



SARF Engineering for Road Safety



Road Traffic Signs Manual & Legislation

- National Road Traffic Act, Act 93 of 1996
- National Regulations 2000
- SADC and SA Road Traffic Signs Manuals

No.	Title	Date
SADCRTSM Volume 1	Southern African Development Community Road Traffic Signs Manual Uniform Traffic Control Devices	Nov 1997 Digitised 2012
SARTSM Volume 2	South African Road Traffic Signs Manual Road Traffic Sign Applications	Nov 1997 Digitised 2012
SARTSM Volume 3	South African Road Traffic Signs Manual Traffic Signals	Apr 2001 Digitised 2012
SADCRTSM Volume 4	Southern African Development Community Road Traffic Signs Manual Traffic Sign Design	Nov 1997 Digitised 2012

OBJECTIVES OF ROADWORKS SIGNING

- simple and clear to understand traffic control devices for road construction and maintenance;
- alert drivers of reduced standard on roadway ahead and increased vigilance is required ;
- generate driver respect and familiarity for efficiency and adequacy of the traffic management at roadworks;
- maintain roadway capacity and traffic flow at the highest possible levels;
- keep roadway related accident levels to minimum;
- provide adequate information to redirect drivers via alternative routes;
- provide designers of traffic management systems, and the site staff who implement them, with adequate tools to accomplish the above objectives;

OBJECTIVES OF ROADWORKS SIGNING



Norms to be Applied to Roadworks Signing

The principles, criteria or standards by which signing of roadworks sites should be developed are:

- temporary signs use exclusive colour code;
- with noted exceptions regulatory, warning or guidance signs may be used;
- signs to have retroreflective backgrounds (regulatory and warning signs to have retroreflective borders);
- diagrammatic guidance signs vertical rectangular format and pictorially display the road condition immediately ahead;
- Principles for temporary diagrammatic guidance signs are:
 - red retroreflective areas to indicate an obstruction in the road;
 - one arrow per lane of traffic in direction of travel;
 - unless necessary for effectiveness of the sign message, lanes of opposing traffic shall be indicated by one arrow;

Norms to be Applied to Roadworks Signing

- when red areas of retroreflective material are applied to yellow retroreflective background materials the reflective index of the yellow material should be at least 3,5 times that of the red material;
- distance information plates shall be used to:
 - indicate the **length of a site**;
 - indicate the **distance** to a change in road conditions;
 - indicate the **distance for** which a particular traffic configuration applies;
- speed limits should be applied realistically and should be capable of being altered to suit changing local conditions and/or time of day;
- regulatory and warning sign sizes should be increased for rural and urban areas to a minimum size;

Norms to be Applied to Roadworks Signing

- when high approach speeds and/or large traffic volumes pertain, sign messages should be repeated along the length of a roadway, and, in the case of dual carriageway roadways should be displayed on both sides of the roadway,
- the **minimum** spacing between repeated signs along the length of a roadway should be 100 metres on high speed roads and 60 metres on lower speed roads where space permits;
- the spacing of delineation devices should be related to the rate of change of direction, using closer spacings for sharper changes of direction;
- the lateral and vertical positioning of temporary signs at roadworks should, wherever possible, adhere to the norms applicable to permanent signs;
- temporary direction signs used to redirect traffic to alternative routes should use the exclusive colour code and comply with all other design parameters of permanent direction signs;

Norms to be Applied to Roadworks Signing

- standard road markings particularly at changes of direction, should be obliterated; temporary road markings should be used to emphasise the new alignment;
- to maintain roadway capacity, taper and crossover design should be directly related to design speed of temporary change of alignment;
- a lane reduction taper should **never** extend over a width of more than one lane;
- to achieve a major change in alignment, without significant or further reduction in roadway width, a reverse curve should be used;
- to reduce complex traffic management conditions, complex changes in width and alignment should be undertaken one stage at a time.

Placement of Temporary Signs at Roadworks

The position of a temporary sign can be specified in three ways, namely:

- longitudinally in relation to the roadway alignment;
- laterally in relation to the roadway cross section;
- vertically.

One of the most important aspects of Longitudinal positioning of roadworks signs is the separation between successive signs. **This separation should not become less than recommended in paragraph 13.1.3.1 (k).** If provision of such separations is difficult to achieve, consideration should be given to reducing number of signs because closer spacings will render the signs ineffective in any case.

Positioning of temporary signs should achieve lateral clearances for permanent signs.

Placement of Temporary Signs at Roadworks

- Due to the temporary or portable method of mounting signs at roadworks it is not practical to position signs vertically to conform to the norms for permanent sign installations. If a temporary sign is to be mounted on a pole support which is placed in the ground, the mounting height should be as for a permanent sign.
- The following factors should be considered in deciding to use right side temporary signs:
 - is traffic likely to obscure left side signs to drivers in a second or third lane from the signs?
 - is there a change of roadway conditions ahead on the right side of the carriageway?
 - is traffic from left being diverted towards the right?
 - is the concentration of the right side driver on traffic likely to result in them missing left side temporary signs?
 - will right side signs be a no greater a hazard than left side signs?



TEMPORARY REGULATORY SIGNS

TEMPORARY REGULATORY SIGNS

Command signs



Prohibition signs



Reservation signs



Comprehensive signs



Selective Restriction signs - Time



Selective Restriction signs - Time



Selective Restriction signs - Action



Selective Restriction signs - Text Message



Selective Restriction signs - Symbol Message



De-Restriction signs - Typical examples



TEMPORARY WARNING SIGNS

TEMPORARY WARNING SIGNS

Road layout signs



Direction of movement signs



Symbolic signs

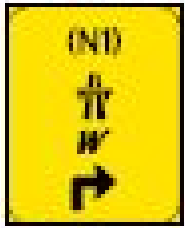


Hazard marker signs



TEMPORARY GUIDANCE SIGNS

TEMPORARY GUIDANCE SIGNS



TGE2



TGA5



TGD1



TGA4(E)

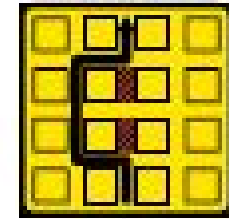


TGA4(V)



TGD2-D

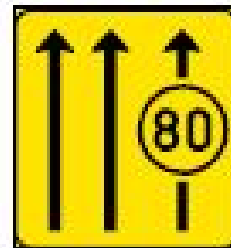
TGD4



TGD9



TGS304 + TIN11.2



TGS303



TGS106 +
TIN11.3

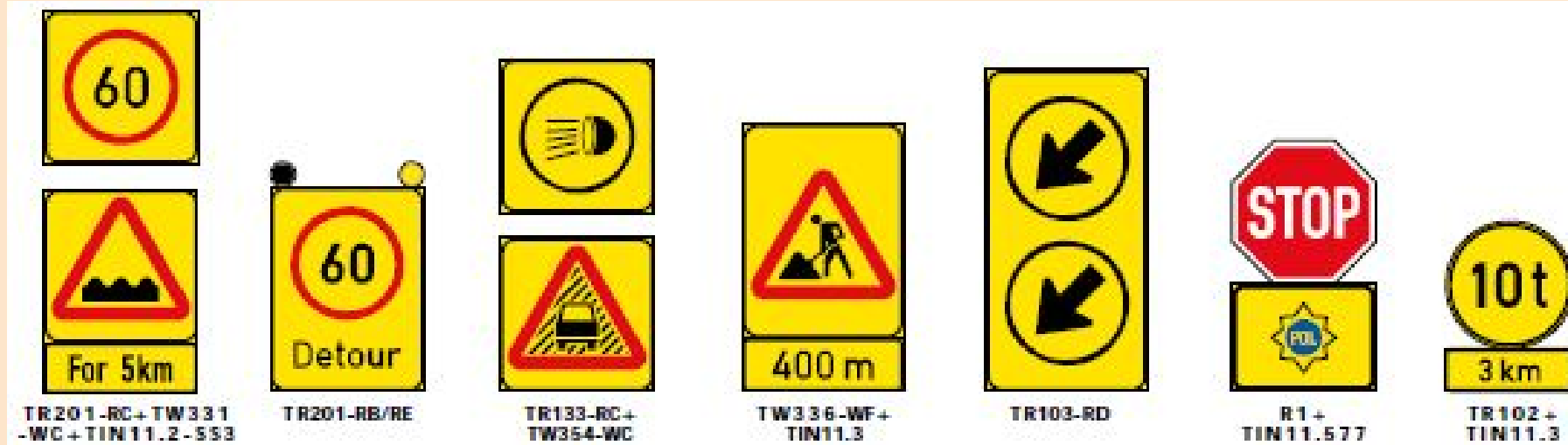
TEMPORARY INFORMATION SIGNS

TEMPORARY INFORMATION SIGNS

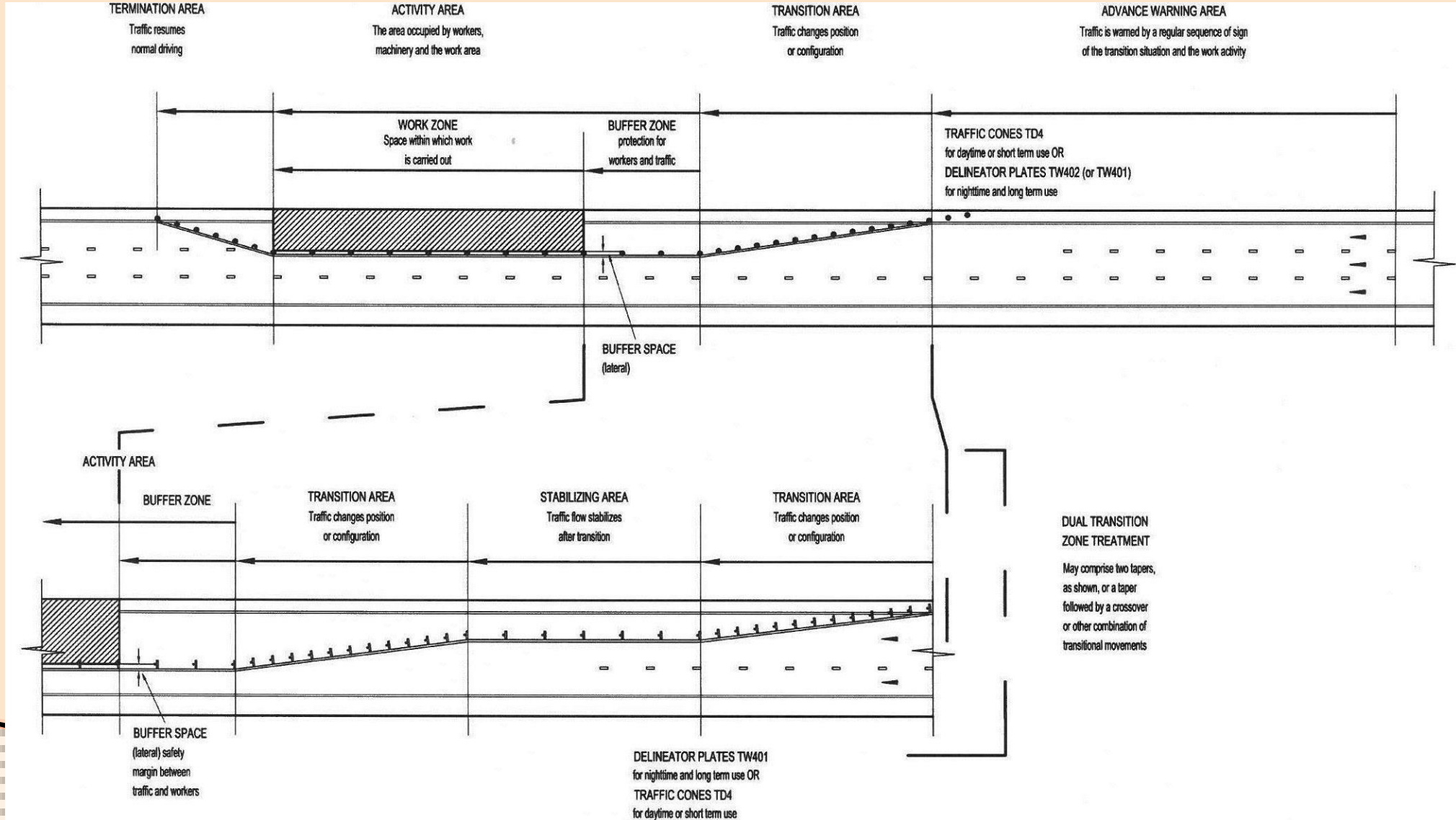
	 TIN11.1	 TIN11.2	
TIN3	 TIN11.3	 TIN11.4	TIN4

OTHER FORMS OF TEMPORARY ROAD TRAFFIC SIGNS

Temporary Combination Signs



Component Parts of a Temporary Traffic Control Zone





Component Parts of a Temporary Traffic Control Zone

ACTIVITY AREA

The area are occupied by workers, machinery and the work area.

TERMINATION AREA

Traffic reduces to normal driving

BUFFER ZONE

Protection for workers and traffic

TRANSITION AREA

Traffic changes position or configuration

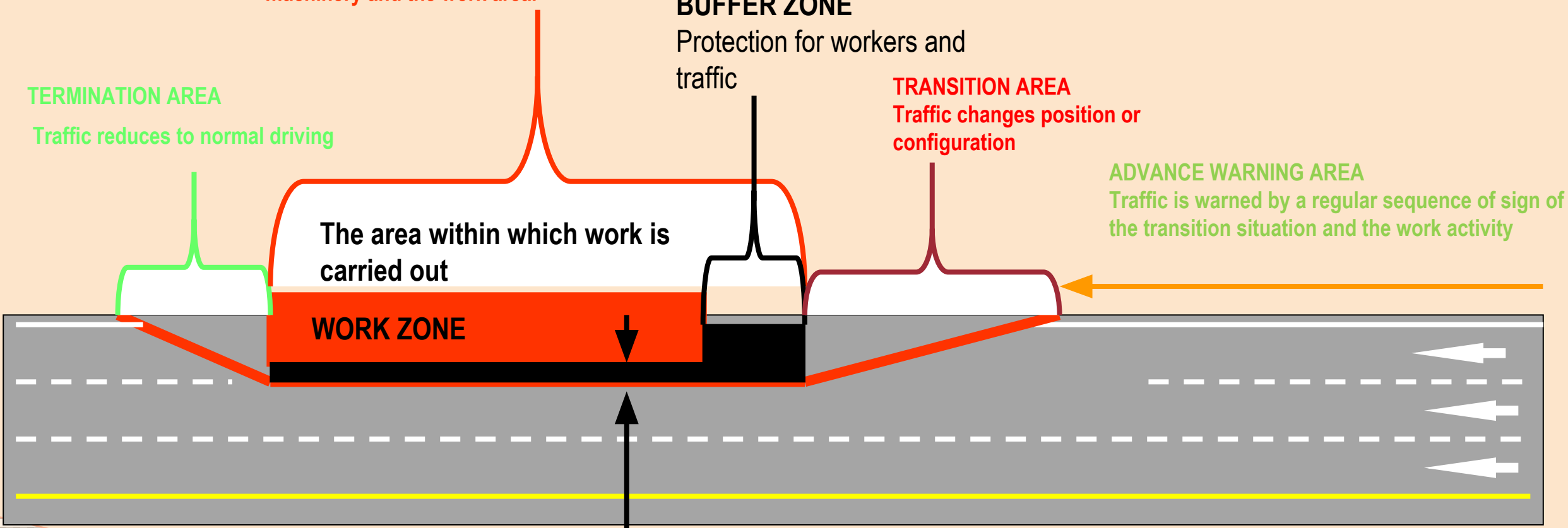
ADVANCE WARNING AREA

Traffic is warned by a regular sequence of sign of the transition situation and the work activity

The area within which work is carried out

WORK ZONE

BUFFER SPACE (Lateral) safety margin between traffic and workers



The Advance Warning Area

- to advise motorists of temporary conditions ahead which require particular care. Usually a stepped reduction in the speed will be required..
- The length of the Advance Warning Area should relate directly to measured approach speeds..
- Urban sites will have limited space for Advanced Warning Area signs.

TRAFFIC MANAGEMENT

The Transition Area

- ❑ Drivers are required to **take an action**, such as:
 - shift position on the roadway without reduction in the number of lanes;
 - merge two lanes into one (lane drop);
 - cross the central median (crossover);
 - enter a detour completely separate from the road under construction.
- ❑ Clearly defined using delineator plates and conform to the layout depicted on the guidance signs preceding it.
- ❑ Action required can be achieved in a limited number of ways, e.g.:
 - a taper;
 - a crossover;
 - a deviation (normally reserved for complete re-routing).
- ❑ The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition.

The Stabilising Area

- The purpose of this area is to allow traffic flow to stabilise after negotiating a transition area before reaching another change of condition. If more than one transition area is required to achieve the final traffic configuration, the signing for second or subsequent transitions should be located within the stabilising area(s). The stabilising area is normally defined by delineator plates.

The Buffer Zone

- ❑ Used between a transition area and the work area. In a situation involving more than one transition area the buffer zone will occur after the transition area closest to the work area. The principal function of the buffer zone in such situations is to separate the traffic from the workers at the site in the interests of worker safety. Provision of a longitudinal buffer zone, and indeed a lateral buffer zone within the work area, must be considered as fundamental to effective worker safety.

The Work Area

- ❑ Adequately defined by delineators in the less complex conditions. Where there is a risk to traffic or workers of vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration are recommended.
- ❑ When traffic is relocated well away from the work area, little action is required along the length of the work area other than to protect contractors' vehicles and employees.
- ❑ If the section of detour running parallel to the work area uses asymmetrical lane configurations, drivers should be reminded of this situation by using lane arrangement signs.
- ❑ Where an asymmetrical lane configuration is varied to permit overtaking through a long site for instance, then the signing and marking of this treatment should follow the principles laid down for transition and stabilising areas.
- ❑ Experiences with major road rehabilitation contracts have shown a tendency towards increasingly long road sections under construction. If a site is going to be long, extra care must be taken to ensure adequate overtaking opportunities.

The Termination Area

- ❑ This area involves the return of traffic to normal flow conditions. In simple cases this can be achieved by a relatively rapid taper of delineator signs. In more complex conditions a reverse crossover may be required.
- ❑ Courtesy signs and permanent speed limit signs restoring the normal speed limit conditions should be erected adjacent to each other as soon as possible after the end of the Termination Area.

Traffic Management Planning

- ❑ Predetermining how all construction sites shall be managed is not possible. However, it is important to plan, and work, in a systematic manner and in standardised steps to optimize site efficiency, traffic flow and all aspects of safety.
- ❑ Although this temporary road signing system has been used for several years there will always be scope for improvement and refinement. It is important that practitioners develop their utilization of the system and include feedback at all phases of the process.
- ❑ At a more detailed level planners should identify the component parts of a site long before ordering signs or transporting them to site.

Traffic Control Methods – One Way Traffic

Flags should be at least **600x600mm** and should be made of a durable fluorescent **red-orange** or red cloth fastened to a staff at least 1 metre long.

Flagging procedures are prescribed in the National Road Traffic Act, Act 93 of 1996.

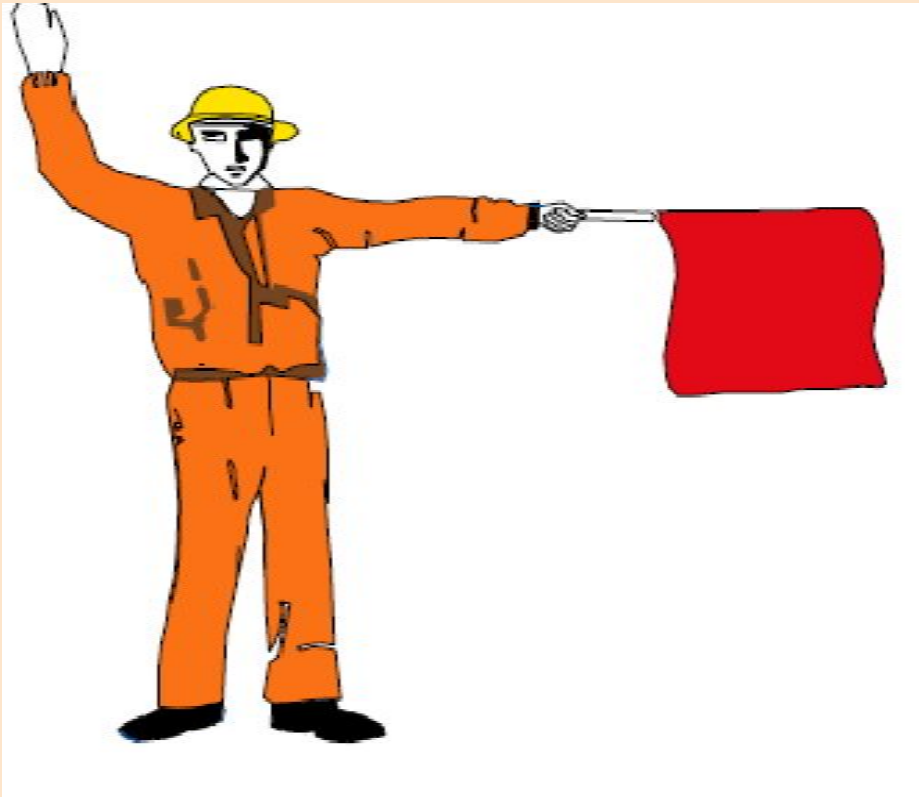


Traffic Control Methods – One Way Traffic

The traffic control method used depends on speed and volume of traffic, and the length of, and visibility on, the section of roadway.

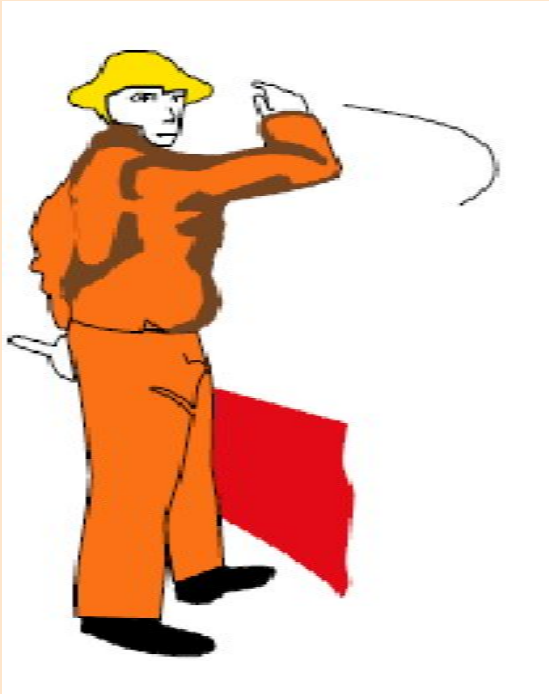
- **Flagmen** use when traffic volumes are less than 200 vehicles per hour.
- **Flags** should be at least 600 mm x 600 mm and should be made of a durable fluorescent red-orange or red cloth fastened to a staff at least 1 metre long.
- **Flagmen stations** should be located far enough from the roadworks to ensure that drivers have sufficient distance to slow down before entering the work-site but not so far away that the drivers will tend to increase speed before passing the work-site.
- **Distinctive clothing** should be worn by flagmen on duty.
- **Careful selection and training** of flagmen is essential.
- **Flagging procedures** prescribed in the Road Traffic Act and must be standardised throughout South Africa.
- **STOP/RY-GO R1.5A and R1.5B** used when traffic volumes exceed 200 vehicles per hour and one-way traffic operation.
- **Temporary Traffic Signals** should be used if one lane one-way traffic is required to operate at night.
- One-way operation of long sites is not generally recommended.

TRAFFIC MANAGEMENT

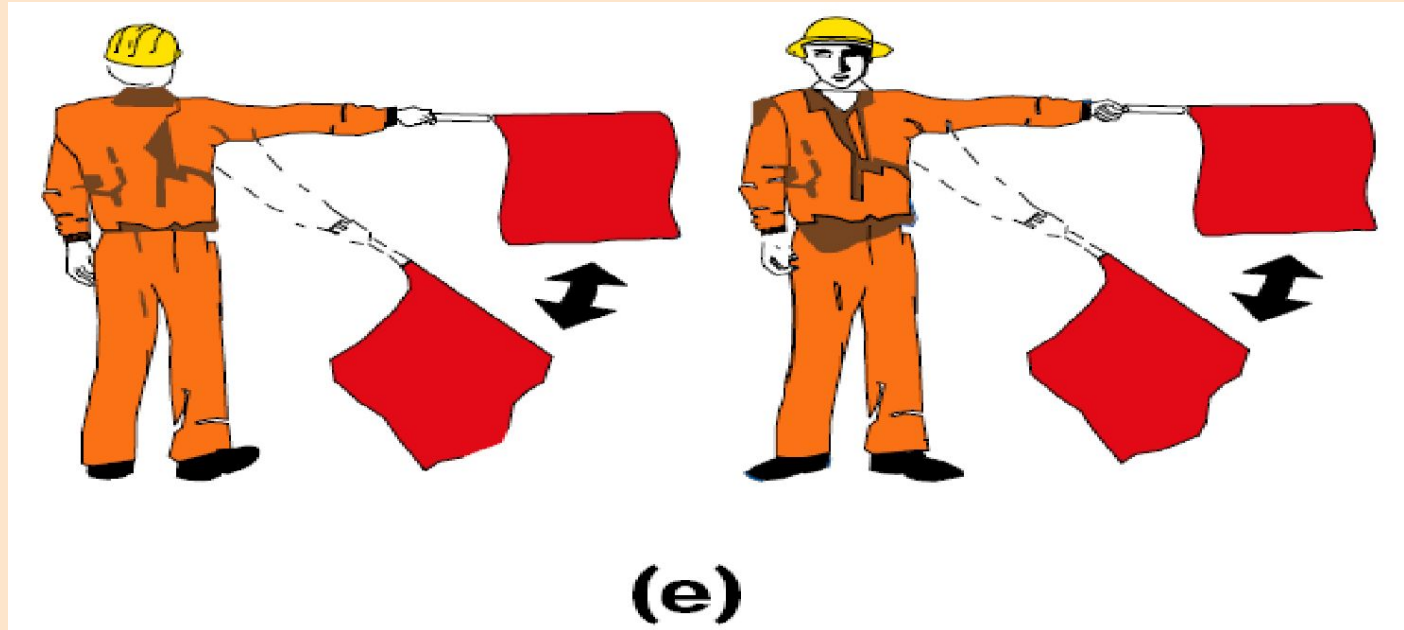


To stop traffic flagmen shall face approaching traffic and extend the flag horizontally, at right-angles to the traffic lane, in a stationary position so that the full area of the flag is

TRAFFIC MANAGEMENT



The **signal to proceed** may be given when it is safe for traffic to proceed. The flagmen shall stand parallel to the flow of traffic and, with flag and arm removed from the view of the driver, shall signal traffic with his free arm to proceed. **The red flag shall not be used to signal traffic to proceed.**



To slow traffic down flagmen shall stand in the position for stopping traffic as set out above and move the flag up and down at a steady pace. When the approaching vehicle has slowed down sufficiently, the flagman shall change his stance and give the signal for traffic to proceed.

Traffic Control Methods – Slow-moving Work

- ❑ Many general maintenance operations on roadways normally require some form of lane closure. Typical of such tasks are the following:
 - road marking; road surface condition surveys; alignment surveys; deflectograph surveys; grass cutting; street lighting maintenance; gardening/weed spraying; roadstud application; and service installation.

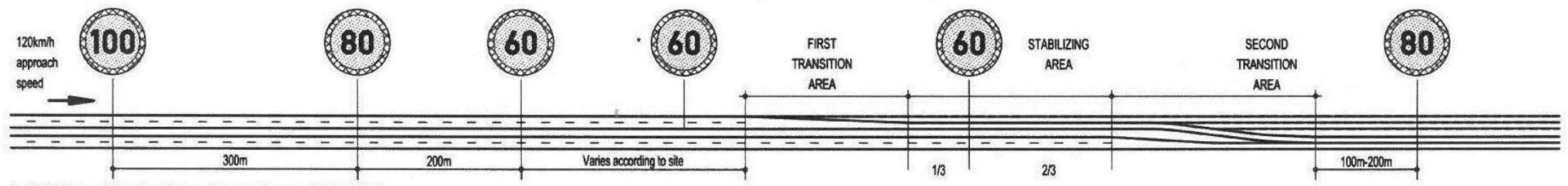
These operations all require a slow-moving, or stop-start operation on the roadway, and this will normally extend over many kilometres.

- ❑ Vehicles used for slow-moving maintenance operations or survey work should be painted in conspicuous colours and equipped with one or more yellow flashing lights.
- ❑ It is also recommended that slow-moving vehicles used for mobile or stop-start work be provided with high visibility rear treatment.

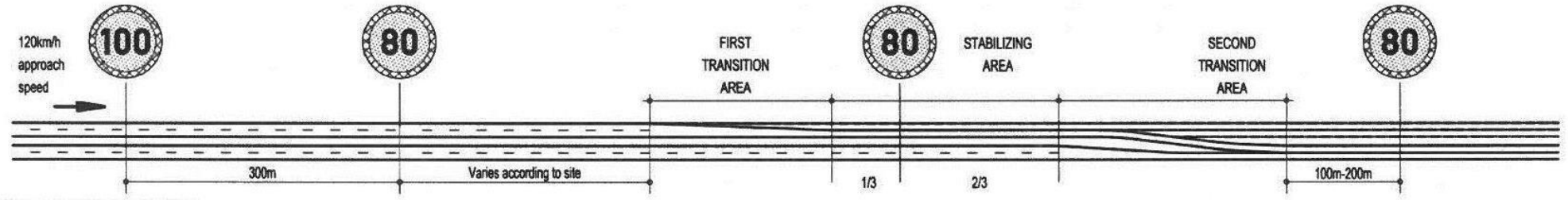
SETTING OF SPEED LIMITS AT ROADWORKS

- Design Speeds
- Summary – Temporary Speed Limits
- Speed Limit Enforcement
- Speed Reductions

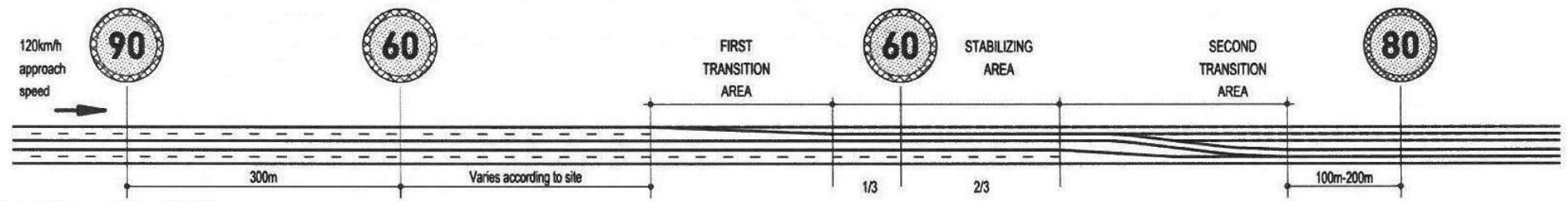
SETTING OF SPEED LIMITS AT ROADWORKS



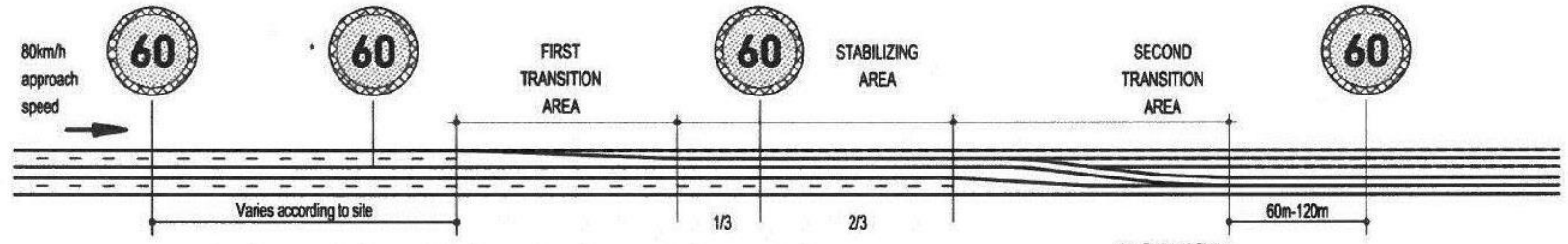
Detail 13.26.1 Speed Reduction - Maximum Reduction Recommended - FREEWAY



Detail 13.26.2 Speed Reduction - Recommended Reduction - FREEWAY



Detail 13.26.3 Speed Reduction - Optional with Space Limitation - FREEWAY



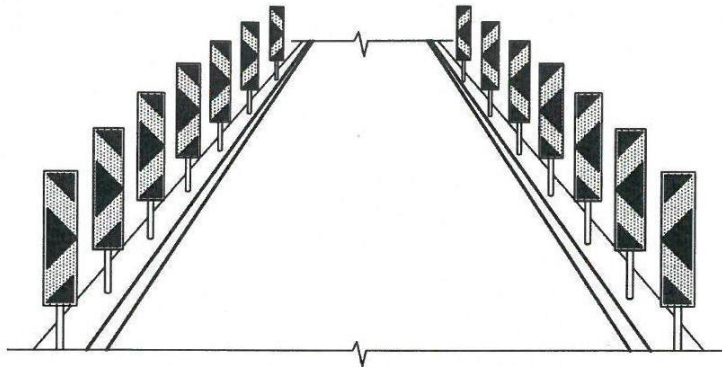
Detail 13.26.4 Speed Reduction - Recommended Treatment - URBAN ARTERIAL

* = Optional Signs

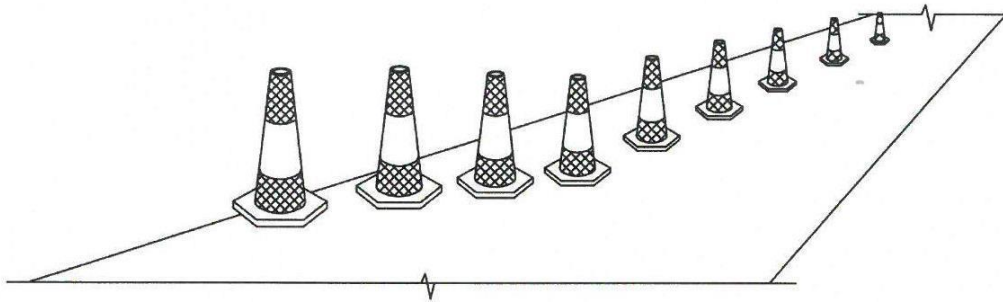
TEMPORARY DELINEATION

Delineation

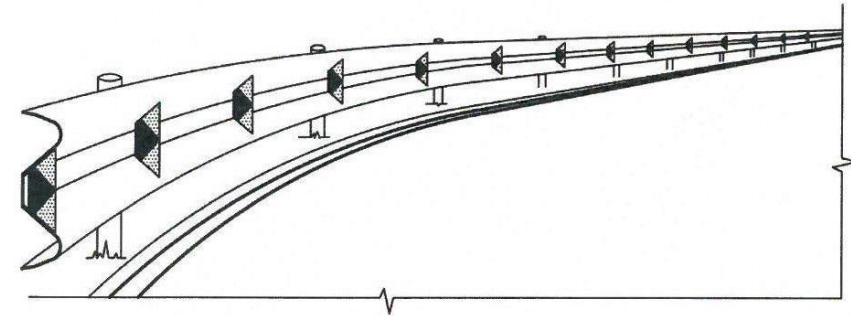
Detail 13.27.1 - DELINEATOR PLATES TW401/TW402



Detail 13.27.2 - TRAFFIC CONES TD4



Detail 13.27.3 - GUARD RAIL DELINEATORS TD1



Detail 13.27.4 - BARRICADE TW411/KEEP RIGHT TR104 COMBINATION (Typical Example)

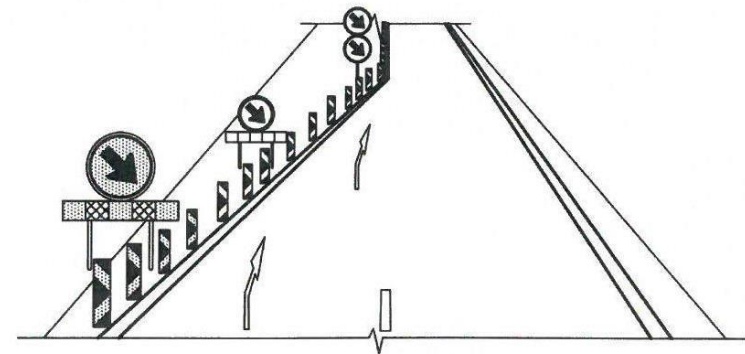


Fig 13.27

Typical Delineation Devices

TEMPORARY DELINEATION

- Barriers
- Barricades
- Crossovers
- Flashing Lights

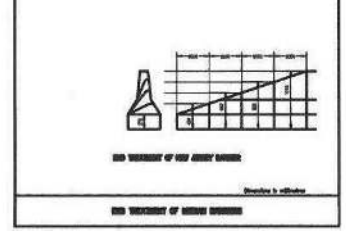
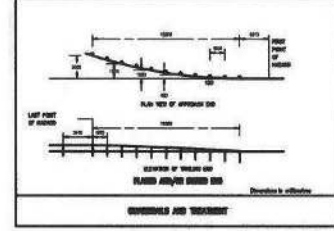
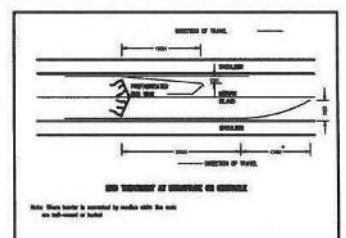
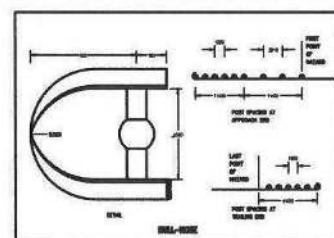
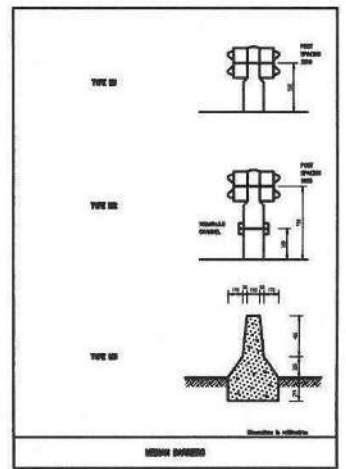
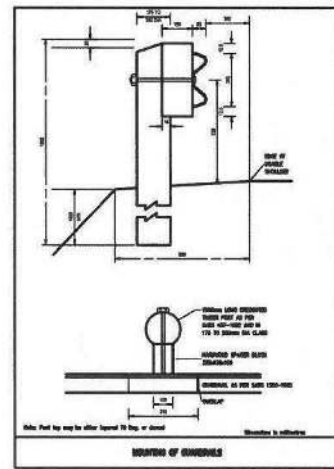
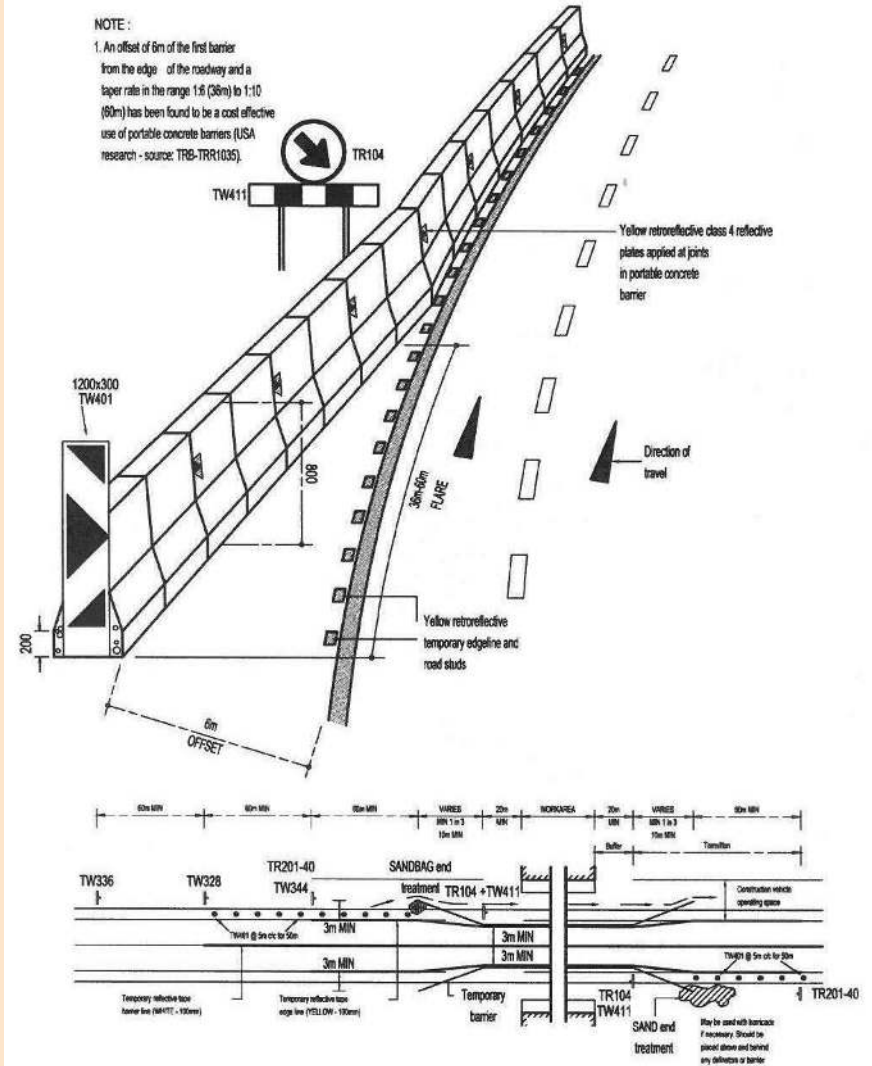


Fig 13.28
Barrier Details

General

- ❑ It is important that the specification and control of roadworks sites be significantly improved. In order to improve safety and efficiency new traffic management and signing techniques are available.
- ❑ A traditional method of contract payment for traffic accommodation, namely that of "lump sum" payment, results in an inability of an engineer in charge to adequately ensure that the contractor pays attention to the necessary detail. The complexity of major sites requires a flexible approach to signing and management. Traffic management techniques recommended in this chapter encourage a systematic approach to signing and management which should make tender pricing more simple for contractors, and installation and reaction to change on site, easier once the job is underway.
- ❑ It is recommended that contract specifications call for tenders based on itemised pricing.
- ❑ Temporary items which should be covered by individual rates are:
 - temporary signs (rate per sign area including direction signs);
 - delineator plates and stands;
 - traffic cones;
 - barricades;
 - barriers (guardrail, portable concrete etc.);
 - flashing lights;
 - road marking (rate per width, colour, type of temporary marking); including COSBI (Control Of Speed By Illusion) lines

General

- roadstuds;
- sandbags;
- cleaning of road traffic signs.
- rumble strips
- speed humps
- ❑ Care must be taken in specifying how the temporary signs should be provided on the site. This can be done in a number of ways:
 - supply only - with separate rates for erection and relocation;
 - supply, erect and maintain for contract period;
 - supply and erect with a daily or weekly maintenance extra rate.
- ❑ Major contracts have included severe penalties in an effort to keep tight control of the temporary signing and to get the support needed for the contractor to achieve this objective.
- ❑ Such drastic measures should never need to be implemented. It is, therefore, recommended that contract specifications require that a member of the contractor's staff be nominated as the "Site Safety Officer" with specific responsibilities to keep the temporary traffic accommodation requirements up to specification.
- ❑ The correct application and enforcement of speed limits may have an effect on the way in which a contract is specified (see Section 13.4).

General

- ❑ It is recommended that the reflective material used on temporary signs shall be one class higher than that of the permanent signs currently used on the same section of road (i.e. use SANS 1519-1 class 3 material for temporary signs if class 1 material is used for the permanent road signs, or use SANS 1519-1 class 4 material is used for the permanent road signs.)
 - are retroreflective materials according to specifications?
 - would replacement of an existing sign with one with a higher grade of material help solve an identified problem?
 - should additional high visibility techniques be used?
 - are signs and markings being properly maintained?

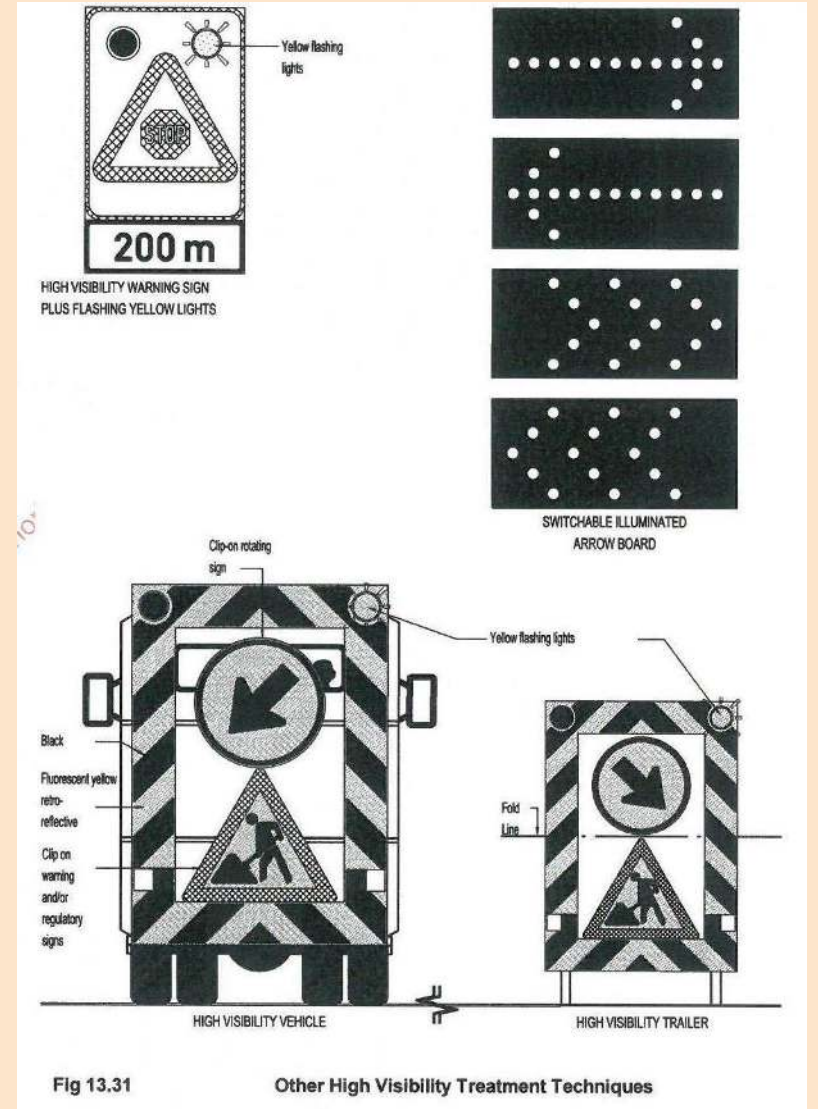
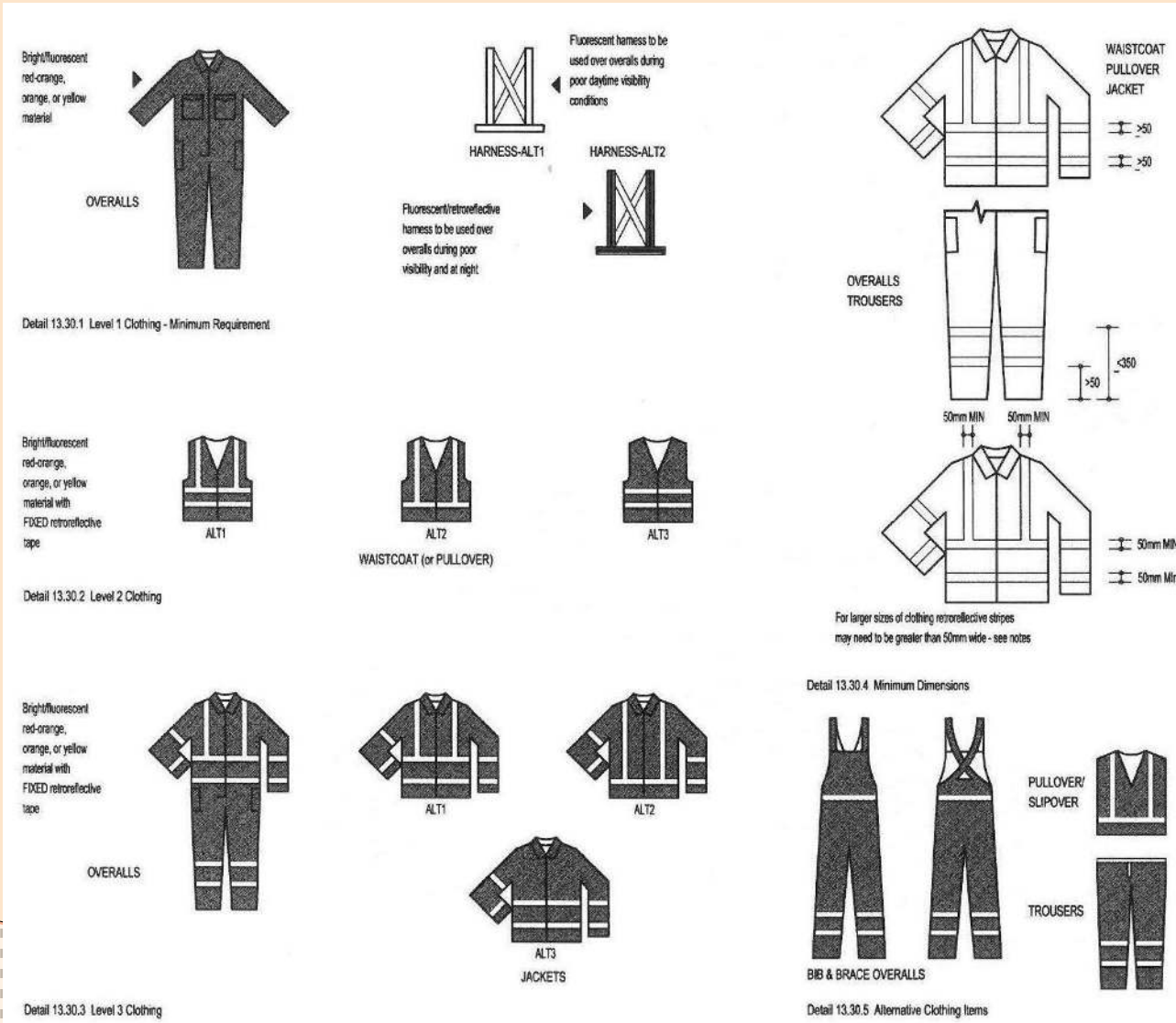
Materials for Temporary Signs

- ❑ All signs for temporary use, should be properly installed and handled with care to prevent damage.
- ❑ The retroreflective and other materials recommended for use on temporary roadworks signs are as follows:
 - black - semi-matt finish;
 - yellow background - Class 1, Class 3 and Fluorescent Class 4
 - red - Class 1, Class 3 and Class 4
- ❑ Those responsible for accepting signs onto a site must ensure that the retroreflective materials conform to specifications. **Materials of a grade lower than Class 3 may well not perform acceptably even from new, and should not be used.** The daytime luminance of certain retroreflective materials, or worn or dirty signs, may be inadequate.
- ❑ SANS 1519-1 Class 4 Fluorescent Yellow retro reflective sheeting is recommended to draw special attention to a particular part of a roadworks site. **This material has very high quality retroreflective properties and excellent daytime luminance.**
- ❑ All signface materials shall conform to the requirements of the most current version of SANS 1519-1 Materials for Road Signs, and SANS 1555 Roadworks Delineators.

High Visibility Treatment

- ❑ Temporary roadworks signing has been developed for high conspicuity. However, sometimes greater conspicuity is required for parts of the roadworks scene.
- ❑ Special high visibility treatment is therefore recommended for:
 - workers clothing;
 - construction vehicles, plant and machinery;
 - slow-moving maintenance and survey vehicles;
 - any vehicle used to travel in the opposite direction to on-coming traffic.
- ❑ All workers at roadworks sites should wear conspicuously coloured clothing. Overalls and "hard" hats should be red-orange, orange or yellow in colour.
- ❑ Any worker, or official, involved in traffic control operations or work requiring him to regularly operate close to the travelled way, or to cross the travelled way, should wear a high visibility waistcoat or vest.
- ❑ All site vehicles should be equipped with one or more yellow flashing lights which shall be maintained in working order.
- ❑ All vehicles should be regularly cleaned and painted in light, and bright, colours. Additional boards or rear panels, covered in highly visible class 4 fluorescent yellow retro-reflective materials, can improve conspicuity of vehicles, plant and machinery.
- ❑ If certain vehicles are regularly used for specific tasks in close proximity to traffic it is recommended that the rear of the vehicles be specially treated to make them highly visible.

- High Visibility Treatment



Maintenance of Temporary Signs

The nature of roadworks sites is such that dust or mud is deposited on the retroreflective surface of signs, delineators and barriers. This will lead to a very rapid reduction in the daytime conspicuity of the signs. DELINEATOR PLATES, which are mounted very close to the road surface, will be particularly subject to this problem. Dirty retroreflective signs will also rapidly lose a significant proportion of their night-time effectiveness. A regular cleaning programme must therefore be undertaken. Signs must be replaced once they are no longer effective. Site safety personnel must agree on an inspection procedure to identify signs that should be replaced.

SIGNING APPLICATIONS FOR SHORT TERM WORKS

- General
- Short Term Works
- Maintenance of Road Reserve
- Firebreak Maintenance
- Weedspray Maintenance
- Fixed Site – Work on Shoulder
- Localised Small Site
- Short Term Lane Closure
- Short Term Lane Drop with Deviations
- Installation/Removal of Traffic Data Logger
- STOP/RV – GO Traffic Control-Minor Works
- Mobile Maintenance of Road Shoulder
- Mobile Maintenance in Centre of Carriageway
- Mobile Maintenance of Dual Carraigeway Roads



SIGNING APPLICATIONS FOR SHORT TERM WORKS

13.8.5 Weedspray Maintenance

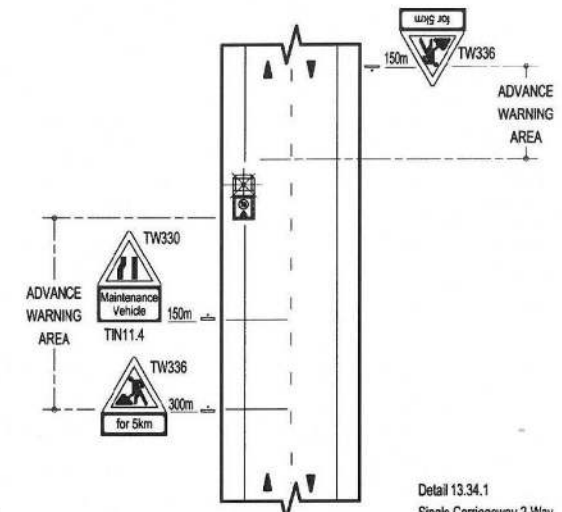
- Weedspraying may be a mechanised operation or it may be a manual operation with a team of workers, working on the ground, either with or without a support vehicle present. The signing requirements for such maintenance are given in Figure 13.34.
- Figure 13.34 includes two signing details. Detail 13.34.1 is appropriate for maintenance operations on one side of a two-way roadway, whereas Detail 13.34.2 applies for maintenance on a multi-lane one-way roadway (normally part of a dual carriageway road). The main differences between the two requirements is that a two-way road requires the placing of a ROADWORKS sign TW336 facing the opposing stream of traffic, and the one-way operation requires advance signs on both the left and right sides of the carriageway. This latter requirement is applicable whether the work is being undertaken on the left side or on the right side.
- When weedspraying is supported by a vehicle, the work can be considered as "mobile". Subject to the proximity of the work to the roadway and the rate of movement of the work, the requirements of Subsection 13.8.12 and Figure 13.41 may be relevant.
- The vehicle carrying out the spraying or supporting the manual team should occupy the far left side of the roadway or shoulder (or the far right side in the case of a median spraying operation). The vehicle shall be provided with a HIGH VISIBILITY REAR PANEL of the type illustrated in Figure 13.31.
- The vehicle shall also have two FLASHING YELLOW WARNING LIGHTS, SS3, of which, at least one shall be visible from the front, and one shall be visible from the rear. In practical terms, if a vehicle is likely to work on the right side of a roadway, the two flashing lights should also define the vehicle width to approaching drivers so that, wherever it is working, the rear side is identified by at least one flashing light. The contractor or road supervisor shall be responsible for ensuring that the flashing light requirement is functioning during day and night, at all times whilst the vehicle is working or within 2 metres of the roadway.

Checklist

- do workers have adequate high visibility clothing?
- is there a support vehicle?
- does the support vehicle have a high visibility rear panel?
- are the signs on the rear panel correctly set?
- will the advance warning signs need to be moved to follow the work (see Subsection 13.8.12)?
- will work encroach into the roadway significantly (see Subsections 13.8.11 and 13.9.8)?

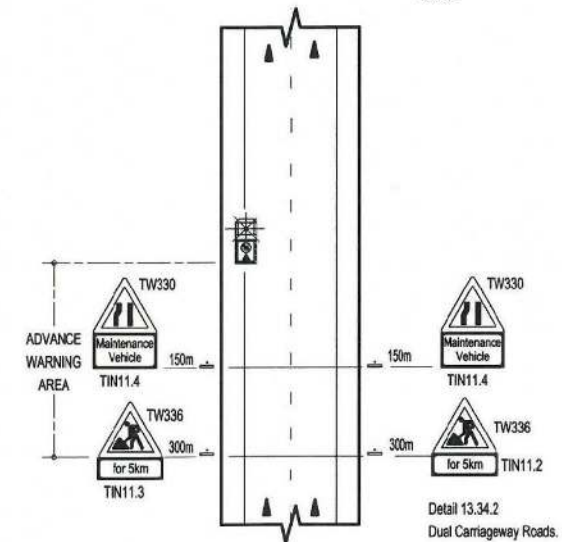
MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW330	1200	2
	TIN 11.2	1200 x 400	2
	Vehicle High Visibility Rear Panel TR103/TR104 plus TW336	To suit Vehicle 900 1200	1 1 1
	Yellow Flash Light		2 Per Vehicle
	TIN 11.4	1200 x 600	2

- NOTES:
- Yellow flashing lights must be visible to front and rear in all situations.
 - Maintenance vehicle equipped with HIGH VISIBILITY REAR PANEL (See Figures 13.32 and 13.41).



Detail 13.34.1 Single Carriageway 2-Way Roads.

NB. See Subsection 13.8.5 for Sign Sizes.



Detail 13.34.2 Dual Carriageway Roads.

Fig 13.34

Weedspray Maintenance

SIGNING APPLICATIONS FOR RURAL ROADS

- General
- Rural Roadworks
- STOP/RV – GO Operation
- Gravel Road Blading Re-Shaping
- Gravel Roads – Gravel Heaps
- Gravel Road Reconstruction
- Reseal/Resurfacing Work – Just Completed
- Reduced Width Operation – 2 – Way Traffic
- Total Road Closure Ahead
- Detour Signing
- Detour at a Road Junction
- Deviation at a bridge site
- Deviation – Low Traffic Volumes
- Deviation – High Traffic Volumes
- Deviation – Detour



SIGNING APPLICATIONS FOR RURAL ROADS

13.9.3 STOP/RY-GO Operation

- STOP/RY-GO operation may be required to control traffic at a wide variety of roadworks sites where the remaining roadway is reduced to less than two lanes in width, for whatever reason. As such, STOP/RY-GO traffic control is effectively a temporary signing sub-system. It may be used on its own or it may be used locally, in more than one place, within a long roadworks site. The detail in Figure 13.44 may therefore be incorporated into other layouts in this Chapter.
- If a daytime STOP/RY-GO operation cannot be opened to traffic by dusk, temporary traffic signals must be provided for night time operation. A portable power source may be required in order to operate the signals, and such an installation will need to be well secured.
- All obstructions close to a one-way site of this nature must be marked adequately by DELINEATOR PLATE signs TW401 and/or TW402 and/or flashing yellow lights. This includes any working or parked construction vehicles.
- The STOP/RY-GO operators must also be equipped with flags and must be well trained/experienced flagmen (see Subsection 13.3.9 and Figure 13.23).

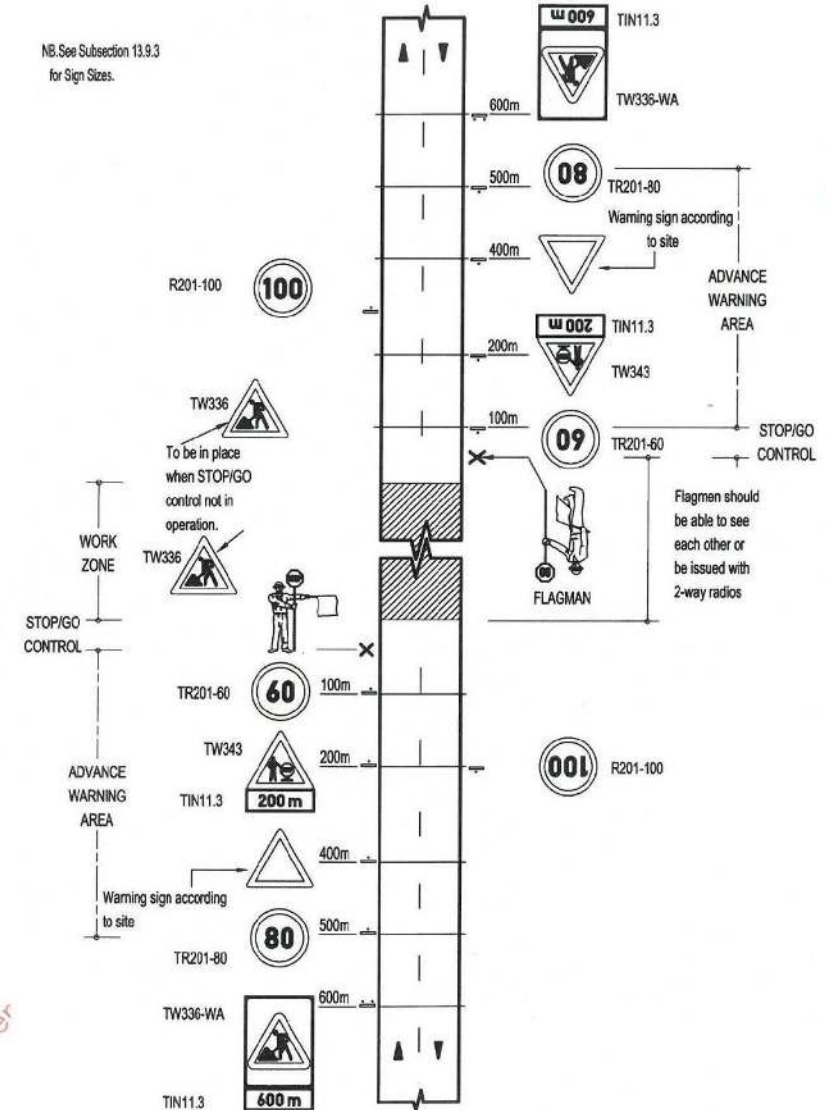
Checklist

- do the advance signs for the STOP/RY-GO control clash with other roadworks signing within the site?
- is the flagman fully visible to oncoming traffic?
- are all signs fully visible to oncoming traffic?
- is the flagman standing in a safe position?
- is the lateral Buffer Zone within the site adequate for worker and public safety?
- can the restriction be eliminated to permit two-way traffic by dusk?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TR201-60 TR201-80	1200	2 2
	R201-100	1200	2
	TW336-WA	1200 X 1800	2 or 0 ⁽¹⁾
	TW336	1200	2 or 4 ⁽¹⁾
	TW343	1200	2
	TW344	1200	2 ⁽²⁾
	TW337	1200	2 ⁽²⁾
	TW331	1200	2 ⁽²⁾
	TW339	1200	2 ⁽²⁾
	TIN 11.3	1200	4

(1) TW336 may be specified for TW336-WA on low volume roads.
(2) Only one pair of these signs may be needed. A large unit may need one pair of each.

NB. See Subsection 13.9.3 for Sign Sizes.



Ref

Fig 13.44

STOP/RY-GO Operation

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SIGNING APPLICATIONS FOR URBAN STREETS

- General
- Urban Roadworks
- Temporary Traffic Signals
- Sidewalk Deviation
- Localised Work Site - Good Visibility
- Lane Closed Beyond a Junction
- Work within a Junction
- Work in a One-Way Street
- Road Closure - CBD
- Road Closure - Dual Carriageway Street
- Road Closure - Detour



SIGNING APPLICATIONS FOR URBAN STREETS

13.10.3 Temporary Traffic Signals

- Temporary traffic signals are an alternative form of temporary traffic control for use on two-way roads which are reduced to one-way operation during roadworks. The use of temporary traffic signals is appropriate at any time, subject to cost effectiveness, as an alternative to the manual STOP/RY-GO operation. However, their use is recommended when such restricted conditions have to be maintained during the hours of darkness.
- The arrangement of light aspects of temporary traffic signals shall conform to the prescribed arrangements for permanent signals as illustrated in Volume 3 Chapter 12. All component dimensions and installation dimensional criteria for temporary traffic signals shall conform to details given in Volumes 3 and 4.
- The operation of temporary traffic signals may utilize any appropriate, proven, electrical/electronic control system, either linked by cable or not, provided adequate fail-safe back-up systems are included.
- Ideally, the timing of temporary traffic signals should be closely related to actual vehicle arrivals (vehicle actuation) rather than by means of fixed time cycles. Where necessary, detection devices should include the ability to detect the presence of vehicles at the STOP LINE and give an indication of queue length. Due to the dual direction, alternating one-way operation associated with traffic signals in a roadworks installation, it is necessary that a long, specifically calculated, clearance all-red period be provided. This will allow the last vehicle to enter the section sufficient time to leave it, before opposing traffic is released.
- In a similar manner to STOP/RY-GO operation, temporary traffic signals may be operated in isolation at a localised site or as part of the overall traffic control signing of a major roadworks site.
- Figure 13.57 shows a typical urban traffic signal application with short advance warning distances. Provided a power source is available, temporary traffic signals may be used in rural situations. When used on a road with high vehicle approach speeds, all advance warning signs should be located at distances consistent with rural roadworks sign sequences (see Section 13.9).

Checklist

- will the need for one-way operation extend into dusk and night time?
- is a power supply available?
- are traffic volumes known in order to set up cycle limit criteria under vehicle actuated operation?
- what are the fail-safe characteristics of the equipment?
- are the advance warning signs correctly located for appropriate vehicle approach speeds?
- will the end of a queue always be visible to approaching vehicles within stopping sight distance requirements?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TR103 TR104	900	1 1
	TW301	900 ⁽¹⁾	2
	TW329 TW330	900 ⁽¹⁾	1 of each
	TD4	450	Taper 24 plus 10 per 100m
	TIN 11.3	900 ⁽¹⁾	2

(1) Sizes indicated for 60km/h. Increase to 1200mm for over 60km/h or for rural use.

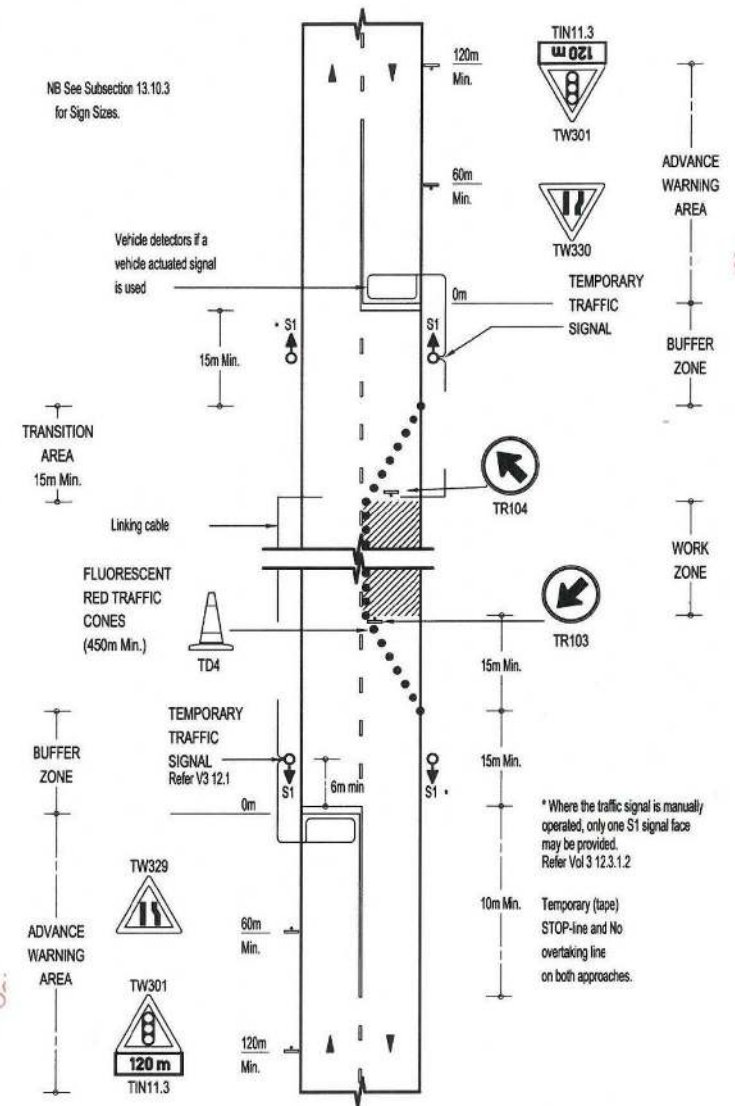


Fig 13.57

Temporary Traffic Signals

SIGNING APPLICATIONS FOR FREEWAY AND DUAL CARRIAGEWAY ROADS

- General
- Freeway / Dual Carriageway Roadworks
- Lane Closure – Day Time Only
- Lane Closure – Right Lane Long Term
- Lane Closure – Left Lane Long Term
- Carriageway Closure – Contraflow 2 Lane / 2 Way
- Carriageway Closure – Contraflow 3 Lane / 2 Way
- Carriageway Closure – Contraflow 4 Lane / 2 Way
- Work in Median
- 2 Lanes Closed
- On Ramp / Off Ramp – Amended Configuration
- Resurfacing – Freeway Interchange Ramps – Diamond
- Resurfacing – Freeway Interchange Ramps - 360° Loop

SIGNING APPLICATIONS FOR FREEWAY AND DUAL CARRIAGEWAY ROADS

13.11.3 Lane Closure - Day Time Only

- The application of temporary signing shown in Figure 13.66 is similar to other figures illustrating lane drop situations. The principle differences are that this example shows a lane drop on a two-lane, one-way roadway (normally part of a dual carriageway) and it assumes high approach speeds. If the situation is not isolated but occurs within a larger roadworks site, the signing level should be adjusted in accordance with the operating speed prevailing (see Section 13.4).
- Since the lane drop is short term, and during daytime only, delineation may be provided by means of TRAFFIC CONES TD4. Signing in the taper area is very limited compared to long term installations so that 750mm TRAFFIC CONES, preferably made more conspicuous with white retro-reflective sleeves, are recommended. Although signing within the transition and work area is kept to a minimum, the advance signing indicated must be provided otherwise traffic will arrive at the lane drop travelling too fast for safe merging to occur. Apart from the hazard this represents, congestion will occur as a result, making the installation very inefficient in its operation.
- Detail 13.66.1 shows dropping of the "Slow" lane. This application is not recommended for roadways with high volumes and/or a significant percentage of heavy vehicles. The dropping of the "Fast" lane as shown in Detail 13.66.2 is generally preferred. If necessary, this can be followed by a lane shift to the right (see Figures 13.77 to 13.79). The sign inventories for all taper details must be added to that given in this subsection.
- If advance signing has to be reduced due to time or space considerations, it is recommended that a full set of signs on one side of the road be omitted, rather than by decreasing in the length of the sequence. Which set may be omitted is likely to be site specific due to space or visibility conditions. The side offering the best visibility to all traffic should be retained with a preference for the "fast" side of the carriageway. In this event the start of the taper must be clearly identified to all traffic. The reduction in signing referred to is not recommended on three or more lane cross sections. According to experience, signs TGS101 (or TGS102) may be replaced by signs TW214 (or TW215) of an adequate size.

Checklist

- how many lanes are there on the section of road on which the lane is to be closed?
- what is the anticipated traffic approach speed during the period of lane closure?
- can lane closure during peak traffic periods be avoided?
- can the required level of signing be accommodated within the space available?
- will the lane closure cross off and on ramps - or can this be avoided?

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TR103 TR104	1200	2 or 3 ⁽¹⁾
	TR201-60 TR201-80 TR201-100	1200	3 2 2
	R201-120	1200	2
	TW336	1500	4
	TW214 TW215	1500	2 ⁽²⁾ of each
	TW411	400 X 2400	1
	TGS101 TGS102	1200 X 1600	2 ⁽²⁾ of each
	TD4	750	35 Min plus 10 per 100m closed
	TIN 11.3	1200	2
	TIN 11.3	1500	2
	FLAGS	600 X 600	4

(1) If possible provide 2 x TR103/TR104 signs at the start of the taper.
(2) TW214/TW215 may be used instead of TGS101/TGS102.

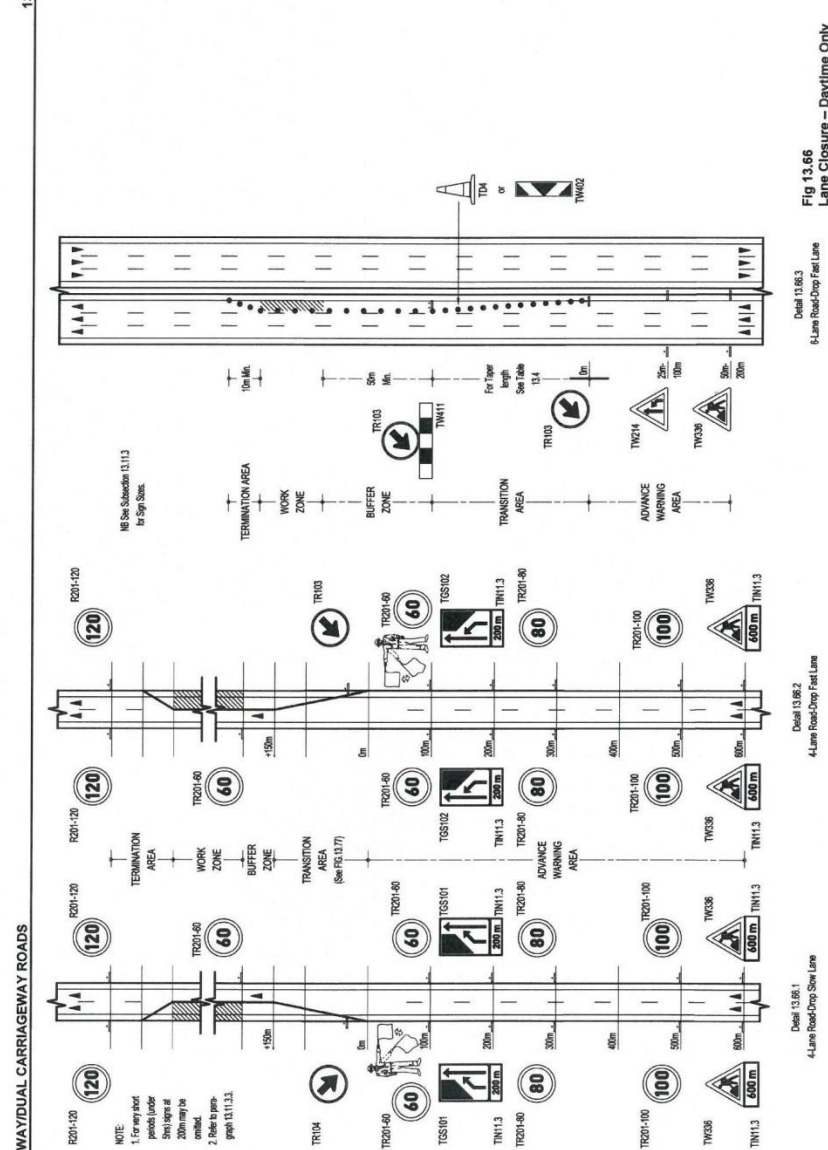


Fig 13.66
Lane Closure – Daytime Only

Detail 13.66.3
6-Lane Road-Drop Fast Lane

Detail 13.66.2
4-Lane Road-Drop Fast Lane

Detail 13.66.1
4-Lane Road-Drop Slow Lane

ENLARGED STANDARD DETAILS – ALL APPLICATIONS

- General
- Lane Drop Taper – Upstream Transition Area
- Taper – Downstream Termination Area
- Lane Shift Taper – Termination Area
- Double Lane Drop Tapers – Upstream Transition Area
- Crossover Reverse Curve – Single Lane Transition Area
- Crossover Reverse Curve – 2 Lane Transition Area
- Start of Deviation Reverse Curve – Upstream Transition Area
- Deviation Crossover Reverse Curve – Transition Area
- Contraflow Operation – Road Markings
- Contraflow Operation – 3 Lane Change Over Buffer Zone
- Road Closed Barrier / Barricades
- No Through Road Barricades
- Freeway Off Ramp – Amended Alignment – 1
- Freeway Off Ramp – Amended Alignment – 2
- Freeway Off Ramp – Amended Alignment






ENLARGED STANDARD DETAILS – ALL APPLICATIONS

13.12.9 Deviation Crossover Reverse Curve - Transition Area

- The terms "deviation" and "detour" are described in Subsection 13.9.14. A deviation tends to be fitted into available space parallel to the road under construction. In a rural environment, it may be necessary on occasions to move the deviation from one side of the WORK AREA to the other, and vice versa. Figure 13.84 shows a typical example of such a deviation crossover of the WORK AREA. This form of crossover is a form of TRANSITION AREA, and shall be preceded by appropriate signs in ADVANCE WARNING AREAS (see Figure 13.55).
- As with all reverse curves of this nature, they should be designed to the highest standard possible in terms of available space. The details given in Section 13.4 and Figures 13.24 to 13.26 are relevant to the design of such a reverse curve. It has been fairly common practise in the past to make this type of crossover to very low geometric standards because it is preferred to keep the section of the main roadway affected by the crossover to a minimum. Care should be exercised so that if this is done, a hazardous and unreasonable situation is not created for drivers.
- Formal "Road Closed" barricades should be established at the limits of the section of roadway being crossed. These barricades should be positioned safely, with an effective buffer zone between them and traffic. The signing of the barricade should conform to one of the options illustrated in Figures 13.18, 13.19 and 13.87.
- The sign inventory for this form of crossover TRANSITION AREA should be added to that specified for the appropriate deviation detail being applied e.g. Figure 13.54 and Figure 13.55.

Checklist

- can drivers accurately determine the severity of the reverse curve?
- if there is a vertical curvature of significance associated with the crossover (rising and falling over the established road construction for example) and is it clearly discernible?
- are effective "Road Closed" barricades in place?
- will construction traffic have to enter the WORK AREA at the "Road Closed" barricades - if so, will a flagman be required to control traffic and construction vehicles?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TR103	900 (urban) 1200 (rural)	2
	TW401 TW402	150 X 600 200 X 800	50 Min plus 5 per 100m
	Road closed barricade	1200 X 2400	4
	TR105	900 (urban) 1200 (rural)	4
	TW408	900 X 2700	4

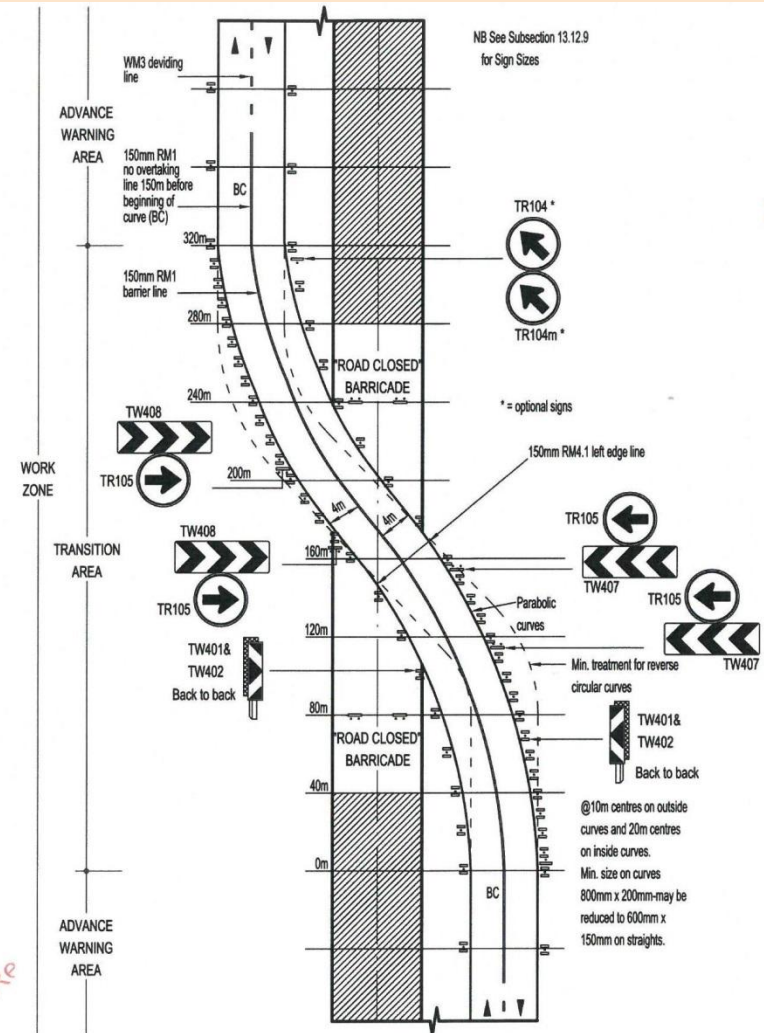


Fig 13.84

Deviation Crossover Reverse Curve - Transition Area

- Ratification by the Roads Coordinating Body (RCB)
- Publishing on the SANRAL website
- Creating a link from the DOT website
- Reference to Roadstuds standard in Regulations to be changed (SANS 1442 to SANS 1463)
- COTO Standard Specification for Road and Bridge Works