirements and recommendations:

- Lane widths shall be in accordance with Table 2.5. For further guidance on lane widths, see Section 2.5.8.
- The swept path shall accommodate heavy and over-dimensional vehicles if required.
- Active traffic control (by traffic controllers or PTCDs) shall be provided at each end of the operation (see Section 5.10), except as follows:
  - GIVE WAY and ONE LANE signs are provided at one end of the shuttle lane and the NO OVERTAKING OR PASSING sign is also to be erected at the start of the single lane for traffic in the opposite direction and all the following apply:
    - traffic volume in both directions is 150 vph or less
    - the traffic speed is 70 km/h or less
    - each entry to the work area is visible from the other
    - the length of the work area is 100 m or less, and
    - there is sight distance to opposing traffic of at least 200 m beyond the far end of the work area for traffic facing the GIVE WAY, ONE LANE assembly.
  - No specific traffic control signs are required for the single lane section, and traffic operates under natural give and take using the one open lane and either one of the following applies:
    - it is a residential street (permanent posted speed is 50 km/h or less) and there is clear visibility past the work area and beyond it for at least 75 m, or to the end of the road if less than 75 m away and the length of the shuttle lane does not exceed 60 m, or

        - road users have clear visibility of the work area and the opposing approach for a distance greater than 150 m or to the end of the road if less than 150 m away, the traffic volume in both directions is 40 vph or less, the permanent posted speed is 70 km/h or less, and the length of the shuttle lane is 60 m or less.

- Where active traffic control is not provided:
  - the length of the approach taper should be approximately 15 m where two-way operation is maintained, and
  - where working under natural give and take, or where GIVE WAY and ONE LANE signs are in operation, the taper should be at 45 degrees on both the approach and departure sides of the work area.
- Ensure single-lane section lengths are a maximum distance as shown in Table 5.4.

Addition

When GIVE WAY and ONE LANE signs are provided at one end of the shuttle lane (in accordance with this section), and advance warning of this arrangement is required, the Give Way Sign Ahead sign (W3-2 or WM3-2A in a multi-message sign assembly – see Figure 5.4.4) should be used.

Figure 5.4.4 – Advance PREPARE TO STOP sign for Give Way control

Addition

The volumes in Table 5.4 have been determined to allow a quick analysis without referring to a traffic engineering professional. Additional traffic engineering input is required to support a longer length of single-lane operation.

Generally, when using Table 5.4, and where the lengths are within the maximum limits, single-lane operation using active control by portable traffic control devices or traffic controllers will lead to a relatively short and consistent or stable queue length; however, additional traffic engineering input and considerations (risk assessments) are required to support longer lengths of single-lane operation which will generally lead to longer maximum queue lengths and queue lengths that are not easily managed, or are variable and unstable. Contingency planning for longer than expected or continually-growing queue lengths shall be included as part of the TGS design. End-of-queue protection measures (see Section 4.8.3) shall be considered.

5.5 Safe traffic speed

Addition

Additional guidance on supplementary devices to reduce speed is provided in Chapter 1, Clause 1 of *Guideline – Traffic Management at Works on Roads*.

5.5.1 Temporary speed limits

Addition

Add the following guidance:

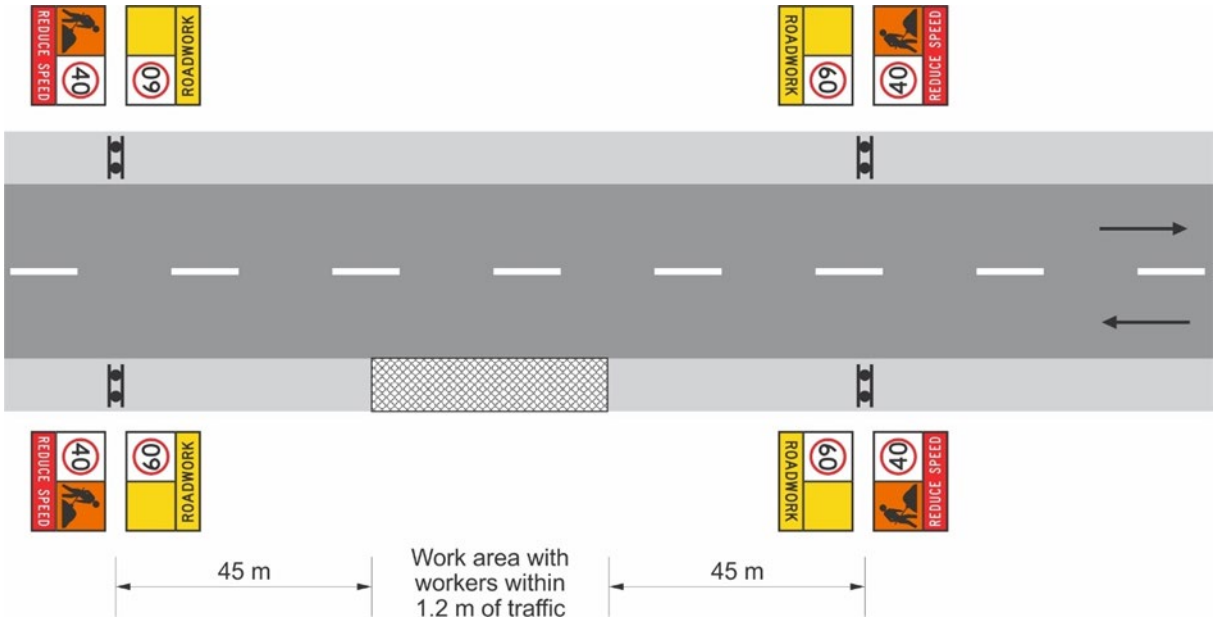
The Designer should ensure reduced speed zones are as short as possible and that they are not commenced so far prior to the hazard (or workers) that drivers start to disregard them and speed up. There is a balance between ensuring drivers can reduce speed prior to a hazard and not making that distance so long that compliance becomes an issue.

Speed limits implemented to meet specified safe workplace requirements for the protection of workers in an active work area are to commence a minimum of a single sign spacing in advance of the active work area. The 200 m zone requirements past a speed limit reduction apply when determining this sign spacing value.

When considering the extent of the reduced speed beyond the work area, the guidance in Section 5.12 should be used, while remembering that offset speed zone requirements and the need to reduce traffic speeds past the work area for the other direction of travel may dictate the speed sign locations.

Figure 5.5.1 illustrates an example of a speed reduction arrangement for road worker safety on a 60 km/h road where road workers will be working within 1.2 m of the traffic lane and the speed past the workers is to be reduced to 40 km/h. The distance in advance of the workers for the start of the 40 km/h reduced speed zone is based on appropriate sign spacing in Table 2.2. As this spacing is within 200 m of a speed limit change (to 40 km/h), the speed value to use in Table 2.2 is 60 km/h which equates to a distance of 45 m. This Figure does not include all traffic control devices required and is not to be used as a TGS diagram.

Figure 5.5.1 – Speed limit sign location for road worker safety



Difference

In subsection **'Selecting the speed limit'**, replace Table 5.5 with the following:

Table 5.5 – Recommended length of temporary speed zone

Temporary speed limit (km/h)	Length of zone (m)	Conditions
<40	100–200	• unusually high level of hazard for workers on foot or road users (pedestrians or cyclists) • it is impractical to separate pedestrians or cyclists from vehicular traffic in the work area
40	100 (minimum)–500 (maximum)*	• workers on foot within 1.2 m of traffic with no physical barrier • structural danger to bridges • high level of hazard for workers on foot or road users (pedestrians or cyclists)
60	150 (minimum)	• workers on foot between 1.2 m and 3 m of traffic or plant within 3 m of traffic with no physical barrier (that is, road safety barrier) • on approach to the traffic controller or PTCD • reduced visibility (for example, dust or smoke) • reduced standard alignment • degraded pavement surface • newly laid bituminous seal
80	500 (minimum)	• workers on foot or plant between 3 m and 6 m of traffic with no physical barrier • disturbance to alignment or pavement surface
80 (buffer)	300 (minimum)	• for advance warning of a 40 km/h or 60 km/h when speed is 100 km/h or more

*Subject to a risk assessment, the maximum length for a 40 km/h temporary speed limit may be extended to 1000 m.

Difference

In subsection **'Designing the speed limit'**, replace the following two dot points on temporary speed zones (regarding the use of the speed limit AHEAD signs and the Speed Restriction signs at the start of a zone):

- a Speed Limit AHEAD sign is located a distance double the speed in advance of the Speed Restriction sign
- a Supplementary ROAD WORK and Speed Restriction signs at the start of temporary speed zone. Speed Restriction signs are to be placed on both sides of the roadway where practicable

with:

- a Speed Limit AHEAD sign shall be located a distance double the speed in advance of the Speed Restriction sign and shall be located on both sides of the roadway where practicable. Refer to Table 5.6 – *Methods for reducing speed limit* for the use of the Speed Limit AHEAD sign
- a Supplementary ROAD WORK and Speed Restriction sign or a Speed Restriction sign in a multi-message panel at the start of temporary speed zone. Speed Restriction signs at the start of a temporary speed zone shall be placed on both sides of the roadway where practicable.

Addition

Add the following additional guidance:

> Where it is not practicable to duplicate speed signage, the designer should document (generally through a risk assessment approach) an alternative to ensure all road users are able to see signs. The options in Section 2.5.3 may be considered.

Difference

In subsection **'Designing the speed limit'**, replace the following paragraph on repeater speed limit signs:

> Repeater signs must be used to confirm and remind users of the speed limit where the zone is long and there are locations which could seem like the temporary speed limit no longer applies (e.g. between work areas in an extended worksite), or to advise road users entering the temporary speed limit. Repeater signs must be placed on the left-hand side of the road at a maximum spacing of 500 m and on both sides on multilane roads.

with:

> Repeater speed limit signs shall be used to confirm and remind users of the speed limit where the zone is long and there are locations which could seem like the temporary speed limit no longer applies (for example, between work areas in an extended worksite), or to advise road users entering the temporary speed limit. Repeater speed limit signs may be used as required above, and shall be placed on the left-hand side of the road at a maximum spacing of 500 m. On multilane divided roads, repeater speed limit signs should also be placed at a maximum spacing of 500 m on the right-hand side of the roadway where practicable.

Difference

In subsection '**Operational**', replace third dot point:

- Signs shall be placed on both sides of the roadway where practicable to ensure road users have clear visibility of speed limit signs.

with:

- Speed Restriction signs where required to be duplicated in the **'Designing the speed limit'** section should be placed on both sides of the roadway where practicable to ensure road users have clear visibility of speed limit signs.

Addition

Add the following additional guidance:

Guidance on the use of temporary variable speed limit signs in construction and maintenance work areas on motorways is given in the *Guideline – Traffic Management at Works on Roads*.

5.5.2 Temporary speed humps

Addition

Guidance on the use of temporary speed humps and associated signage is given in the *Guideline – Traffic Management at Works on Roads*.

5.5.3 Rumble strips

Addition

Guidance on the use of rumble strips and associated signage is given in the *Guideline – Traffic Management at Works on Roads*.

5.5.4 Speed enforcement

New

Requirements for planned speed enforcement are included in Technical Specification MRTS02 *Provision for Traffic*. Projects not subject to the requirements of MRTS02 may adopt the requirements in MRTS02.

Speed enforcement planned and undertaken in accordance with MRTS02 shall include the TC sign SPEED CAMERAS USED AT ROADWORKS FOR ROAD SAFETY (TC2320_1, see Figure 5.5.4(c)) and shall include an orange target board to the speed limit signs as per TC2320_2 for camera enforcement, or TC2320_3 for enforcement by a Roadways Behaviour Monitoring System (RBMS) camera. The orange target board shall be added to all speed limit signs (including repeater and speed limit AHEAD signs) on approach to the enforcement location. The ROADWORK AHEAD sign (T1-1 or equivalent, such as a VMS) shall be installed in advance of the site. The multi-message sign arrangements in Figures 5.5.4(a) and 5.5.4(b) shall not be used for speed enforcement in accordance with MRTS02.

When speed enforcement is planned and undertaken outside the requirements of MRTS02, TC sign TC2361 shall be used as follows:

- For enforcement by camera, use the multi-message sign arrangement in Figure 5.5.4(a).
- For enforcement other than by camera, use the multi-message sign arrangement in Figure 5.5.4(b).

The multi-message sign arrangement in Figure 5.5.4(b) may be used at roadworks sites where there is no active speed enforcement; however, in this case, the installation of this arrangement shall be limited to locations which meet all the following criteria:

- the roadworks site has known or expected low speed compliance, and
- it is not feasible or practicable to implement other engineering treatments to reduce vehicle speeds (or where the treatments in Chapter 1, Clause 1 of the *Guideline – Traffic Management at Works on Roads* have been ineffective), and

- the location should have a permanent speed limit of 70 km/h or greater (prior to any speed reductions for the works).

When used, the enforcement signs SPEED CAMERAS USED AT ROADWORKS FOR ROAD SAFETY (TC2320_1 – see Figure 5.5.4(c)) and the multi-message sign arrangements in Figures 5.5.4(a) and 5.5.4(b):

- shall be located in advance of any enforcement device
- shall be located in the advance warning area as an additional sign
- shall be separated from other signs and devices by a minimum of at least one sign spacing
- shall be duplicated in accordance with the requirements in Section 2.5.3, and
- ideally should be located one sign spacing in advance of a speed restriction sign within the advance warning area.
    - Where enforcement is occurring, and this is not the speed limit which is being enforced and if space is available, a repeater enforcement sign may be installed one sign spacing in advance of the lower speed restriction sign (this repeater enforcement sign may be outside the advance warning area).

There are no requirements for the special enforcement style signs to be in place for police to conduct unplanned speed enforcement.

Figure 5.5.4(a) – Multi-message sign arrangement for planned camera enforcement (undertaken outside the requirements of Technical Specification MRTS02 Provision for Traffic)

Figure 5.5.4(b) – Multi-message sign arrangement for planned enforcement by other than a camera (undertaken outside the requirements of Technical Specification MRTS02 Provision for Traffic)

Figure 5.5.4(c) – Traffic Control sign TC2320_1 for speed enforcement planned and undertaken in accordance with Technical Specification MRTS02 Provision for Traffic

5.6 Safety buffer

Addition

On roads with a permanent speed limit (prior to any reductions for the works) of less than or equal to 80 km/h, the safety buffer may be omitted where the works (including the work area, all workers, vehicles, equipment and materials) are at least 6 m clear of traffic and is supported by a risk assessment.

5.8 Additional warning area and devices

5.8.1 Truck-mounted attenuators

Addition

Additional guidance on the use of truck-mounted attenuators (TMAs) is given in the *Guideline – Traffic Management at Works on Roads*.

Only TMAs included on the current list of products in Transport and Main Roads' *Accepted Road Safety Barrier Systems and Devices* document shall be used at roadwork sites in Queensland.

5.9 Transition area

5.9.1 Tapers

Difference

Replace the title for Table 5.8:

> Table 5.8: Distance between tapers

with

> Table 5.8: Recommended distance between tapers

Difference

Replace the text following Table 5.8:

> The speed to use in Table 2.2 and 5.8 must be as per Figure 2.2 of Section 2.5.3.
>
> For details on how to use delineation devices see Section 5.4.

with

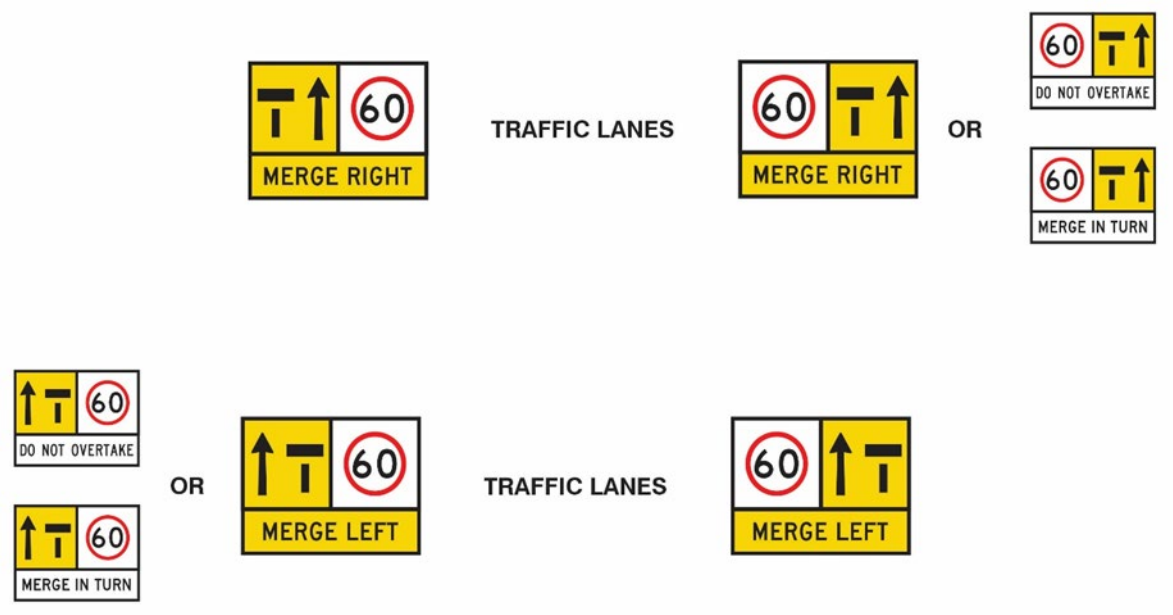
> The speed value used in Tables 5.7 and 5.8 shall be as per Figure 2.2 of Section 2.5.3 – the 200 m zone in Figure 2.2 applies to the recommended length and recommended spacing of tapers.
>
> For the spacing of delineation devices at tapers, see Section 5.4. The 200 m zone in Figure 2.2 does not apply to delineation spacing.
>
> Where the posted permanent speed limit of the road is 80 km/h or greater, the recommended taper length for merge tapers (Table 5.7) and the recommended distance between merge tapers (Table 5.8) may be increased and be based on the posted permanent speed limit of the road.

Addition

In subsection '**Merge taper**', add the following:

When signing merge tapers, the multi-message signs on each side of the multilane road on approach to the merge taper may be different. The MERGE LEFT / MERGE RIGHT panel should be included with the lane status panel for the lane which is required to merge (must change lanes); however, for the lane where no action is required as this lane continues, the MERGE LEFT / MERGE RIGHT panel may be replaced with either a DO NOT OVERTAKE or MERGE IN TURN panel as shown in the following Figure 5.9.1(a).

Figure 5.9.1(a) – Lane status signs for merge tapers



Addition

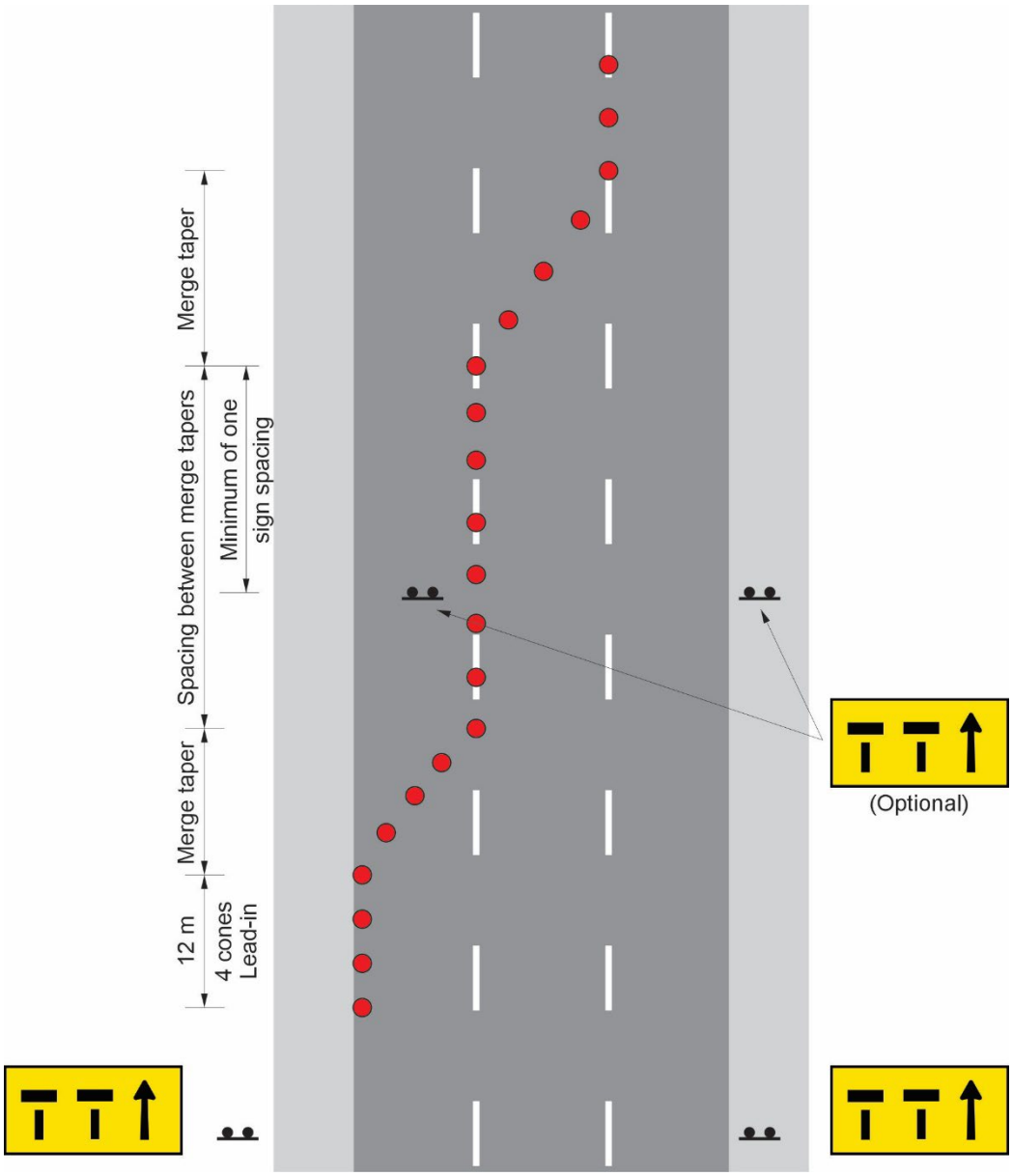
In subsection '**Multiple tapers**', add the following:

When signing multiple merge tapers, the following lane status sign configuration and location requirements will apply:

- All lane status signs shall display the final lane configuration regardless of their location.
- A lane status sign shall be located a minimum of a single sign spacing prior to the start of the first merge taper; however, as more than one lane is merging, this spacing may be increased to a distance of two sign spacings (see Section 2.5.3).
- A repeater lane status sign may be installed in the area between the two merge tapers and, if used, should be located a minimum of a single sign spacing prior to the start of the second merge taper.

The following Figure 5.9.1(b) is an example of the lane status sign configuration and location for a road with multiple merge tapers. This Figure does not include all traffic control devices required and is not to be used as a TGS diagram.

Figure 5.9.1(b) – Lane status signs for multiple merge tapers



Difference

In subsection '**Designing a taper**', replace the fifth and sixth dot points:

- Tapers shall not start or end within 50 m of an intersection on Category 2 roads. In this case, the start of the taper is the point where the shift / merge finishes, and the end of the taper is where closed lanes are re-opened.
- Tapers shall not start or end within 100 m of an intersection or on / off-ramp on Category 3 roads. In this case, the start of the taper is the point where the shift / merge finishes, and the end of the taper is where closed lanes are re-opened.

with:

- Merge tapers shall not start or end:
  - within 50 m of an intersection (both approach and departure sides) on a controlled leg of an intersection on a Category 2 road

  - within 100 m of an intersection (both approach and departure side) located on a ramp from / to a Category 3 road, or
  - within 100 m of a ramp (on or off) on a Category 3 road.
- Merge tapers located on an uncontrolled leg of an intersection on a Category 2 road should not start or end within 50 m of the intersection (both approach and departure sides).
- Merge tapers shall not be implemented through / across an intersection or ramp.
- Lateral shift tapers (excluding at contraflow transition points) shall not be implemented through / across an intersection or ramp. Where provided at contraflow transition points, the management of the other approaches to the intersection will be critical.

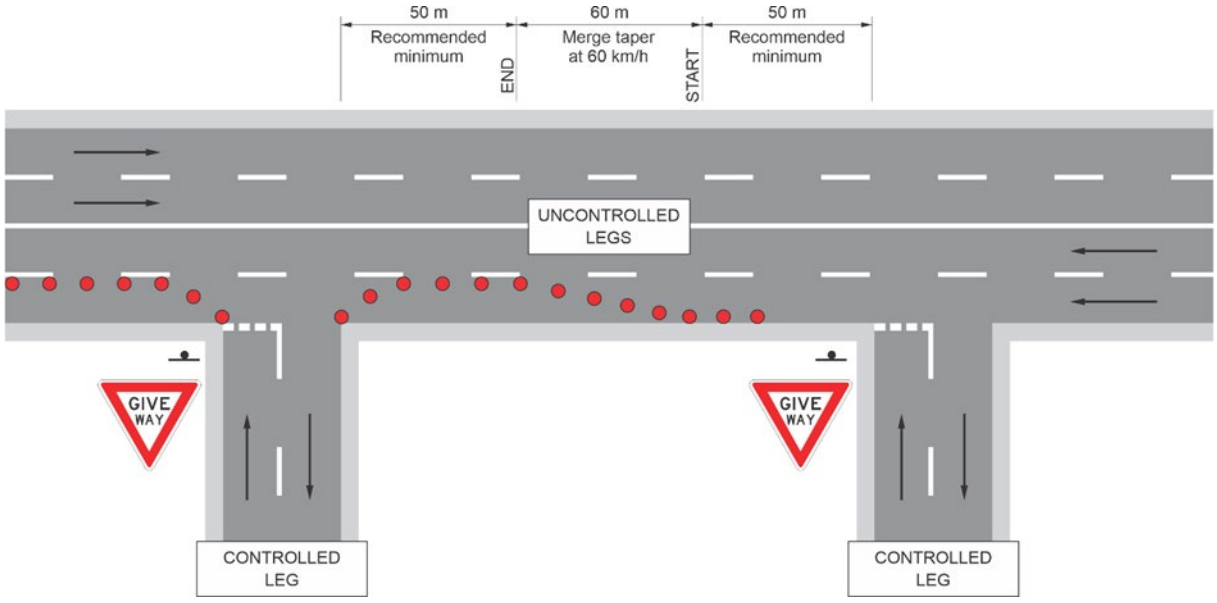
Addition

In subsection **'Designing a taper'**, add the following:

When considering the space requirements for a merge taper, the terminology referring to a controlled leg or uncontrolled leg of an intersection on a Category 2 road is different to a controlled intersection. Controlled legs are those approaches to an intersection controlled by traffic signals, roundabout give way signs, give way signs, or stop signs. In some cases, a controlled intersection may have uncontrolled legs, which are not subject to any formal control method.

Figure 5.9.1(c) shows an example of a merge taper on a Category 2 road with a 60 km/h speed limit that includes intersections with minor side streets (GIVE WAY or STOP signs on the side streets only). The side street legs are controlled while the multilane road has uncontrolled legs through these controlled intersections.

Figure 5.9.1(c) – Controlled and uncontrolled legs on a multi-lane road



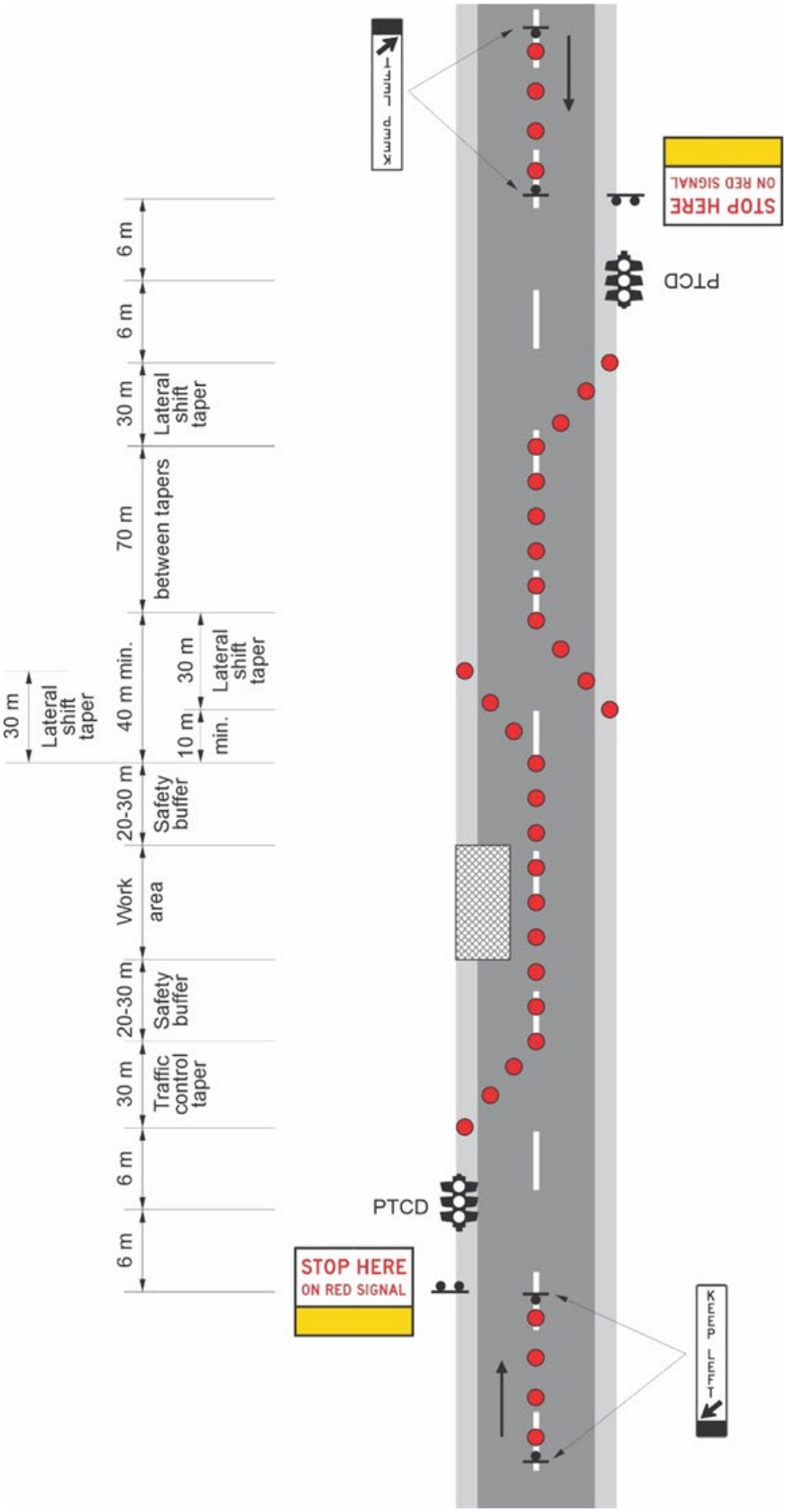
5.9.2 Chicanes

Addition

A chicane is also a useful treatment when using shuttle flow traffic control to ensure vehicles return to the correct side of the road and should be implemented when the site is unattended.

Figure 5.9.2 illustrates an example of a chicane used with shuttle flow and signal traffic control on a road with a 60 km/h speed limit. This diagram does not include all traffic control devices required and is not to be used as a TGS diagram.

Figure 5.9.2 – Chicane with traffic control



5.9.4 Closing the shoulder

New

Shoulders are not generally used as traffic lanes; however, shoulders may be used by cyclists and, in some cases, by motorcyclists. Parking lanes may also appear to some road users as possible traffic lanes.

Where works require the closure of the area outside of the traffic lane (shoulder), to ensure road users do not inadvertently traverse the area behind the delineation of works, the following options apply:

1. Where the shoulder may be used by cyclists and, in some cases, motorcyclists, a short taper at a 45 degree angle to traffic should be provided (see Figures 5.9.4(a), 5.9.4(b) and 5.9.4(c)). This is the preferred method of closing a shoulder.
2. Where the shoulder is unlikely to be used by other road users, subject to a risk assessment, a square closure may be implemented (see Figures 5.9.4(d) and 5.9.4(e)).
3. Where there is a very wide shoulder (for example, wide road reserves in rural towns or where angle parking is provided), subject to a risk assessment, a combination of these options may be implemented (see Figure 5.9.4(f)).

Devices which may be used to close the shoulder include traffic cones, bollards, Temporary Hazard markers, barrier boards, or a combination of these, depending on the site characteristics. The following Figures do not include all traffic control devices required and are not to be used as TGS diagrams.

Figure 5.9.4(a) – Closing a shoulder at a 45 degree angle

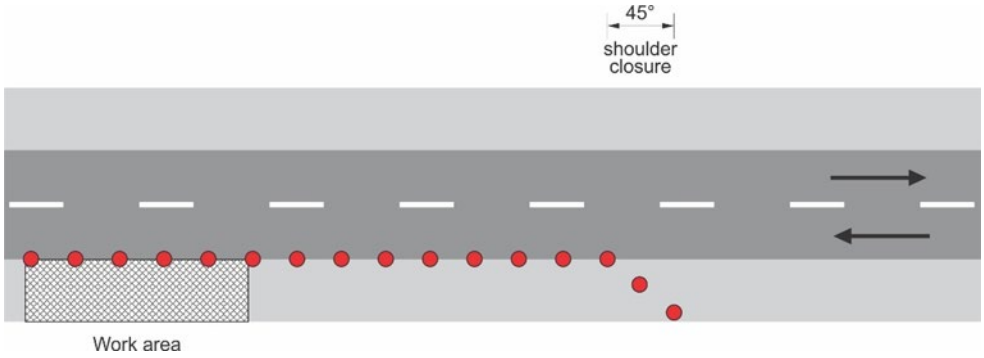


Figure 5.9.4(b) – Closing a shoulder at a 45 degree angle where a taper is required

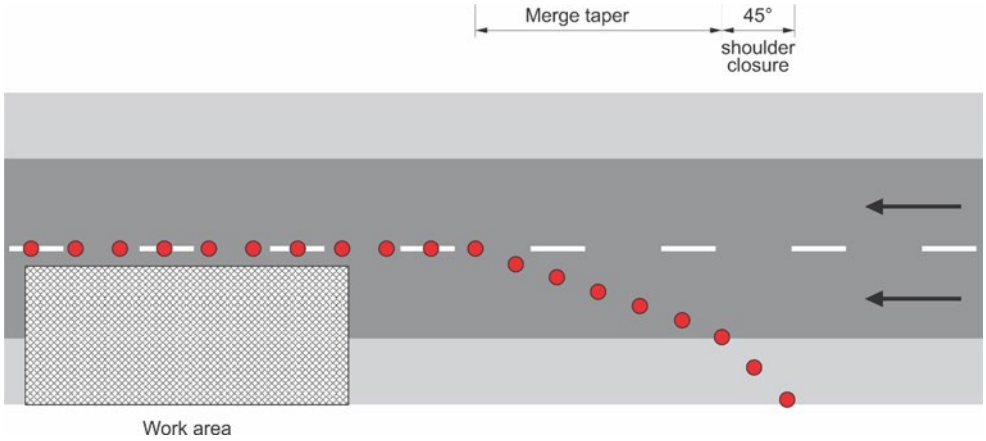


Figure 5.9.4(c) – Closing a shoulder at a 45 degree angle where a taper is required and a lead-in is provided

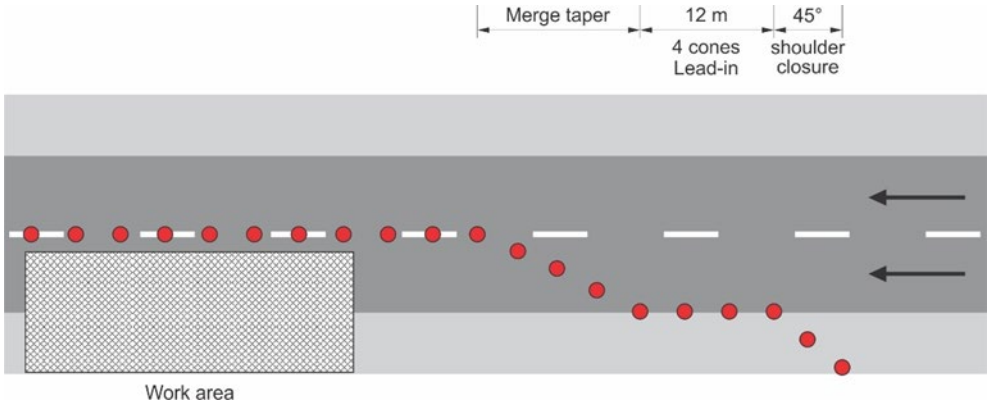


Figure 5.9.4(d) – Closing a shoulder with a square treatment where a taper is required

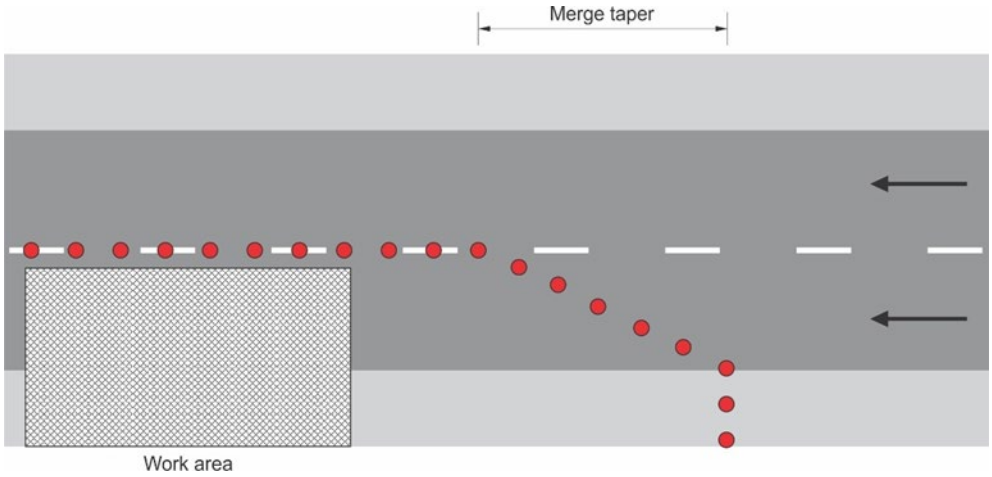


Figure 5.9.4(e) – Closing a shoulder with a square treatment where a taper is required and a lead-in is provided

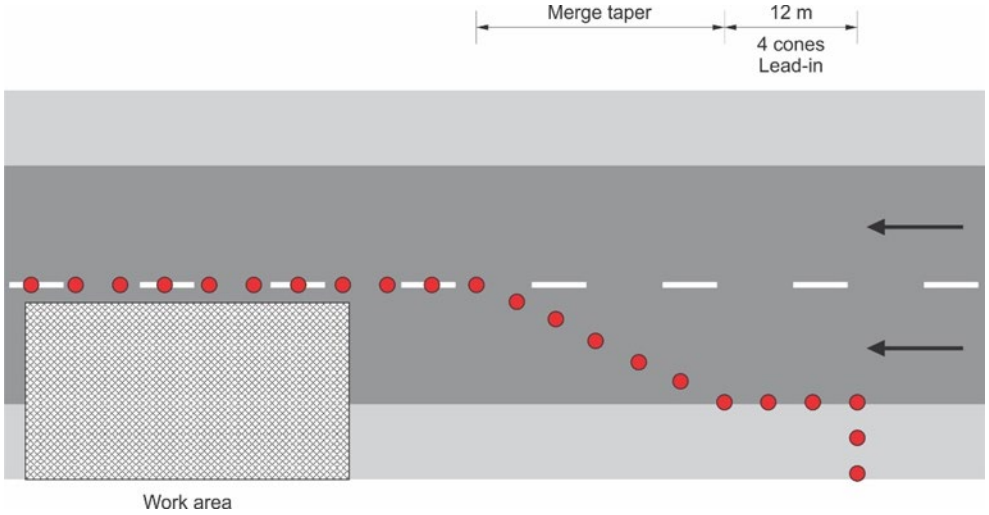
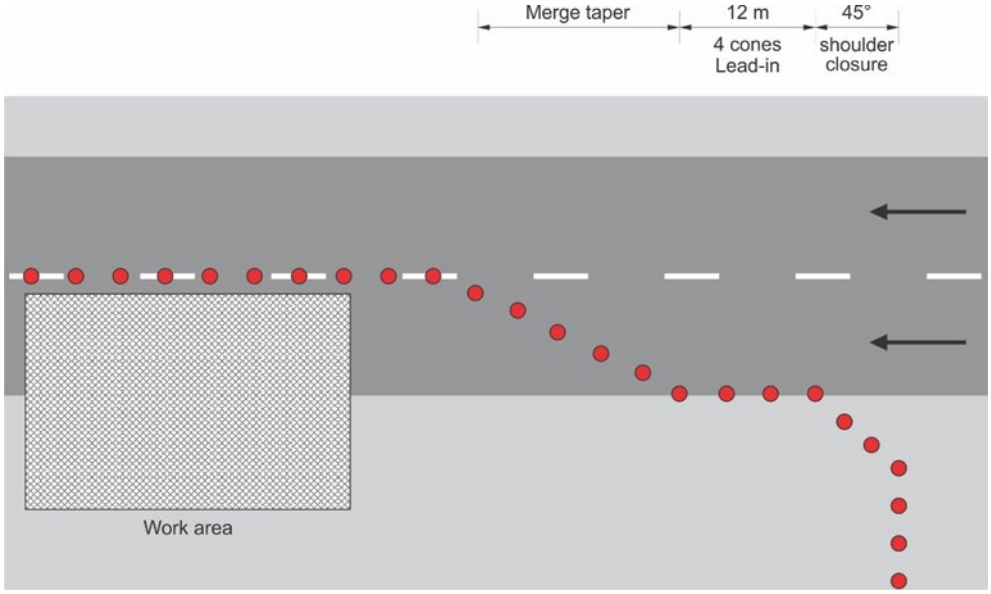


Figure 5.9.4(f) – Closing a wide shoulder with a combination of treatments



5.10 Traffic control

Addition

The advance warning area requirements, including estimating the end of queue position and calculation requirements in Section 4.8 (including subsections) also apply to the traffic control methods used in this section.

5.10.1 Portable traffic control devices

Difference

Replace Section 5.10.1 with the following:

PTCDs are used to enhance the safety and protection of road users and road workers, specifically traffic controllers.

When using PTCDs, and situations occur where vehicles can bypass the temporary traffic control station, the placement of additional cones along the centreline shall be installed to provide a sufficient distance to prevent the vehicle passing the PTCD. Prior to including a PTCD in a TGS, a risk assessment shall be undertaken to ensure the suitability and choice of PTCD. Other considerations are as follows:

1. impacts of equipment failure on road workers and road users; employ back-up traffic controllers in case of failure
2. background impacts on the visibility of the PTCDs for approaching road users
3. clear visibility and available sight distance (see Section 2.5.4); install PTCDs on the left-hand side of each approach – if they are not readily visible in that location, they should be placed in a more visible position
4. speed of traffic
5. traffic volumes
6. duration of works, and

7. can only be manually operated.

PTCD options include:

8. portable traffic signal systems (PTSS):
    a) intended for shuttle flow (see Section 5.4.4) or gating (all stop) operation
    b) available to provide control at intersections (see *Guideline – Traffic Management at Works on Roads* Chapter 5 Clause 2.5.3.1)
    c) signals automatically respond to traffic demands via vehicle actuated operation (unmanned)
    d) option of fixed time operation that used fixed timed cycles when traffic flow is relatively constant
    e) may be used in manual mode but require qualified operators (that is, traffic controller) – operators with two-way radio can monitor signal performance, warn the roadworks site and manage road users, and
    f) do not use where side roads intersect the roadworks site and are not controlled by a traffic controller or other PTSS.
9. Portable boom barriers:
    a) are intended to stop traffic
    b) manage shuttle flow or gating (all stop) operation, and
    c) require qualified operators to operate in manual mode (that is, traffic controller).

When using PTCDs:

10. four cones should be placed on the centreline spaced 4 m apart starting from the STOP HERE ON RED SIGNAL or the STOP HERE WHEN DIRECTED sign position (downstream), and
11. undertake a risk assessment.

Consider the following when using PTCDs:

12. PTCDs require qualified operators (that is, traffic controller).
13. They are intended for traffic control of relatively short duration: for roadworks sites that will continue for a longer period without work area location changes, consider installing temporary, rather than portable, traffic signals (see AS 1742.3).
14. Where traffic is required to stop, temporary road markings may be installed 6 m in advance of the PTCD to indicate a stop line. The STOP HERE ON RED SIGNAL or STOP HERE WHEN DIRECTED shall be installed in accordance with the Queensland MUTCD Part 3.
15. Provide warning signs (for example, Signals AHEAD) an appropriate sight distance in advance of any PTCD as shown in Section 2.5.3 (see QGTTM Part 3 Section 4.8 for advance sign options). For PTCD, the Traffic Controller (symbolic) sign is replaced with the relevant PTCD (symbolic) sign.

16. Apply a temporary speed limit of 60 km/h or less if speed is above 60 km/h (see Section 5.5.1) on approach to the PTCD.
17. Regularly monitor PTCDs to ensure they are operating effectively and safely by checking that:
    a) the settings are appropriate
    b) the alignment of the signal displays is correct
    c) the associated signs are intact and properly displayed
    d) detectors are functioning correctly
    e) there are no burnt out lamps, and
    f) batteries are charged.

Figure 5.23 illustrates an example of PTCD and sign placement. This diagram does not include all traffic control devices required and is not to be used as a TGS diagram (see Section 4.8 for avoiding end-of-queue collision options and placement of signs). Traffic must be reduced to a maximum of 60 km/h on the approach to a PTCD and an advance warning sign (ROADWORK AHEAD) is to be located in accordance with Section 4.8.

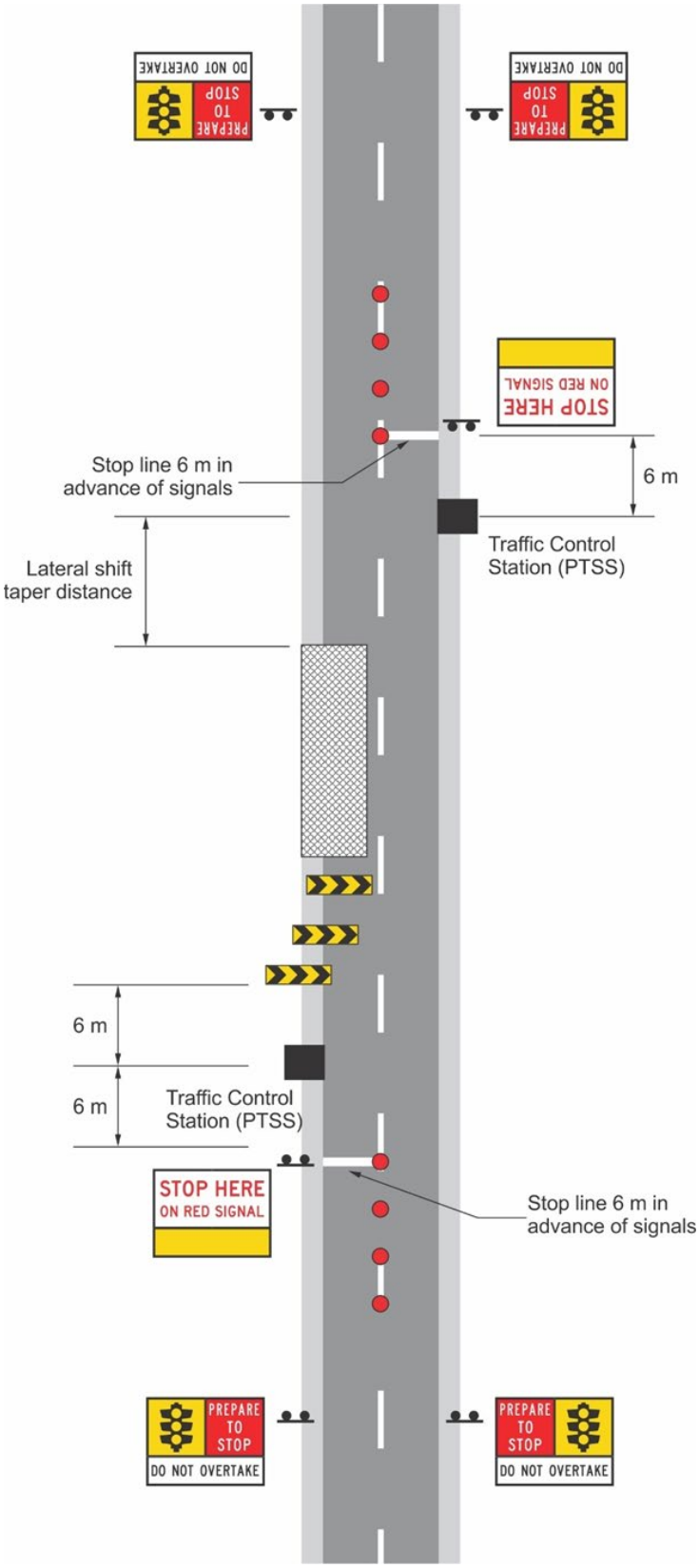
PTCDs may be used on any road environment; however, PTCDs should be used in lieu of traffic controllers using a STOP / SLOW bat on all roads with an annual average daily traffic (total vehicle count in both directions of travel per day) of over 500 vehicles per day and a permanent posted speed limit of 70 km/h or greater.

Where a PTCD is not used as recommended here, a risk assessment in accordance with the requirements of Clause 1.9 of the Queensland MUTCD Part 3 will be required.

Only PTCDs included on the current list of approved products in the Transport and Main Roads ITS Approved Products document shall be used at roadworks sites in Queensland.

Additional guidance on the use, installation and operation of PTCDs, including Type 1 and 2 PTSS and boom barriers, is available in the *Guideline – Traffic Management at Works on Roads*.

Figure 5.23 – Typical use of portable traffic control devices, 60 km/h road



Note:

1. Traffic speed must be reduced to a maximum of 60 km/h on the approach to a PTCD, and
2. An advance warning sign (ROADWORK AHEAD) or VMS shall be installed in accordance with Section 4.8.

5.10.2 Traffic controllers

Difference

Replace:

> Worksites are hazardous areas so use manual traffic control only where PTCDs are insufficient to provide the safety, capacity and efficiency required for effective traffic control. When traffic controllers are used, traffic controllers cannot direct a road user to contradict upcoming intersection signals. Traffic controllers are to coordinate activities with operating signals. If traffic controllers are operating within close proximity to a signalised intersection and the lights are flashing yellow or are off, a traffic controller must only control one lane and the approach to this intersection must be reduced to one lane of traffic. Where works cause delays to traffic flow or a side road intersects the worksite, do not use an automated PTCD, a traffic controller is required. The following requirements and recommendations apply when using traffic controllers:

with

> Worksites are hazardous areas so use manual traffic control only where PTCDs are insufficient to provide the safety, capacity and efficiency required for effective traffic control. When traffic controllers are used, traffic controllers cannot direct a road user to contradict upcoming intersection signals. Traffic controllers are to coordinate activities with operating signals. If traffic controllers are operating within close proximity to a signalised intersection and the lights are flashing yellow or are off, a traffic controller must only control one lane and the approach to this intersection must be reduced to one lane of traffic. Where works cause delays to traffic flow, or a side road intersects the worksite, do not use an automated PTCD;, a traffic controller using a STOP/SLOW bat or controlling a PTCD is required. The following requirements and recommendations apply when using traffic controllers:

Difference

Replace the following dot point:

- Ensure that traffic controllers are well illuminated at night. Where required, provide additional lighting.
- Ensure a single traffic controller never controls more than one lane of traffic or more than one approach. A single traffic controller can operate two PTSS at one time in special circumstances.

with

- Ensure that traffic controllers are well illuminated at night. Where required, provide additional lighting. See Section 6.7 *Night works* for greater detail about working at night.
- Ensure a single traffic controller never controls more than one lane of traffic or more than one approach when using a STOP/SLOW bat or a PTCD. This may only be varied where a traffic controller is using a PTCD which is capable of alternative arrangements and both the device and manner of operation is approved by the department. See Section 2.6.2 of AGTTM Part 7 for additional requirements and considerations when designing and using PTCDs for traffic control.

5.10.4 Combining portable traffic control devices

New

The Transport and Main Roads Technical Specification, MRTS267 *Boom Barriers for Roadworks*, permits the use of a boom barrier with a Type-1 or Type-2 PTSS and details the technical requirements for the device.

The combination of a Type-1 or Type-2 PTSS with a boom may be used at any location a PTSS may be used but may be suited to locations where compliance with the PTSS has been poor.

The following operational requirements apply when using a combination PTSS with boom:

- The primary device will be the PTSS, with the boom providing a visual support to the operation of the signals.
- The STOP sign shall not be installed on the boom.
- As the signals will be the primary device, the advance warning signs will include the signals (symbolic) panel and not the boom barrier (symbolic).
- The STOP HERE ON RED SIGNAL sign shall be installed 6 m in advance of the PTSS.
- The boom shall be located such that in the raised position it is slightly behind the signals (no greater than 1 m behind) and must not interfere with the visibility of the signals. Traffic stopped at the boom must still be able to see and respond to the PTSS.
- The boom may be either freestanding or attached to the same support structure as the PTSS.
- The boom in the raised position shall be at least 800 mm clear of the traffic lane.
- When in the lowered position, the boom shall block the approaching traffic lane and extend to a point not further than 600 mm from the road centre line.
- Four cones should be placed on the centre line spaced 4 m apart starting from the STOP HERE ON RED SIGNAL sign and extending toward approaching traffic.

The advance warning area requirements, including estimating the end of queue position and calculation requirements in Section 4.8 (including subsections), also apply to the traffic control method used in this section.

Only combination PTSS and boom barriers included on the current list of approved products in the Transport and Main Roads ITS Approved Products document shall be used at roadwork sites in Queensland.

5.11 Advance warning area

Difference

Replace:

> For divided multilane roads, advance warning signs are usually only required in one direction unless the work is carried out in the median.

with

> For divided roads, advance warning signs are usually only required in one direction, unless the work is carried out in the median.

Difference

Replace:

- Worker (symbolic) in advance of the worksite (if road workers or plant are visible to traffic)

with:

- Worker (symbolic) – see AS 1742.3.

Difference

Replace:

- space successive signs (after the primary sign) at a distance equal to those specified in Table 2.2

with:

- space successive signs at a distance equal to those specified in Table 2.2 and see Section 2.5.3.

6 Design for additional issues

6.5 Shoulder as a Temporary Lane

Difference

Replace:

- moving road users to the shoulder may bring roadside hazards within the clear zone.

with:

- moving road users to the shoulder may bring roadside hazards within the clear zone. See Section 6.11 for details on the clear zone.

6.6 Pavement markings

Addition

The methods specified in Transport and Main Roads Technical Specification MRTS45 *Road Surface Delineation* shall be used to cover or remove line marking / pavement marking. In addition to the methods in MRTS45, the use of proprietary line marking tape may be used to either temporarily cover or install temporary line marking / pavement marking.

6.7 Night works

Difference

Replace the entire Section 6.7 with the following:

> Undertaking work at night is effective in reducing delays to traffic because traffic volumes are normally lower than during most daylight hours; however, work at night requires careful additional planning and inspection.
>
> The following are in addition to the requirements in AS 1742.3 Clause 4.2.4 *Night conditions*.

When planning night-time traffic management measures, the following considerations apply:

1. many visual cues available during the day are not available to drivers at night

2. TMA(s) may be used to increase visibility and provide forward warning to motorists as well as protecting workers
3. noise limitations
4. traffic demand will be lower, so traffic speed may increase
5. road user and road worker visibility are reduced
6. road user and road worker awareness may be reduced due to fatigue, increasing the risk of error
7. the potential for road users to be affected by drugs or alcohol is increased
8. traffic management methods may need to be different
9. the installation of delineation devices and any impact of reflective components from multiple rows of delineation
10. flashing lamps may be used for delineation if the flashing lamps are smart devices (see AS 1742.3 Clause 4.13)
11. flashing lamps may be used to warn pedestrians and cyclists of upcoming hazards they need to be aware of, and
12. flashing lamps may be used to alert drivers

When planning night-time traffic management measures, the following requirements and recommendations apply:

13. Personal Protective Equipment (PPE) with increased night-time visibility (for example, reflective tape) shall be used
14. additional lighting for the roadworks site, including areas where workers or plant are operating, traffic controller locations, pedestrian paths / areas, bicycle lanes and sections of the travel path or Temporary Traffic Management (TTM) devices which require illumination, shall be provided; mount lighting so that it directs light downward and do not use light sources that produce glare that could become disabling or confusing for road users
15. traffic controllers shall use illuminated wands in addition to the STOP / SLOW bat.
16. flashing lamps should be used as part of the advance warning for roadworks sites on roads with an approach speed limit of 80 km/h or greater and be located on the initial advance warning signs such as the ROADWORK X km / X m AHEAD, ROADWORK AHEAD, BRIDGEWORK AHEAD, or DETOUR AHEAD signs as applicable: flashing lamps may be used on any other signs as determined by the traffic management designer and a risk assessment – when used, flashing lamps are to be in pairs on both top corners of the sign at least 500 mm clear of traffic lanes on Category 1 roads and at least 1250 mm clear of traffic lanes on Category 2 and 3 roads, and ensure that whatever is holding the lamp is collapsible on impact
17. flashing lamps shall not take away the purpose of advance warning signs
18. a variable message sign should be used to increase visibility of warning

19. flashing lamps should be placed on barricades or fences where there is a hazard on a footpath or bicycle lane, and
20. flashing lamps should be placed on the corner of barricades or fences to ensure the roadworks site or hazard is clearly visible.

The level of lighting required shall be sufficient in the work area for workers to safely conduct their duties and complete their tasks. For the traffic control station, the level of lighting shall be sufficient to allow the traffic controller to see where they are going (use an escape path if required), avoid slips, trips and falls, and also illuminate the traffic control station sufficiently that it is obvious to approaching traffic.

For pedestrian areas, the level of lighting shall be sufficient to illuminate any pedestrian paths so that pedestrians may avoid slips, trips and falls, and to also create a feeling of safety (personal safety) for pedestrians, with no dark (unlit or poorly lit) areas. Off- and on-road cycle paths shall also be sufficiently illuminated to ensure cyclists can safely navigate and see any surface irregularities.

6.8 Excavations

Difference

Replace the following:

> Where an excavation is readily accessible to any person and likely to collect or retain water of such a depth as to constitute a danger, or is left unattended, it is required that:
>
> - the excavation is fully covered, fenced or backfilled when the worksite is unattended.
> - the excavation is covered, fenced or filled when work is completed.
> - only approved skid resistant plating must be used to cover an excavation.
> - fully enclose the excavation. Do not use barricades, traffic cones or plastic mesh fencing that is not supported by a solid frame as they are not sufficient to adequately protect road users from excavations.

with:

> Where an excavation is readily accessible to vulnerable road users and is either likely to collect or retain water of such a depth as to constitute a danger, or is left unattended, it shall be protected by one of the following:
>
> - the excavation is fully covered, fenced or backfilled when the worksite is unattended.
> - the excavation is covered, fenced or filled when the worksite is attended and works on the excavation are not active.
> - fully enclose the excavation.
>
> Do not use barricades, traffic cones or plastic mesh fencing that is not supported by a solid frame as they are not sufficient to adequately protect vulnerable road users from excavations.
>
> When excavations are covered with plating, only approved skid resistant plating shall be used.

Difference

Replace the lead-in sentence for the list:

> Table 6.1 shows clearance between an excavation, or any ground level hazard associated with the excavation, and the nearest traffic lane, relative to speed and traffic volume. The delineation method is also shown as one of three options. These are as follows:

with:

> Table 6.1 defines the recommended protection method for an excavation based on clearance between an excavation or any ground level hazard associated with the excavation, and the nearest traffic lane, relative to speed and traffic volume, and depth of excavation. The protection method which should be implemented is one of the three following options:

Addition

Designers should also consider the stability of the excavation face and material (angle of repose and zone of influence) for the depth of excavation. In addition, the proximity of load-bearing sources on the high side of excavations to items such as safety barriers, delineation, traffic, works vehicles or stored material may affect the stability of the excavation face. The presence of shoring as well as the strength of the shoring will also have an impact on the loads and proximity of loads to the excavated face. Greater clearances between the excavation and these items may be required.

Where safety barriers are provided to protect excavations, the requirements of Section 5.3.1 must also be considered. When excavations are located behind safety barriers, the designer is to consider the deflection zone behind the barrier which shall be clear of personnel, equipment, and materials at all times. The designer must also take into account the location and clearance to the excavated face and ensure the safety barrier, if impacted by traffic, does not encroach into the excavation or move close enough to the excavation such that the weight of the safety barrier system affects the stability of the excavated face.

Designers are only responsible for considering the temporary traffic management impact of excavations, such as proximity of temporary traffic management workers, traffic (road users including vulnerable road users) or other temporary traffic management measures (such as safety barriers) to ensure they do not negatively impact the excavated face or are negatively impacted by the excavation.

Designers are not trained to calculate or determine elements related to excavations such as the angle of repose, zone of influence, shoring requirements, or the stability of an excavated face. It is the responsibility of others (such as the Person Conducting a Business or Undertaking (PCBU)) to supply the designer with the necessary input data for excavations, so that the designer may then adequately design the temporary traffic management measures for sites with excavations.

6.8.1 Lateral excavations

New

A site-specific risk assessment (Section 2.2) shall be completed for all instances involving lateral excavations in proximity to traffic. Where there is a need to delineate or protect traffic, the requirements in Section 6.8 for excavations may be considered or modified as required.

6.10 Placement and operation of Portable Variable Message Sign (VMS)

Addition

Insert lead in sentence to this Section:

Please note Portable Variable Message Signs (VMS) referred to in this section, are referred to as Temporary Variable Message Signs (TVMS) in Queensland.

6.10.1 Principles and guidance

Addition

The requirements for TVMSs apply to both trailer-mounted VMS and vehicle-mounted VMS.

The need for a TVMS will be determined by either technical documents (including the Queensland *Manual of Uniform Traffic Control Devices* (Queensland MUTCD), or *Queensland Guide to Temporary Traffic Management* (QGTTM) or contract documents such as Technical Specification MRTS02 *Provision for traffic*) or by a risk assessment.

The longitudinal and lateral placement requirements for a TVMS are subject to the requirements of Sections 6.10.3 and 6.10.4 and a risk assessment.

6.10.4 Lateral placement

Difference

Replace item (c):

> Where practicable, the portable VMS should be positioned behind semi-rigid or rigid protection (e.g. guard fence, wire rope).

with:

> Where practicable, the TVMS should be positioned behind semi-rigid or rigid protection (for example, guard fence, wire rope) and outside the appropriate deflection zone clearance area behind the barrier.

Addition

Add after the dot points:

The further a TVMS can be located from the traffic lane (lateral clearance, see Figure 6.12), the less likely it will be impacted by errant vehicles; however, to perform satisfactorily, the TVMS must be located where drivers will easily see and read the messages displayed.

6.10.6 Other location requirements

New

Subject to the requirements in the previous section, the TVMS should be located so that it does not interfere with, or block visibility to, other official roadside signs and roadside advertising devices. It may be necessary to also consider impact for drivers approaching the rear of the TVMS.

Sight lines for road users from adjoining roads or driveways should also be considered.

Where the TVMS is to be located near a roadside advertising billboard, the requirements of the *Roadside Advertising Manual*, Clause 2.1.2.2 and Appendix C should be considered, with the TVMS desirably being located outside any restriction areas for the billboard if practicable.

6.10.7 Drive through requirements

New

Legibility and readability of the TVMS shall be confirmed using a 'drive through' of the site. If there are two alternating screens on the TVMS, ensure both screens can be easily read while travelling at the speed limit on approach. It may be necessary to adjust the aiming distance, angle of the TVMS to traffic and screen timing to ensure the message(s) on the TVMS are both legible and readable.

6.10.8 TVMS specification

New

TVMSs must be manufactured in accordance with the Transport and Main Roads Technical Specification MRTS262 *Temporary Variable Message Signs*.

6.10.9 Display of messages on TVMSs

New

The use of the TVMS to display roadside signs or text messages must be in accordance with the Queensland MUTCD Clauses 4.22 *Variable message signs used at roadworks* and 4.24 *Display of electronic signs*.

6.11 Clear Zone

New

The identification of hazards is generally based on the use of the clear zone concept to define the area beside the road that is of most interest in terms of roadside safety.

A clear zone is the area adjacent to the traffic lane that should be kept free from features that would be potentially hazardous to errant vehicles. The clear zone is a compromise between the recovery area for every errant vehicle (allowing a driver to stop safely or safely regain control of a vehicle that has left the road), the cost of providing that area and the probability of an errant vehicle encountering a hazard. The clear zone should be kept free of non-frangible hazards where economically and environmentally possible. Alternatively, hazards within the clear zone should be treated to make them safe or be shielded by a safety barrier.

The clear zone commences from the closest edge of the through travelled way for the direction of travel and is the total roadside border area available for safe use by errant vehicles. This clear zone area may consist of a shoulder, a verge, and a recoverable slope.

While the clear zone concept draws on a wide range of experience and research, engineering judgement should also be applied in the determination of lateral position requirements. The guidance here should be regarded as a supplement to aid in exercising this judgement and not as a substitute for it.

Roadside hazards shall be located outside the clear zone or protected by a suitable and approved safety barrier. If a safety barrier is installed no portion of the hazard is to be located within the deflection limits of the safety barrier.

Hazards that lie outside the clear zone will generally not require assessment because the locations are a sufficient distance from the edge of the road that the probability of a collision is relatively small.

6.11.1 Factors influencing the clear zone

New

The variables that influence the determination of the clear zone include:

- traffic volumes
- vehicle speeds
- road curvature (geometry)
- roadside slopes (cut and fill), and
- presence of physical devices that limit or prevent errant vehicle incursion (e.g. safety barrier or steep cutting).

It is important to consider both objects (hazards) and terrain that may cause vehicles to rollover.

6.11.2 Determination of clear zone requirements

New

The influence of the above-mentioned variables on the width of the clear zone is determined by assessing the roadside environment in accordance with the following:

- The clear zone is measured by extending a horizontal plane from the edge of the travelled way to the edge of the hazard, as indicated in Figure 6.11.2(a).
- Either Table 6.11.2 or Figure 6.11.2(b) may be used to establish the required clear zone distance for hazards located on straight roads, given a designated speed environment, AADT and the slope of the roadside.
- A combination of Table 6.11.2 or Figure 6.11.2(b), and Figure 6.11.2(c) is used when the device is located on a curve in the road alignment. The horizontal curve multiplier established from Figure 6.11.2(c) recognises the higher risk and larger encroachment distance for errant vehicles on the outside of curved road alignments. See Figure 6.11.2(e) for transition requirements between the curve clear zone and the straight clear zone.
- A combination of Table 6.11.2 or Figure 6.11.2(b), and Figure 6.11.2(d) is used to assess the influence of cut height and slope on traversability when the device is located on a cut slope. Non-transversable cuttings typically prevent vehicles from travelling further away from the travel path and reduce the clear zone distance for other hazards beyond the cutting (as vehicles will not reach these hazards), However the non-transversable cutting may also be considered a hazard.
- Consideration of fill slopes. It may be necessary to approximate the contributory influence of each slope element in a roadside environment, noting that non-recoverable fill slopes are disregarded in the calculation of a clear zone. Typically, a vehicle will travel to the bottom of any non-recoverable fill slope and an errant vehicle recovery area beyond the toe of the non-recoverable fill slope will be required. See Figure 6.11.2(f) for fill slope examples.

Figure 6.11.2(a) – Clear zone base parameters on a straight road

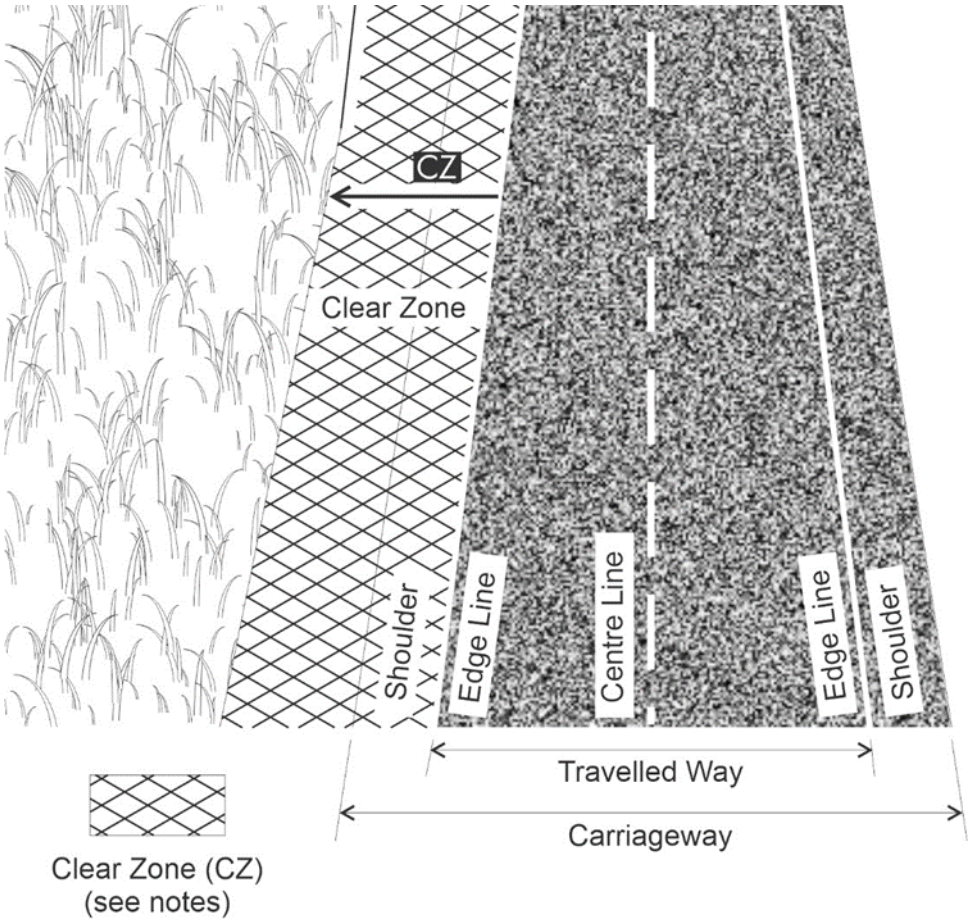


Table 6.11.2 – Clear zone distances from edge of through travelled way (extracted from Table 3.1 (AASHTO 2011))

Design speed (km/h)	Design ADT	Clear zone width (m)					
		Fill batter			Cut batter		
		6:1 to flat	4:1 to 5:1	3:1 and steeper[2]	6:1 to flat	4:1 to 5:1	3:1 and steeper[2]
≤ 60	< 750	3.0	3.0	[2]	3.0	3.0	3.0
	750 – 1500	3.5	4.5	[2]	3.5	3.5	3.5
	1501 – 6000	4.5	5.0	[2]	4.5	4.5	4.5
	> 6000	5.0	5.5	[2]	5.0	5.0	5.0
70 – 80	< 750	3.5	4.5	[2]	3.5	3.0	3.0
	750 – 1500	5.0	6.0	[2]	5.0	4.5	3.5
	1501 – 6000	5.5	8.0	[2]	5.5	5.0	4.5
	> 6000	6.5	8.5	[2]	6.5	6.0	5.0
90	< 750	4.5	5.5	[2]	3.5	3.5	3.0
	750 – 1500	5.5	7.5	[2]	5.5	5.0	3.5
	1501 – 6000	6.5	9.0	[2]	6.5	5.5	5.0
	> 6000	7.5	10.0[1]	[2]	7.5	6.5	5.5
100	< 750	5.5	7.5	[2]	5.0	4.5	3.5
	750 – 1500	7.5	10.0[1]	[2]	6.5	5.5	4.5
	1501 – 6000	9.0	12.0[1]	[2]	8.0	6.5	5.5
	> 6000	10.0[1]	13.5[1]	[2]	8.5	8.0	6.5
110	< 750	6.0	8.0	[2]	5.0	5.0	3.5
	750 – 1500	8.0	11.0[1]	[2]	6.5	6.0	5.0
	1501 – 6000	10.0[1]	13.0[1]	[2]	8.5	7.5	6.0
	> 6000	10.5[1]	14.0[1]	[2]	9.0	9.0	7.5

Notes:

1. Where a site-specific investigation indicates a high probability of continuing crashes, or such occurrences are indicated by crash history, the designer may provide clear zone distances greater than the clear zone shown in this Table.
2. Since recovery is less likely on the unshielded, traversable 3:1 slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high-speed vehicles that encroach beyond the edge of the shoulder may be expected to occur beyond the toe of the slope. Determination of the recovery area at the toe of the slope should take into consideration available road reservation, environmental concerns, economic factors, safety needs, and crash histories. Also, the distance between the edge of the travelled lane and the beginning of the 3:1 slope should influence the recovery area provided at the toe of the slope. While the application may be limited by several factors, the fill slope parameters which may enter into determining a maximum desirable recovery area are illustrated in Figure 6.11.2(f).
3. The design ADT in the table is the average daily traffic volume in both directions and in all lanes, other than for divided roads where it is the total traffic in all lanes in one direction.
4. Where the road is curved the values in Table 6.11.2 should be adjusted by the curve correction factors in Figure 6.11.2(c).

Figure 6.11.2(b) – Clear zone distance curves for straight roads (extracted from Figure 3.1 (AASHTO 1996))

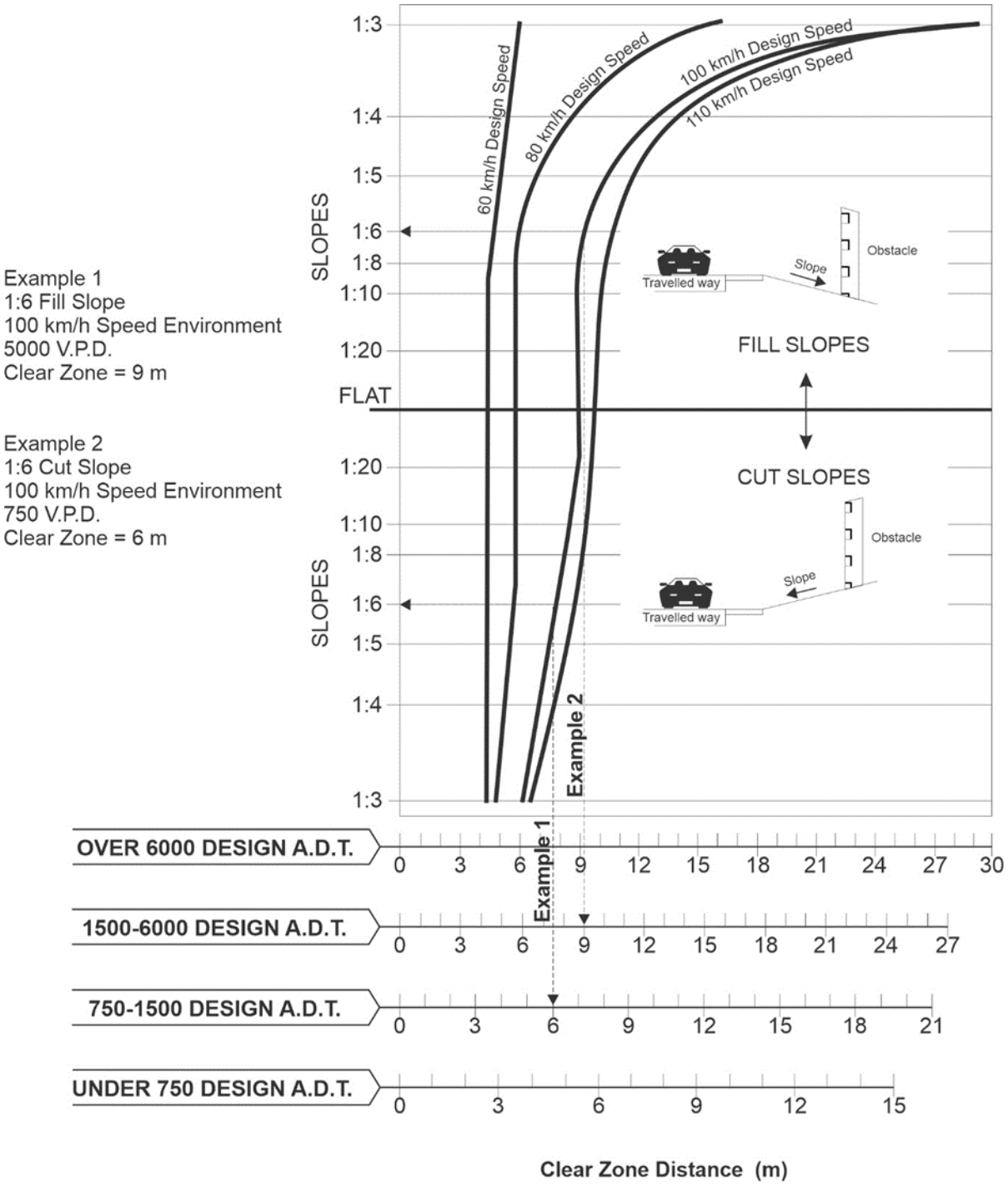
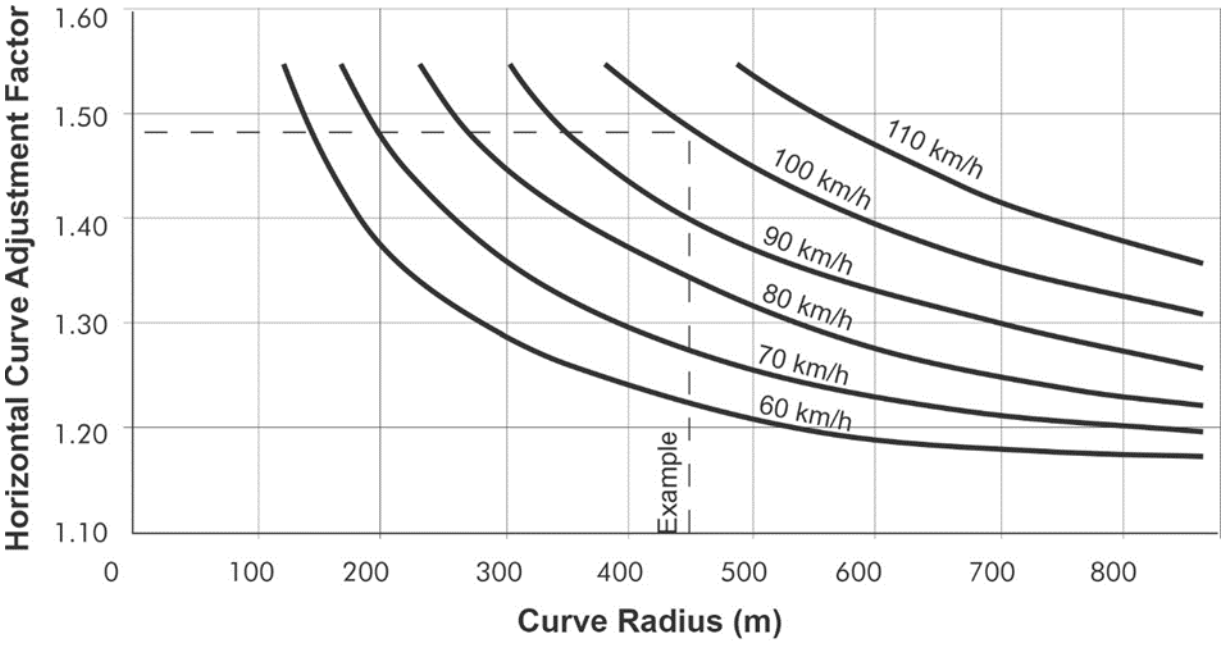
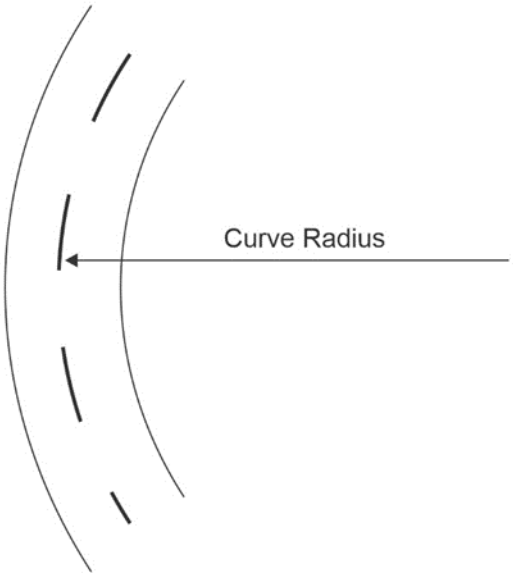


Figure 6.11.2(c) – Clear zone horizontal curve adjustment factors





Example

450m Radius Curve
100 km/h Speed Enviroment

CZ required on flat straight road = 9m (Figure B1)
Curve Adjustment Factor (Figure B2 above) = 1.48

Required Clear Zone = 9 x 1.48 = 13.5m

Figure 6.11.2(d) – Influence of cut height and slope on traversability

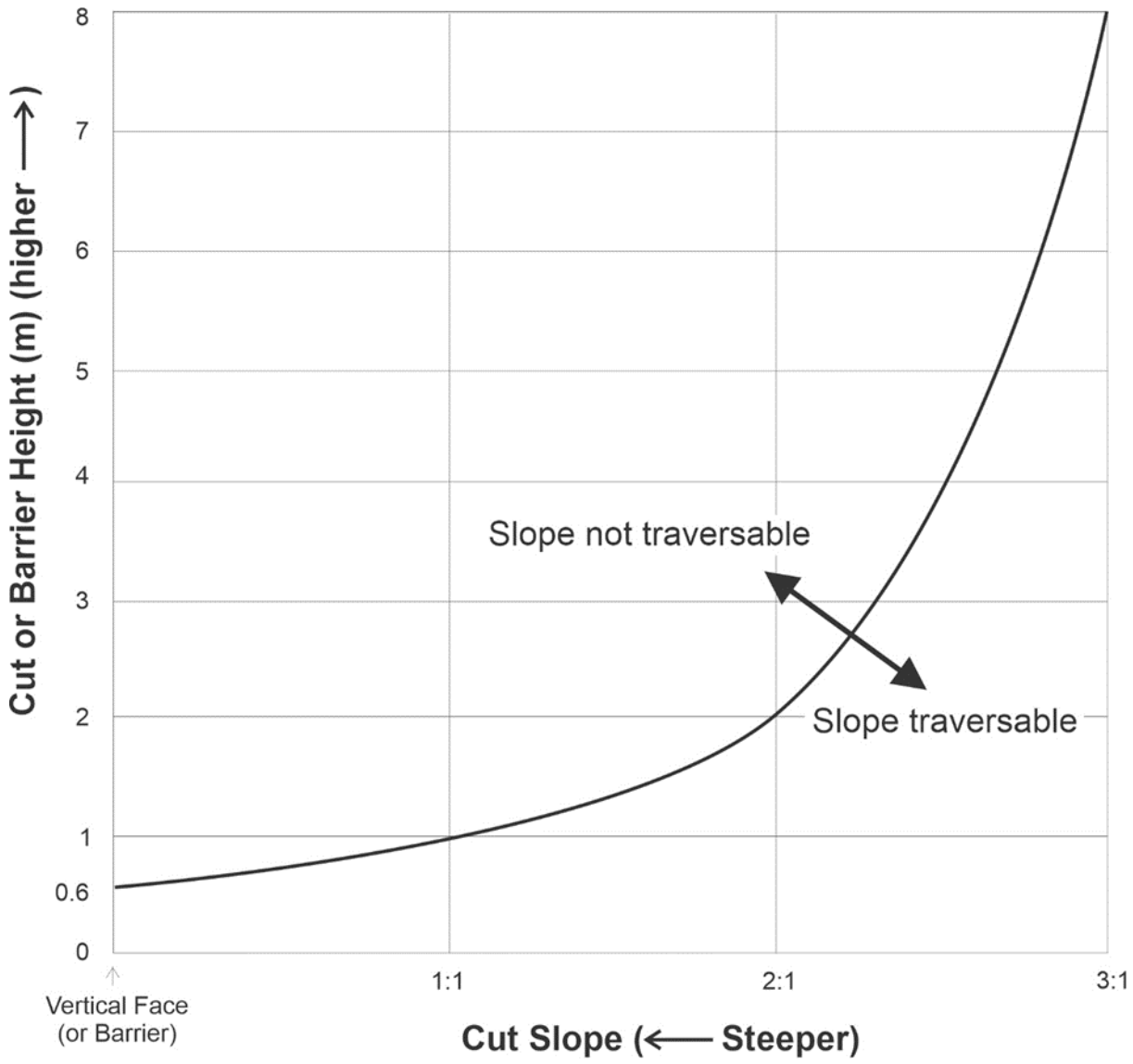


Figure 6.11.2(e) – Influence of curve adjustment factors and transitions (source: Austroads Guide to Road Design Part 6 (2010))

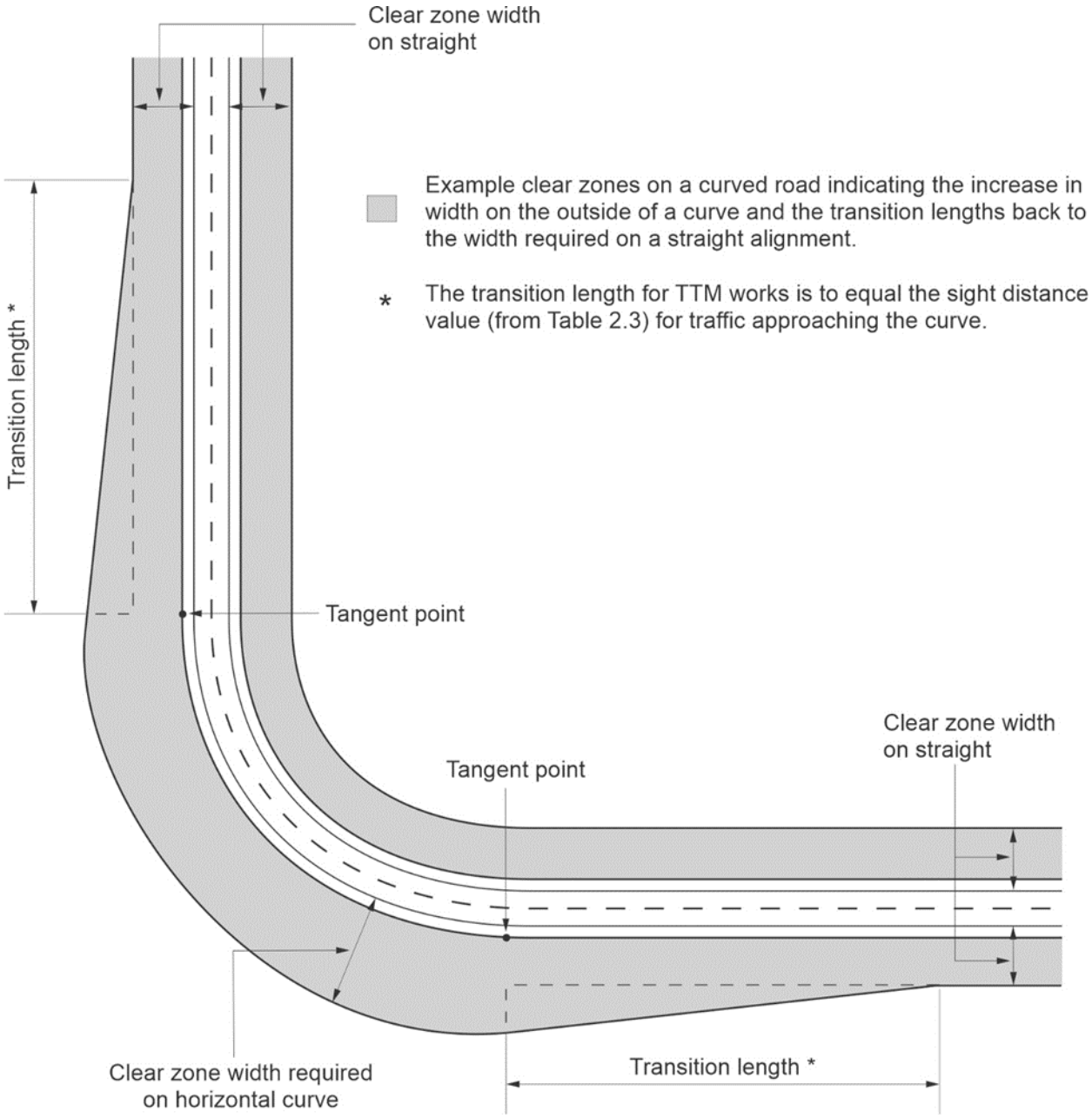
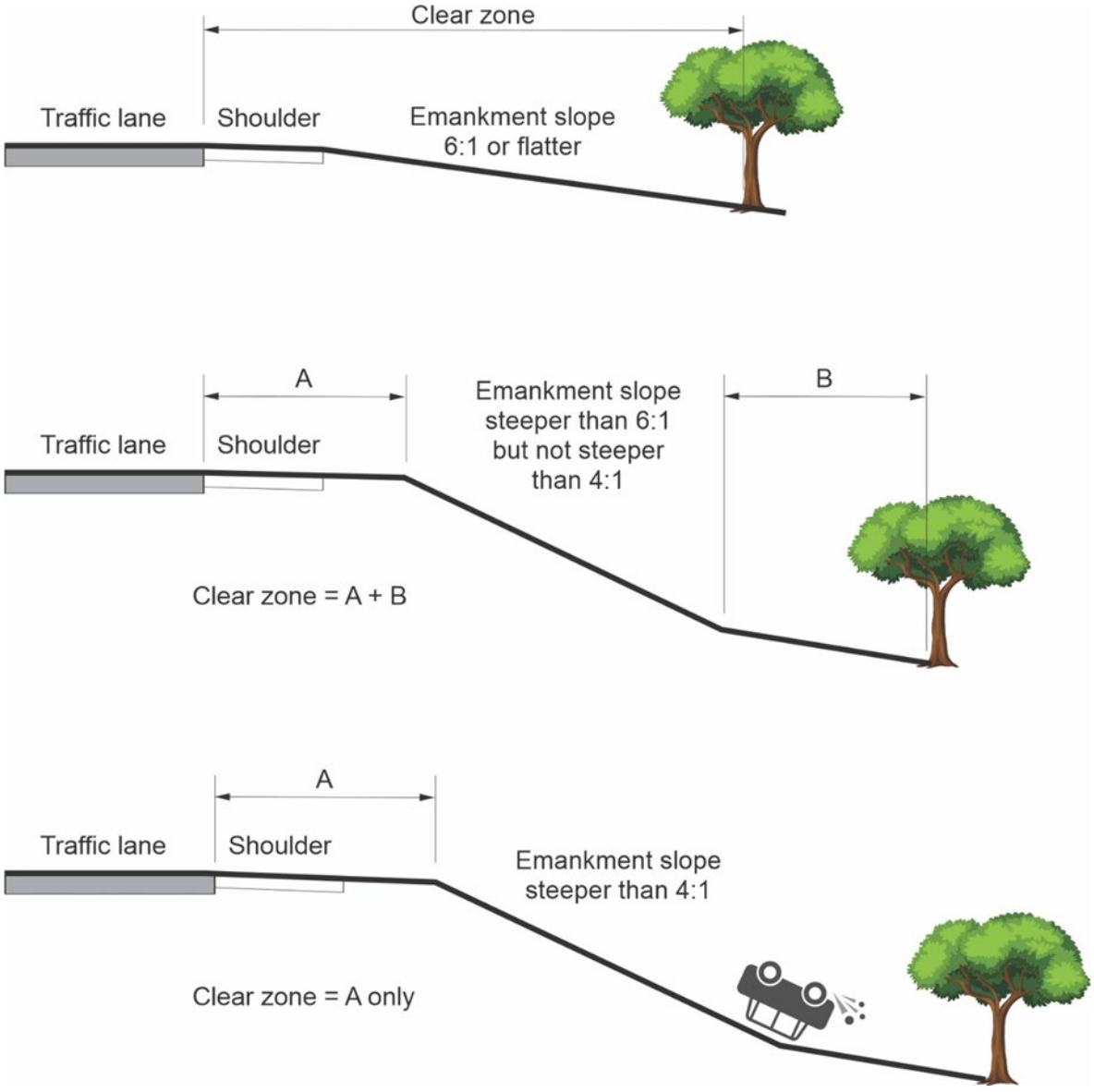


Figure 6.11.2(f) – Examples illustrating clear zones on fill slopes (source: Austroads Guide to Road Design Part 6)



7 How to apply the Traffic Guidance Scheme

7.3 Installation

Difference

Replace:

> When designing a TGS, the designer must consider and document the process for installing traffic control devices.

with:

> When designing a TGS, the designer must consider and document the process and order for installing traffic control devices.

7.4 Removal

Difference

Replace:

> As per the installation, the designer should stipulate the process and order of removal of the traffic control devices in the TGS.

with:

> As per the installation, the designer must consider and document the process and order of removal of the traffic control devices in the TGS.

7.4.1 Redundant devices

Difference

Replace:

- The equipment is stored at least 6 m clear from traffic.

with:

- The equipment is stored outside the clear zone (see Section 6.11) and when located within nine metres of the edge of a traffic lane shall be delineated, unless located behind a safety barrier.