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Temporary Traffic Management Operations Guidance



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Temporary Traffic Management Operations Guidance

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Part

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Introduction and Background



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0.1 Introduction

0.1.1 Foreword

This is the first publication of the '*Temporary Traffic Management Operations Guidance*' document issued in August 2019.

This document has been developed by the Department of Transport, Tourism and Sport in conjunction with representatives from Local Authorities, Transport Infrastructure Ireland, the LGMA, the Health and Safety Authority, the Construction Industry Federation and practitioners in the industry.

0.1.2 Objectives

This document provides guidance on the planning, implementation, maintenance, modification and removal of Temporary Traffic Management (TTM). The purpose of the document is to:

- Provide a consistent approach for Local Authorities, TII and other stakeholders such as contractors, utilities, Motorway Maintenance and Renewals Contract (MMaRC) contractors and Public Private Partnerships (PPP) involved in TTM operations;
- Identify and promote safe methods of working for road workers involved in TTM operations; and
- Provide a safe passage for road users through, past or around a roadworks site.

0.1.3 Scope

This document is intended to provide operational guidance for TTM on all roads. It is part of a suite of publications covering all aspects of TTM on Irish roads. The hierarchy of these documents is as follows:

1. Traffic Signs Manual Chapter 8. This sets out the requirements that TTM must comply with.
2. Temporary Traffic Management Design Guidance. This provides guidance that should be followed on the design of TTM; and
3. Temporary Traffic Management Operations Guidance (this document). This provides guidance that should be followed for TTM operations.

Although this document is intended to provide clearly defined and standalone guidance on TTM operations, many TTM issues are interrelated and may be addressed in other related documents.

The document is intended for use by the Temporary Traffic Operations Supervisor (TTOS) and others involved in the operation of TTM at roadworks.

The diagrams within this document show typical layouts that meet the layout requirements described in Chapter 8 of the TSM. Standard TTM layouts, site specific plans and method statements may be developed in accordance with an Organisation's own safety statements. This document may also be used by stakeholders to allow the development of standard operating procedures for their own particular routine operations.

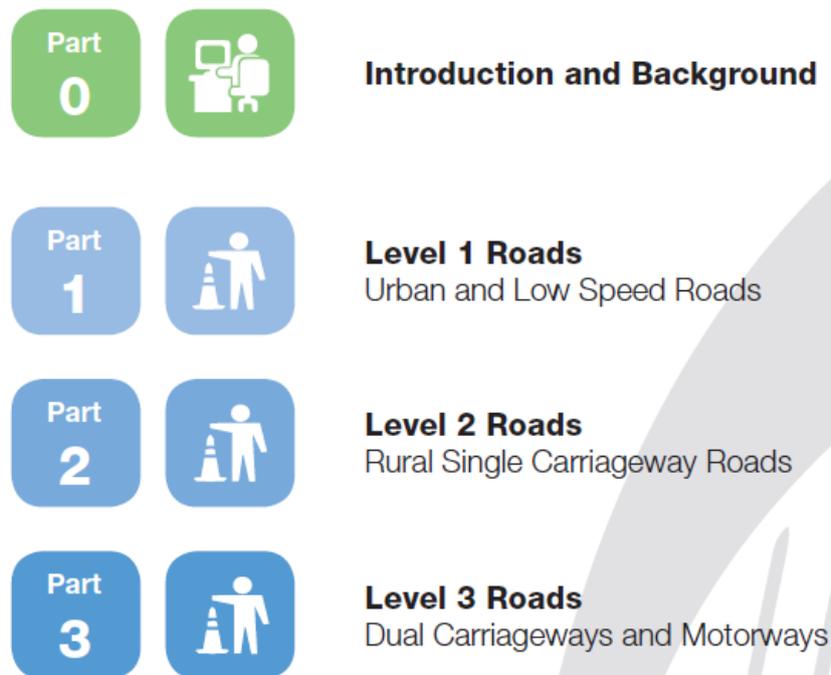
The advice given within this document is also applicable to TTM requirements for managing the health and safety of road workers and road users on roads which may not be public but to which the public have a right of way such as roads open to the public but not taken in charge by the Local Authority.

0.1.4 Structure

This document is structured around the typical daily routine of a TTOS and TTM operative. It starts from when they arrive at the start of their shift and follows through to what they need to do to get their day's work done correctly and in a safe manner.

The guidance document is divided into four parts. It is intended that all end users will require Part 0 and the part(s) that apply to the specific TTM operation.

The document structure is as follows:



Figures throughout this document are provided to illustrate elements of the TTM; they can be used to develop templates for site specific application.

0.1.5 Glossary of Terms

General

For the purposes of this guidance document:

- **Shall** or **Must** indicates that a requirement is mandatory;
- **Should** indicates a recommendation; and
- **May** indicates an option.

Organisations

DTTAS	Department of Transport, Tourism and Sport
TII	Transport Infrastructure Ireland
HSA	Health and Safety Authority
Road Authority	Any Local Authority in charge of a public road
Road Operator	Company undertaking construction, maintenance or operation of a National Road under a contract agreement with TII

Documentation

TII Publications (Standards)	Documentation in the TII Publications system defining the requirements that support policy, administrative and technical procedures developed by TII to govern activities relating to the National Road network.
TII Publications (Technical)	Documentation in the TII Publications system that aligns with TII Publications (Standards) but does not contain requirements that should form part of TII Publications (Standards). TII Publications (Technical) documentation includes Interim Technical Advice, Technical Bulletins and research papers.
TSM	Traffic Signs Manual published by the Department of Transport, Tourism and Sport (www.trafficsigns.ie)
DMURS	Design Manual for Urban Roads and Streets published by the Department of Transport, Tourism and Sport

Abbreviations

CSCS	Construction Skills Certification Scheme
HSA	Health and Safety Authority
PPE	Personal Protective Equipment

Health and Safety

Competent Person	A person is deemed to be a competent person where, having regard to the task he or she is required to perform and taking account of the size or hazards (or both) of the undertaking or establishment in which he or she undertakes work, the person possesses sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken
Health and Safety Co-ordinator	A competent person appointed in writing to assist the Project Supervisor in their duties

SSWP	Safe System of Work Plan. This is a plan which identifies the hazards associated with the work activities and identifies and records implementation of appropriate controls. Organisations may develop their own SSWP forms for routine works activities. The term SSWP where used within this document does not exclusively refer to a specific form type.
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Roadworks

Road	<p>a) Any street, lane, footway, square, court, alley or passage.</p> <p>b) Any bridge, viaduct, underpass, subway, tunnel, overpass, overbridge, flyover, carriageway (whether single or multiple), pavement or footway.</p> <p>c) Any weighbridge or other facility for the weighing or inspection of vehicles, toll plaza or other facility for the collection of tolls, service area, emergency telephone, first aid post, culvert, arch, gully, railing, fence, wall, barrier, guardrail, margin, kerb, lay-by, hard shoulder, island, pedestrian refuge, median, central reserve, channelliser, roundabout, gantry, pole, ramp, bollard, pipe, wire, cable, sign, signal or lighting forming part of the road.</p> <p>d) any other structure or thing forming part of the road and:</p> <ul style="list-style-type: none"> • necessary for the safety, convenience or amenity of road users or for the construction, maintenance, operation or management of the road or for the protection of the environment. • or prescribed by the Minister.
Roadway	The portion of a road which is provided primarily for the use of vehicles
Roadworks	Roadworks means repairs, maintenance, alterations, improvements or installations or any other works to, above or under, a public road
Roadworks Speed Limit	A regulatory speed limit applied at a roadworks site for a duration and at a location specified in a Manager's Order made under Section 10 of the Road Traffic Act 2004
TTOS	Temporary Traffic Operations Supervisor. The person on site with direct responsibility for implementation, maintenance and removal of TTM.
Minor Road	A local roadway less than 5.5m wide with an AADT of less than 1000 vehicles. All other public roads shall be non-minor roads.
Urban Road	A road in urban areas as defined in county / city development plans with a speed limit of 60km/h or less.
Set Back	The minimum clearance, required on Level 3 roads, from the edge of the traffic lane to the front face of a temporary barrier. It is provided for the safety of the road user and allows for driver judgement when travelling next to a physical barrier. Set back does not include the space required for the swing or overhang of site vehicles.

0.2 Planning and Design

0.2.1 Introduction

This section follows a logical order of pre-planning through to completion and removal. It is divided into the following three sub-sections:

- Pre-planning and Design;
- Pre-commencement; and
- Work Activities and Operations.

0.2.2 Pre-Planning and Design

0.2.2.1 General

Temporary Traffic Management Design Process

The TTM Design Process is based on three fundamental stages:

- Stage 1 - Obtain Information;
- Stage 2 - Risk assess various TTM options; and
- Stage 3 - Traffic Management Design.

Stage 1 includes items such as works details, works area requirements and site characteristics.

Stage 2 includes items such as roadway widths, traffic volumes including cars, buses and HGV traffic and vulnerable road users. Stage 2 also includes a review of possible TTM options and an assessment of the factors affecting the choice of traffic management control. These factors include maximum speed limit, coned area length and maximum traffic flow.

Stage 3 includes road classification, roadworks types and design parameter selection.

Temporary Traffic Management Designer

A TTM Designer is a person or party designing, contributing to and having overall responsibility for a Temporary Traffic Management Plan. A TTM Designer is required to prepare:

- A **suite of standard TTM layouts**; or
- A **site specific plan**.

Standard TTM Layouts

Standard TTM layouts are generally used for routine short duration works which are carried out by Local Authorities, contractors or utility companies. They include a suite of approved TTM standard layouts for different work activities, circumstances and site conditions with the required layout being selected by the TTOS via completion of a site specific record for Standard Traffic Management Plans (refer to Appendix D of Part 1 of these guidance documents). This layout along with a Safe System of Work Plan (SSWP) and risk assessment as a minimum form the Job Information Pack (refer to Section 0.2.3.4).

Site Specific Plan

A site specific plan may be used for longer-term or more complex works. A suitably qualified competent TTM Designer is used to prepare the site specific plan.

A site specific plan should include specific information such as the length of works, road alignment, available road widths, existing junctions and house entrances, existing utilities and services, proposed diversion routes, available visibility and surrounding topography. It should also include the sequence of works and different TTM phases if they are required. It should be based on a current ordnance survey map or site survey.

0.2.2.2 Road Classifications, Roadworks Types and TTM Elements

The type and level of TTM deployed is dependent upon, the road classification, the type of works and carriageway capacity.

Road Classifications

The Road Classifications used in this document are listed in Table 0.2.2.2.1. If roadworks take place across more than one classification, the design parameters for the higher road classification should be applied.

Level		Carriageway Type	Speed / Speed Limit (km/h)
Main	Sub		
Level 1	i	Single	≤ 30
	ii	Single	40
	iii	Single	50
	iv	Single	60
Multi-lane / Dual		≤ 60	
Level 2	i	Single	80
	ii	Single	100
Level 3	i	Dual and Motorway	80
	ii	Dual and Motorway	≥ 100

Table 0.2.2.2.1: Road Classifications

Roadworks Types

This document relates to the following roadworks types listed in Table 0.2.2.2.2. If more than one roadworks type is needed, the design parameters for the higher roadworks type should be used. Guidance on the TTM for these roadwork types is given throughout this document.

TTM Type	Description	Traffic Flow Conditions	Visibility Conditions	Planned Duration
Static Type A	Works requiring full time Temporary Traffic Management (TTM)	All	All	Permitted for any duration but required for durations in excess of 12 hours
Static Type B	Works that normally involve the use of one or two vehicles in the operation. This type of work is typically maintenance and repair type operations, including maintenance of utilities or street furniture.	Unrestricted by either traffic volume or weather conditions	All	Permitted for a duration of up to 12 hours
Static Type C	Works at a discrete location that is of a short duration (excluding signage setup / removal).	Unrestricted by either traffic volume or weather conditions	Good	Permitted for a duration of up to 15 minutes
Semi Static Operation (SSO)	Works where the operations are mobile or making short duration stops continuously along a road where static warning signs are used. SSOs are only suitable on Level 1 to 2 roads.	Unrestricted by either traffic volume or weather conditions	Good	Permitted for stop durations of up to 15 minutes
Mobile Lane Closure (MLC)	Works where the operations are mobile or making short duration stops continuously along a road where mobile warning signs and Impact Protection Vehicles (IPV) are used. MLCs are only suitable for Level 3 roads.	Unrestricted by either traffic volume or weather conditions	Good	Permitted for stop durations of up to 15 minutes

Table 0.2.2.2.2: Roadworks Types

Static Type A

These are full-time roadworks that remain in operation in all traffic flow conditions and usually remain in position for a duration typically more than 12 hours. They may remain in position for several weeks or months. They typically require a site specific plan but this is not always the case so may include works with a standard TTM layout.

Major roadworks such as a road realignment, road widening, pavement overlay, drainage works, utility installation maintenance or upgrade generally fall in to this category. These are Type A works because a significant amount of labour, plant and materials are required to carry out the operation. Additionally, a significant portion of the road or roadway is required.

Static Type B

These are roadworks that are of a short duration and where there are one or two vehicles in the operation. These works are typically maintenance and repair operations, including maintenance of utilities or street furniture and where traffic flow is unrestricted by either traffic volume or weather conditions. Duration can be up to 12 hours. These works may include a site specific plan or standard TTM layouts.

Type B roadworks typically include footway repairs, sign replacement and minor utility / drainage upgrade and maintenance. These roadworks typically include three to four road workers. The duration of the works may vary from approximately 15 minutes to a full work shift of 12 hours. Linear works away from junctions may be undertaken using standard TTM layouts, however, for example if there is a drainage access chamber at a junction, then this should be undertaken using a site specific plan.

Footway repairs carried out over a number of phases, where the duration exceeds 12 hours, may be done as Type B roadworks using a Standard Operating Procedure (SOP) or a standard TTM layout, and where a risk assessment has been carried out.

Static Type C

These are roadworks at discrete locations with a duration of up to 15 minutes excluding signage setup / removal. Traffic flow is unrestricted by either traffic volume or weather conditions. Roadworks such as washing signs, checking utilities (sounding of leaks and operation of valves) and one off minor road repairs generally fall within the scope of Type C works. This scope normally includes a maximum of two road workers, one works vehicle and a minimal amount of plant. Emphasis of controls (as with Type A and B) are built around advanced visibility from the road user to the works and stopping sight distance. These increase significantly within Type C Roadworks as traffic speeds increase, in line with the design standards laid down within the DMRB. If a vehicle is being used, it must have warning beacons in operation.

Signs mounted on the works vehicle may be sufficient provided the visibility complies with the requirements listed within this section. Where signs are not mounted on a vehicle, sign WK 001 Roadworks Ahead should be erected on each approach side to the works.

- These works must be individually separate and distinct and detached from other works. They are a single one-off piece of work at any given location;
- Traffic flow must be within the carriageway capacity; and
- There must be good visibility.

It should be noted that a sequence of pothole repairs does not fall within the scope of Type C works. Such works are classified as a semi-static operation.

The works should not introduce an additional hazard at the location over and above that associated with normal road usage. This should be assessed in a two-step process:

Step 1:

Assesses the risks associated with stopping or parking a works vehicle, if such a vehicle is being used. A works vehicle does not present an additional hazard if it is parked off carriageway, or if it is legally parked on the carriageway. This means the vehicle should not be parked at a location:

- Where there is a double yellow line; or
- Where a no parking sign, or other local restriction applies, and the restriction is in force, or
- Within 5m of a junction; or
- On a 2 lane road with a continuous white line; or
- Obstructing an entrance or an exit for vehicles to or from premises, unless with the consent of the occupier of such premises.

In addition to the above, where a vehicle is stopped or parked on a live lane, it must be clearly visible to approaching traffic in accordance with Table 0.2.2.2.3.

Speed / Speed Limit (km/h)	Visibility (m)
30	25
40	35
50	50
60	60
80	90
100	120
120	Not permitted to park in live lane

Table 0.2.2.2.3: Static Type C Visibility Requirements

Step 2:

Assess the risks associated with the road worker.

- If working on a road with a speed / speed limit of ≤ 60 km/h the road worker should:
 - not be working in a live lane; or
 - be working under the protection of a fend vehicle stopped or parked in accordance with Step 1.
- If working on a road with a speed / speed limit of > 60 km/h the worker should:
 - not be working within 1.5m of a live lane, where no footway is provided; or
 - be working on a footway, if provided; or
 - be working under the protection of a fend vehicle stopped or parked in accordance with Step 1.

In either case, if a road worker is working off the roadway and no fend vehicle is being used, the minimum size of sign WK 001 Roadworks Ahead should be 450mm.



Figure 0.2.2.2.1: Cleaning a blocked gully can be carried out as Type C Works



Figure 0.2.2.2.2: An unprotected road worker working in a live lane is not Type C Works

Traffic Flow Guidance

Indicative carriageway capacity figures are given in Table 0.2.2.2.4 for guidance only.

Road Type	Road Width	Vehicles / 3 min (busiest direction *)
Single Carriageway ≤ 60 km/h	< 6.0m	20 - 30
	≥ 6.0m and < 7.3m	40 - 50
	≥ 7.3m	60 – 70
Single Carriageway > 60 km/h	< 6.0m	35 - 45
	≥ 6.0m and < 7.3m	55 - 65
	≥ 7.3m	75 – 85
Dual Carriageway		60 - 65 per lane left open

Table 0.2.2.2.4: Carriageway Capacity Guidance

* This does not mean total capacity

If the Indicative carriageway capacity figures in Table 0.2.2.2.4 above are exceeded, then the works must be carried out as a Static Type A.

Adverse weather conditions may further reduce the carriageway capacity figures described above, due to an increase in the stopping distance or the reduction in visibility depending on the severity of the weather conditions.

Semi-Static Operation (SSO)

These are works where the operations are mobile or making short duration stops continuously along a road, where static advance warning signs are used. SSO are permitted for stop durations of up to 15 minutes and are only suitable on Level 1 and 2 roads. These operations need to be unrestricted by either traffic volume or weather conditions and need good visibility. Examples include hedge cutting, mowing, weeding, minor road surface repairs, installation of road markings or studs, pavement sweeping, cleaning gullies or manholes and litter picking.

Mobile Lane Closures (MLC)

These are works where the operations are mobile or making short duration stops continuously along a road, where mobile advance warning signs and Impact Protection Vehicles (IPV) are used.

MLC are permitted for stop durations of up to 15 minutes and are only suitable on Level 3 roads. MLC need to be unrestricted by either traffic volume or weather conditions and also need good visibility.

Examples include hedge cutting, mowing, weeding, minor road surface repairs, installation of road markings or studs, pavement sweeping, cleaning gullies or manholes and litter picking.

Roadworks (Traffic) Parameters

Table 0.2.2.2.5 outlines where the different roadworks types are permitted and gives brief details on safety zones and training.

Level		Carriageway Type	Speed / Speed Limit	Works Type					Safety Zones	
Main	Sub			Static			SSO	MLC	Lateral (m)	Longitudinal (m)
				A	B	C				
Level 1	i	Single	≤ 30	SLG	SLG / HSRW	SLG	MLC	0.5	0.5	
	ii	Single	40					0.5	0.5	
	iii	Single	50					0.5	5	
	iv	Single	60					0.5	15	
Multi-Lane / Dual		≤ 60								
Level 2	i	Single	80	SLG	SLG / HSRW	SLG	MLC	1.2	45	
	ii	Single	100					1.2	60	
Level 3	i	Dual	80	HS	HS	MLC	HS	1.2	45	
	ii	Dual	≥ 100					1.2	60	

Table 0.2.2.2.5: Proposed Roadworks (Traffic) Parameters

Table Abbreviations and Notes

- Green – permitted;
- Amber – restricted use on Level 3 roads, see Section 3.3.4 of Part 3;
- Red – not permitted;
- SSO – Semi-Static Operations;
- MLC - Mobile Lane Closures;
- SLG - Signing, Lighting and Guarding at Roadworks;
- HSRW – Health & Safety at Roadworks: and
- HS – Minimum Quality and Qualifications Ireland (QQI) Level 5 recognised training.

Works off a Roadway

In certain circumstances such as where there are wide footways or wide verges, works may take place within the road boundaries which do not affect the roadway. Roadworks types may not apply in these scenarios.

A risk assessment of the impact of the works on traffic on the adjacent roadway and on vulnerable road users should be carried out. Consideration should be given to the number of works vehicles movements anticipated and the number of personnel working alongside the carriageway. Where significant numbers of vehicle movements and deliveries are expected, signage should be provided on the carriageway. Where the works do not impact on traffic or result in vulnerable road users being diverted from their normal route onto the roadway, then signage is not required on the roadway.

The works must still be properly managed, and the construction regulations may still apply. Some such works may be defined as low exposure activities. Guidance is given here for typical scenarios for footway and verge works.

Works on Footways

Advance warning signage may not be required on the roadway in the following situation:

- the works area must be a minimum of 0.5m from the roadway; and
- a minimum 1.0m unobstructed width of footway can be maintained.

WK 001 Roadworks Ahead (450mm) shall be provided on the footway and the works area should be separated from footway users by suitable barriers.

Works off a Roadway with no Footway or Cycle Track

Advance warning signage may not be required on the roadway where:

- the workers are not working within, 0.8m on a Level 1 road or 1.5m on a Level 2 road, of the carriageway; and
 - for Level 1 roads where works vehicles can be legally parked; or
 - for Level 2 roads where works vehicles can be parked such that they are no closer than 1.5m from the roadway.

WK 001 of size 600mm shall be provided on the verge.

Verge works on Level 3 roads require more detailed consideration by operatives. Guidance on Level 3 verge works is given in Part 3 of this document.

TTM Elements

The purpose of this section is to identify and describe the various TTM elements that are commonly used during operations. These include:

- Advance warning signage;
- Lead-in taper;
- Advance central coning;
- Longitudinal cone run;
- Safety zones;
- Works area; and
- Exit taper.

The TTM elements are shown together in Figure 0.2.2.2.3 and each element is described in further detail thereafter.

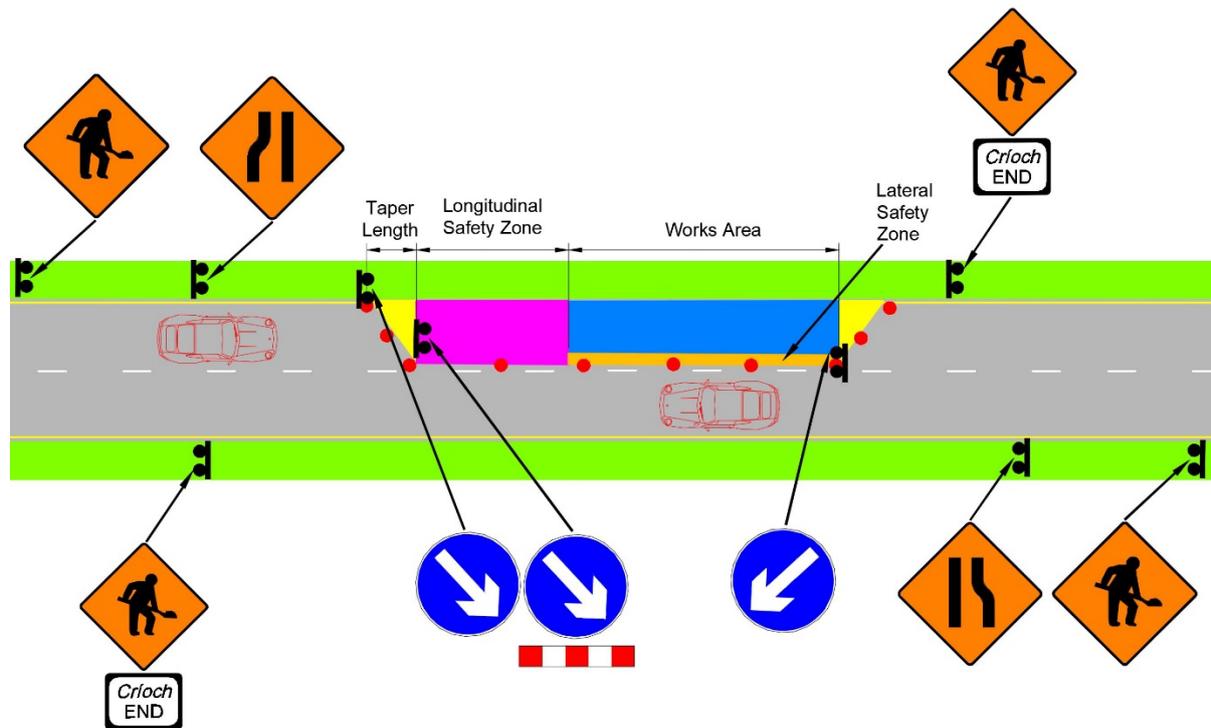


Figure 0.2.2.2.3: Typical TTM Layout showing different TTM Elements

Advance Warning Signage

Advance warning signage must be provided to warn road users of the presence of roadworks ahead. Advance warning must start with the WK 001 Roadworks Ahead sign. Other signs should then be set out in sequence moving towards the works area. Signs should not be positioned where they are hidden from view by other temporary signs, existing features or vegetation. Additionally, they should not interfere with the visibility of permanent signs, merges, diverges, etc.



Lead-in Taper

A lead-in taper is provided to deflect road users around the works area. It must be defined with traffic cones or alternatively temporary barriers. The taper area should be treated the same as a safety zone with regards to restrictions of use and access. The first cone must include RUS 001 / RUS 002 Keep Left / Right arrow. The last cone to be placed must also include RUS 001 / RUS 002 arrow.



Advance Central Coning

Advance central coning is the line of cones used in advance of a lead-in taper. Where practicable the length of advance central coning is 20m in rural areas and 10m in urban areas. The purpose of the central coning is when a large vehicle is at the head of the queue, the cones extend beyond the back of that vehicle giving an indication of roadworks ahead and prevent overtaking of that vehicle. Funnelling (narrowing) of the advance central coning may be done however the narrow end of the funnel should not be less than 3.3m.

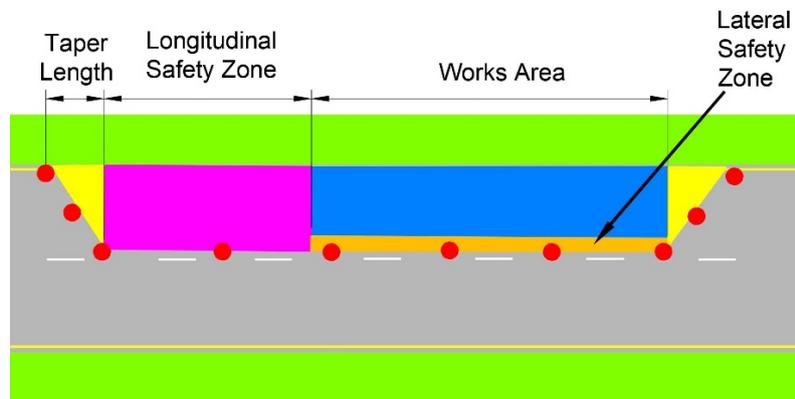


Longitudinal Cone Run

A longitudinal cone run is the line of cones that runs past the longitudinal safety zone and works area. It must be defined with a delineation device such as cones, temporary barriers traffic cylinders etc. On Level 1 and 2 roads, the first and last cones must include a RUS 001 / RUS 002 Keep Left / Right arrow. This is not the case on Level 3 roads, excluding the implementation of a contraflow.

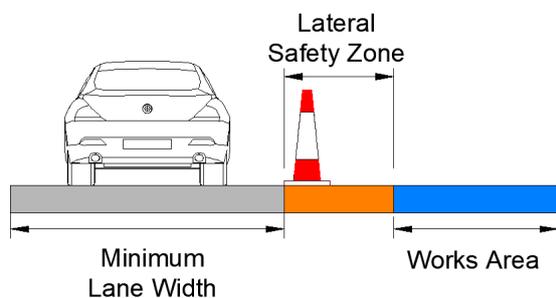
Longitudinal Safety Zone

A longitudinal safety zone is provided between the lead-in taper and works area. It shall be kept clear of operatives, materials and vehicles and shall only be entered to maintain the TTM layout. The boundary of the safety zone should always be clearly defined by traffic cones or an approved temporary barrier.



Lateral Safety Zone

A lateral safety zone is provided between the works area and the live lane. It shall be kept clear of operatives and materials and shall only be entered to maintain the TTM layout. The outer boundary of the safety zone should always be clearly defined using traffic cones or an approved temporary barrier. Traffic cones are included as part of the lateral safety zone width.



Works Area

The works area is the actual area required to carry out the works and it includes the space required for storing vehicles, materials and equipment. The works area is protected by a longitudinal and lateral safety zone. The works area includes an area where:

- Plant is parked;
- Material is stored;
- Operatives can be present;
- Deliveries are being made or loading operations are taking place;
- Temporary works are present; or
- Swing areas for excavators or other plant overhangs.

Exit Taper

An exit taper is provided from the end of the works area and lateral safety zone. It must be defined with traffic cones or alternatively temporary barriers. The first cone (from works area) must include a Keep Left / Right arrow however this may not be the case on Level 3 roads.

0.2.2.3 Roles, Responsibilities and Competence

The successful implementation of this document is dependent on the provision of appropriate training to those involved in the implementation of TTM at roadworks.

The scale and type of the TTM will determine the roles, numbers of staff, and the competency of the staff required. A person is deemed to be a competent person where they have sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken and the environment in which the work takes place. The Employer shall ensure that employees are competent to undertake their assigned role in relation to the combination of training, experience and knowledge that the employee possesses. The Employer shall determine the necessary training, experience and knowledge requirements having regard to the size or hazards (or both) of the tasks to be undertaken.

The following is a summary of assessment points for the competence of persons in each TTM role, along with an outline of their roles and responsibilities:

Temporary Traffic Operations Supervisor

Competence	Training	<p>Must hold a three day Signing, Lighting and Guarding at Roadworks card undertaken as part of the Construction Skills Certification Scheme (CSCS SLG).</p> <p>If supervising works on Level 3 roads, supervisors must have an accredited TTM Level 3 qualification for the particular work type being carried out as follows:</p> <ul style="list-style-type: none"> • Static Operations: Static Operative qualification • Mobile Operations: Mobile Operative qualification <p>On Level 3 roads, depending on the size or hazards (or both of them) of the tasks to be undertaken, the Employer may determine that supervisors also require an accredited TTM Level 3 Supervisor qualification.</p>
	Experience	Appropriate to the scale of the works and hazards present.
	Knowledge	Of the works to be undertaken, hazards present, and controls required.
Role & Responsibility	Supervise the site including on site supervision during installation, modification and removal of TTM equipment.	
	Install TTM in accordance with the Organisation’s safety management system, safe operating procedure, or method statement for the works.	
	Assess the implementation of standard TTM layouts in accordance with an Organisation’s safety management system or safe operating procedure.	
	Monitor and ensure TTM remains in place as detailed in the TTM Plan (TTMP) and correct if necessary.	
	Maintain TTM site records.	

TTM Operatives

Competence	Training	<p>If the TTOS is not on site, at least one operative must hold a one day Health and Safety at Roadworks card undertaken as part of the Construction Skills Certification Scheme (CSCS HSRW).</p> <p>If working on Level 3 roads, TTM operatives must also have an accredited TTM Level 3 qualification for the particular work type being carried out as follows:</p> <ul style="list-style-type: none"> • Static Operations: Static Operative qualification • Mobile Operations: Mobile Operative qualification • Use of IPV: IPV driver qualification plus Static and / or Mobile Operative Qualification depending on the works type <p>For trainees on Level 3 Roads, see Section 3.1.2 of Part 3 of these guidance documents.</p>
	Experience	Appropriate to the scale of the works and hazards present
	Knowledge	Of the works to be undertaken, hazards present, and controls required
Role & Responsibility	Install, modify and remove TTM equipment under the supervision of the TTOS	
	Monitor and ensure TTM remains in place as detailed in the TTMP	
	Perform minor tasks in relation to TTM (e.g. re-stand cones, clean devices etc)	
	Report TTM defects to the TTOS	
	Cooperate with the TTOS	
	Only alter TTM while under the supervision of the TTOS	

Other Training

On construction sites, all employees should have the following:

- Safe Pass, and
- Manual Handling.

Employer policy on competency may identify that specific additional training should be provided. A non-exhaustive list includes the following:

- Traffic management banksman;
- Convoy operations;
- Stop and Go operations;
- Temporary traffic signals; and
- Temporary traffic management equipment handling.

0.2.2.4 Equipment

Signs

Warning Signs

Warning signs warn road users of roadworks activity and hazards on the road ahead. These signs are generally diamond shaped with a black legend on an orange background. Signs should be made of retro-reflective material, be in good condition and be visible to the road user. Sign WK 001 Roadworks Ahead must be put in place first. Examples are given below.



Regulatory Signs

Regulatory signs give mandatory instructions or place restrictions on road users. They are generally circular with the exception of yield and stop signs. Blue signs mean you must and red boundary signs mean you must not. Examples are given below.



Information Signs

Information signs give directions and other information to road users. They are generally rectangular in shape. Examples are given below.



Supplementary Plates

Supplementary plates are used with roadworks signs to provide additional information for road users. They are rectangular and are located underneath roadworks signs. Examples are given below.



Control Devices

Cones

Cones are red with a white reflective band used to delineate the works zone and direct road users through the roadworks site. The minimum cone height on a single carriageway road is 750mm. Cones should be stable enough to remain upright and should be kept clean to ensure visibility. Cones should have a weighted detachable base. The reason for this is that if the cone gets struck by a vehicle, it will not become a hazard, as the weighted base will remain on the ground.

Putting a spare base over the cone, can be used to add ballast to cones where there is a tendency for them to get blown over. Sand bags should not be used as ballast on cone bases. Cones without a reflective band or if the band is damaged are not acceptable.



Cones or other alternative frames may be used as sign stands where space is restricted, and the use of A frames is problematic. This may be useful in urban areas where space is restricted by urban furniture, parked cars or other obstructions or in rural areas where narrow verges are present. Signs should be attached to cones via brackets, slings or elasticated bands. The complete sign face and supplementary plate (if used) must be visible to the road user.



Installation of signs upside down is not acceptable.



Barriers

Barriers may be required either to delineate the required path of a road user or as a means of protection for road workers, road users or both.

Pedestrian Barriers

Pedestrian barriers should be used to define temporary footways at roadworks. At a minimum, they should have a visibility bar (150mm high) between 1.0 and 1.2m from the ground, measured to the top of the bar. They should have a minimum 150 to 250mm high tapping rail a maximum of 200mm measured from the ground, to the bottom of the rail.



They should have reflective strips, be secure enough to keep children out of the roadworks site and should be linked together so that they cannot be easily separated.

Key points include the following:

- Easy to use, assemble and store;
- Linking allows barrier sections to be easily joined together;
- Provide good stability; and
- Legs may present a trip hazard.

Workforce Barriers

These are lightweight barriers used to delineate the inner edge of a safety zone for the workforce. They should only be used when there is no risk of vulnerable road users encountering the works.

Vehicle Barriers

Vehicle barriers can be used to define the works zone but also to define the path a vehicle is expected to take through the works area or lane closure. Vehicle barriers are used to control the turning movements of vehicles at worksites. They may also be used to provide enhanced protection to road workers.



Vehicle barriers must be installed as per the manufacturers' guidelines. Water or sand filled barriers should be ballasted as required on installation. They are easy to use, assemble and store because linking allows barrier sections to be easily joined together in a straight or curved shape and given that they can be easily moved when not filled. They are easy to fill and drain and provide good stability when full and good impact resistance.

In some cases, it may be appropriate to provide temporary vehicle restraint system barriers acting as vehicle barriers to provide enhanced protection to road workers. In such

circumstances, the working width for deflection of the vehicle restraint system is not required and the lateral safety zone can be measured from the outside edge of the barrier. This provision can only be used where a risk assessment indicates a restraint system for errant vehicles is not required.

Vehicle Restraint Systems

Restraint systems are used at roadworks to contain errant vehicles, protect roadworks sites, channel and redirect traffic, form a median barrier and for contra-flow situations. The sections should be linked together and done so correctly. The working width should be kept clear of operatives, materials and vehicles.



Lamps, Lighting and Reflectors

Lighting is provided at roadworks to further define the works area for road users and to provide visibility for works during hours of darkness. Sufficient lighting should be provided however it should not dazzle oncoming traffic. The different types of lighting used at roadworks include the following:

- Steady state lamps;
- Flashing including sequential lighting;
- Rotating reflectors; and
- Temporary overhead lighting.

Warning Lamps

Warning lamps should be installed in unlit areas for Type A works in accordance with Chapter 8 of the TSM. Warning lamps may be omitted for Type B works on Level 1 and 2 roads subject to a risk assessment. Warning lamps should be installed on cones, ensuring the reflective sleeve of the cone is not masked. Anti-vandalism cages must not be used on warning lamps on Level 3(ii) roads.

Warning lamps may be steady state, flashing or sequential flashing. Steady state warning lamps must be used unless highlighting a specific hazard. Flashing lamps must only be used where attention needs to be drawn towards a hazard.

Flashing warning lamps are typically used at the following locations:

- At the first advance warning sign to notify the road user of the approaching roadworks;
- At the start and end of tapers;
- At site access / egress points;
- At ramps; and

- At start of narrow lanes.

On Level 3 roads sequential lamps are permitted on lane closure tapers. Sequential lamps shall not be used when a lane or lanes are narrowed or at crossover locations and shall not be used for hard shoulder closures. Spacing of sequential lamps on tapers shall be a maximum of 12m centres and shall comply with manufactures requirements. A combination of sequential lamps and steady state lamps shall not be permitted on tapers. Where multiple tapers are required the lighting arrangement used on the first taper shall be used on all subsequent tapers.

Warning lamps may be replaced by rotating reflectors on the longitudinal run of cones only.

Tower Lights

Tower lights can be used to illuminate the works area and features in the TTM layout such as crossover points or where traffic is moved from one lane to another. A sufficient amount of lighting units should be provided to illuminate the areas required.

Care must be taken to ensure that tower lights do not dazzle motorists. Usually extending the tower lights as high as possible keeps the angle narrow so that light shines almost directly down on to the area requiring illumination. When extending the tower lights consideration should be given to the location overhead power lines and weather conditions, particularly high winds.

Tower lighting units should not be placed behind a facing wall of cones. They should be placed behind the back wall of cones on the crossover so any errant vehicles that run through the facing wall do not run into the tower lighting units. Refer to Part 3 for details on facing wall and back wall.

Tower lights are usually run on diesel and a drip tray should be positioned under the unit to prevent spillage from getting onto the road surface and entering the water course. The drip tray contents should be disposed of in accordance with the site Environmental Policy.

Variable Message Signs

Variable Message Signs (VMS) are used to provide regulation, warning, and information messages to road users. They should be located so that they do not become a hazard to either road users or road workers.

Temporary Traffic Signals

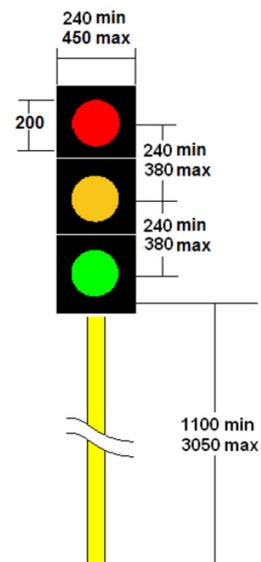
Temporary traffic signals are mainly used where traffic is reduced to shuttle working. They can be used both during



daytime and at night. They are particularly useful where work sites are left unmanned overnight. They should be capable of running a number of different phases. The TTOS should ensure that the Gardaí have been notified in advance of the operation and that permission has been given by the Road Authority. The minimum mounting height should be 1.1m, although the requirements for visibility by approaching traffic shall still be met.

In certain conditions, temporary traffic signals should be vehicle actuated. These include the following:

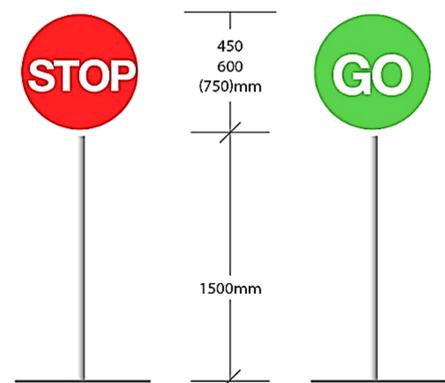
- Type A and B works on National and Regional routes;
- Where a Stop and Go system is required but it is not possible to deploy a Stop and Go operator;
- On narrow roads (lateral safety zone less than 1.2m) where vehicles must be brought to a stop before entering the shuttle, and it is not possible to deploy a Stop and Go operator.



Vehicle actuated temporary traffic signals are generally not advisable within urban areas. Where possible the site should be provided with Stop and Go discs as backup in case of traffic light failure. Temporary traffic signals are preferable to manually operated TTM methods because it means operatives are not exposed to live traffic.

Stop and Go Discs

RUS 060 and RUS 061 Stop and Go discs are used at plant crossings or short lengths of working. The TTOS should ensure that the Gardaí have been notified in advance of the operation and that permission has been given by the Road Authority. The discs consist of a double sided round disc (450mm or 600mm diameter) on a batten. One side of the disc states Stop on a red background and the other side states Go on a green background. The bottom of the disc must be a minimum height of 1.5m above the adjacent pavement, but may need to be higher in certain circumstances, to maintain visibility.



Stop and Go discs can be used manually or automatically. The disc diameter is typically 750mm if automatically operated. For works less than 20m in length, a single operator may use them manually. For works greater than 20m and less than 200m, automatic use by a single remote operator is possible. For works longer than 200m, two operators are required with one located at each end of the works area. Radio contact is also useful.

Manual Stop and Go discs are particularly advantageous where visibility is not a problem. Stop and Go discs should be replaced with temporary traffic signals for night working. If they are required at night, lighting must be provided however floodlights should not dazzle oncoming road users.

Vehicles

The type and number of TTM vehicles used will vary depending on the TTMP, location and operation to be carried out. The types of vehicles used include vans, pick-up trucks, Impact Protection Vehicles (IPV) and quad bikes. These can be used as advance warning vehicles, IPVs, working vehicles or lead pilot vehicles. Larger IPVs are generally not used on lower speed single carriageway roads.

Vehicles and trailers must be of a conspicuous colour, either yellow or white and must be maintained so that they are roadworthy and fit for purpose. Reflective markings should be kept clean. Vehicles should include warning beacons visible 360° and they should be kept in full working order and replaced if damaged or faded. Towing equipment should be in full working order and checked regularly. Livered vehicles should include a minimum sign size of 600mm.

Quad bikes must have four wheels and be capable of driving at up to 20km/h and have appropriate signage on the rear of the vehicle. They may be used as convoy vehicles as they are manoeuvrable in tight situations and have good turning circles. They must have good all round visibility, be either yellow or white and be fitted with a reflective stripe along the side and rear of the vehicle. They should also be fitted with warning beacons visible 360° and be kept clean so that the colour and reflectivity of stripes are not affected.

They must be roadworthy, have wing mirrors, indicators, registration plates and should have an NCT. Under the Road Traffic legislation, a quad bike operator in a public place must have insurance, road tax, a driving licence and wear a motorcycle helmet. They should also have a reliable form of two way communication, ideally as part of the helmet.



Figure 0.2.2.4.1: Typical 3.5 tonne TTM Vehicle



Figure 0.2.2.4.2: Typical 7.5 tonne TTM Vehicle



Figure 0.2.2.4.3: Typical Impact Protection Vehicle (IPV)

0.2.3 Pre-Commencement

0.2.3.1 PPE

General

Employers must ensure that PPE complies with the relevant European standards. PPE should be appropriate to the task to be undertaken and the level of risk. PPE must be kept clean and in good condition and should be replaced when required.

High Visibility Clothing

High visibility clothing must be worn and should comply with EN ISO 20471. They should be fluorescent yellow or orange with retro-reflective stripes. Yellow or orange clothing may be selected for different site activities. Clothing should be fastened so that reflective bands can be seen and to maximise visibility to road users.

High visibility clothing tops (jackets, vests etc) must be worn on Level 1 and 2 roads and shall be Class 2 as a minimum. Class 3 high visibility clothing tops (or combination of top and trouser) shall be used on Level 3 roads and may also be used on Level 1 and 2 roads. Tabards, retro-reflective bands, or harnesses are not permitted in lieu of Class 2 or 3 requirements, as they do not encircle the torso.



Class 2 - Waistcoat



Class 3 – Jacket / Trousers

Safety Boots

Safety boots must be worn when on roadworks sites. They should have a steel toe cap and mid sole protection.



Hard Hat

A hard hat must be worn whenever employees are exposed to hazards that may result in damage or injury to the head or skull. Hard hat requirements should be based on a risk assessment.

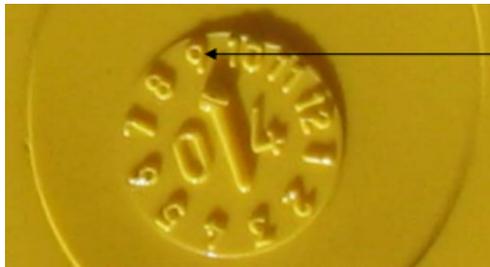
Specific areas where hard hats should be used include, but are not limited to:

- Construction, building or other areas designated as “Hard Hat Areas”;
- Areas where any crane, hoist, mobile elevated work platform, loader crane or other overhead lifting device is in operation;
- Areas where there is a possibility of falling objects/debris; for example, in excavations, beside excavators, whilst loading vehicles etc.;
- Machinery yards, storage areas, depots etc.; and
- Areas where there is a risk of falling from a height; for example, beside excavations and on rear of trucks.

Hard hats should fit correctly and be worn properly. A chin strap should be used when working near fast moving traffic, working in high winds or beside excavations. Hard hats should be changed when damaged and should be inspected regularly.



Hard hats typically last for between three and five years depending on how much weather exposure they have had, how they have been stored and how many knocks they have had. Out of date hard hats must not be worn and must be replaced. The image below shows a manufacturer's stamp which is located on the inside of the hat near the peak.



Note the year is 04 and the arrow points to 9, meaning the hat was manufactured in September 2004

Gloves

Gloves should be worn on sites to protect operatives' hands when handling signs and other equipment. The type of gloves used should be suitable for the type of work being undertaken and should be a good fit for the user.



0.2.3.2 Effective Planning Checks

The TTOS should confirm the Temporary Traffic Management Plan is acceptable for the task.

Key items for ensuring this include the following:

A Temporary Traffic Management Plan (TTMP) should:

- Take account of the site location and clearly highlight local constraints such as road widths, junctions, house entrances and services;
- Clearly show the proposed traffic control system;
- Clearly show how road users should get through/around the works;
- Take account of local events or other activities in the vicinity of the site; and
- If a standard TTM layout is being applied, identify the appropriate layout to be used.



Standard Operating Procedure (SOP) and Method Statements

A Standard Operating Procedure details how a particular task or activity should be carried out safely. It should be completed as part of an Organisation's overall safety management system. A method statement is generally prepared for a particular site or task. They may include, but are not limited to the following:

- Work start and finish times;
- How and where vehicles are to be parked;
- How and where equipment and materials are to be delivered and stored;
- A Standard Operating Procedure sets out a step by step instructions for completion of standard tasks;
- Method statement to include methodologies, procedures and sequencing for setting-out, placement, modification and removal of TTM equipment. This is generally provided by the TTM Designer;
- Checks and maintenance procedures including arrangements for replacing damaged equipment;
- Procedures for working at night; and
- Contingency plans for possible problems such as adverse weather.

Safe System of Work Plan (SSWP)

A SSWP may include a risk assessment and should:

- Be done at the start of each activity;
- Provide information on the work activity to be undertaken and the required resources;
- Identify the hazards present on site;
- Identify the specific controls to be put in place;
- Act as a check that appropriate controls are in place before work begins;
- Be communicated to and be signed by all persons attending site; and
- Be reviewed at any time during the work if conditions change.

**SAFE SYSTEM OF WORK
PLAN (SSWP)**

Organisations may develop their own standard SSWP forms for routine work tasks.

Site Induction

- A Site Induction is a short safety talk usually given by a TTOS;
- It may be necessary to carry out further site inductions where a risk assessment deems it necessary;
- The first is given at the start of the works and additional while on site. Additional site inductions usually involve instructions given to operatives;
- The aim of a site induction is to:
 - Communicate the SSWP or Site Specific Risk Assessment (SSRA) and TTMP to attendees;
 - Highlight specific hazards;
 - Discuss emergency procedures;
 - Raise the awareness of attendees; and
 - Inform them of the control measures put in place to prevent accidents.
- It should be easily understood by those with either reading or language difficulties;
- TTOS should keep it simple and encourage interaction with the attendees; and
- TTOS should check the level of understanding by having a quick questions and answers session at the end.

There should be a sign off procedure with a record kept of the relevant paperwork. It may be included in the SSWP.

0.2.3.3 What Should Be In Place Before Starting Operations?

A number of items should be in place or carried out before TTM operations begin on site. A traffic management layout sheet should be used to determine the items required. These should include details on the following:

- Road type, width, speed limit;
- How will you use the road cross section?
- What type of traffic control will you implement?
- Signage, safety zones, tapers, visibilities, cone spacing; and
- Site inductions.

The TTOS may select templates to assist in determining that sufficient information is available before starting operations. If the TTOS identifies any significant issues, they should refer to the TTM Designer.

0.2.3.4 Job Information Pack

A Job Information Pack should be in place before the TTOS prepares to go to site. This pack contains the information and instructions required by the TTOS and operatives to plan for and execute the works safely.

Job Information Pack **must** include:

- TTM layouts;
- * SSWP;
- Risk Assessments;
- Times of operation; and
- Contact numbers.

Job Information Pack **may** also include:

- Site location;
- SOPs;
- Method Statements; and
- Other job specific information.

*The SSWP must be prepared in accordance with an Organisation’s Safety Management System and Standard Operation Procedures.

The TTMP should be implemented in accordance with the Job Information Pack. Documentation should be retained on site for the duration of the works.

0.3 General Principles

0.3.1 Introduction

The general principles of TTM operations are covered in this section.

What should be in place before starting operations? So, what if there are problems with the TTMP? Do I need to carry out a Risk Assessment?

This section reviews these items.

This section also sets out TTM operations methods for installing, maintaining, modification / phase changes and removing TTM.

0.3.2 Principles of TTM Operations

0.3.2.1 Personal Safety

TTM operations should be designed, planned and implemented in a safe manner. General principles include the following:

- Avoid working alone, if possible;
- Do not become complacent; and
- Recognise your own limitations and the limitations of your crew / colleagues.

Working on Foot

The number of operatives on foot required for installing, modifying and / or dismantling TTM operations should be kept to the absolute minimum necessary to complete the work. Operatives should not run on site to reduce the risk of trips and falls and they should take care when climbing up and down side slopes to avoid slipping, falling or rolling onto the carriageway. A delineated safety zone should be provided whenever practicable. Unless necessary, workers on foot should not enter or undertake activities in a live lane during the installation, maintenance, modification or removal of TTM.

Safely Crossing the Road on Foot

The location chosen to cross the road should have adequate visibility, in both directions if appropriate, and a place of safety at both sides of the carriageway. Crossing the road should only be done when an adequate gap is available. A traffic count should be carried out as part of a risk assessment for crossing the carriageway on foot. Allow greater distances when judging safe gaps at night and where traffic speeds are high.

Indicative guidance on crossing the carriageway on foot is shown in the table below.

Speed (km/h)	Distance to Oncoming Traffic - per Lane (m)
30	35
50	60
60	70
80	95
100	115
120	150

Table 0.3.2.1.1: Guidance on Crossing the Carriageway on Foot

When crossing the road on foot:

- See and be seen by traffic;
- Wait back from the edge of the carriageway or protected by safety barriers or cones;
- Estimate safe gaps in the traffic;
- Only cross when a safe gap is present;
- Avoid road studs and trip hazards;
- Briskly walk straight across the road;
- Do not carry excessively heavy loads when crossing the carriageway;
- Do not run or zig-zag across lanes; and
- Do not feel pressurised into crossing when your co-workers do so. You are responsible for your own safety.

Carrying TTM Equipment

TTM equipment may be difficult to handle. Operatives should take care when carrying TTM equipment so as not to endanger themselves, other workers or road users. Operatives should be aware of manual handling training and techniques.

Carrying TTM equipment may restrict an operative’s vision, increasing the risk of slipping, tripping, falling or colliding with obstructions. If an operative’s vision is affected by the load it may be useful for another operative to support the other end and therefore have a clear view. Carrying of TTM equipment on foot across the carriageway shall be done only when there is a suitable gap in traffic.

When carrying TTM equipment:

- Grip equipment securely;
- Ensure the load does not obscure high-visibility clothing;
- Ensure the load does not obstruct your view;
- Carry signs so as to reduce wind resistance;
- Ensure it is safe to cross the road;
- Do not show the front of signs to oncoming traffic.

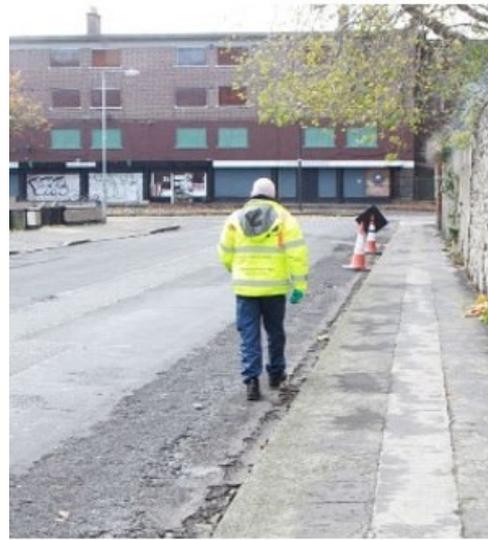


Figure 0.3.2.1.1: TTM operatives must use footways where they are provided

Communicating with Road Users

Delays are often unavoidable and although they are within standard parameters, road users may get frustrated and TTM operatives may be subject to abuse. TTM operatives should receive a site induction on how to deal with confrontational situations. TTM operatives should advise road users of the expected delay as this should alleviate any potential frustration and aggression towards the TTM crew.

0.3.2.2 Using TTM Equipment

Storage, Deliveries, Loading and Unloading of TTM Equipment

Equipment should be stored so that it does not get damaged easily. For example, damaged sign legs may interlock with one another, making it difficult to load or unload signs. Sand bags, batteries and other equipment should be stored in a dry location. Also, temporary traffic signals and radios should be charged.

The order of loading TTM equipment should be planned to avoid unnecessary unloading delay. TTM equipment is typically loaded in the reverse order of how it will be unloaded, and operatives should select which side of the vehicle will be away from live traffic on site.

Transport to Site

The condition of TTM equipment should be inspected before being loaded on to the vehicle in the yard. Only equipment that is in an acceptable condition should be used. The TTM equipment should be loaded onto the TTM vehicle so that it can be unloaded in an order that matches the setting up sequence. TTM Equipment should be secured so that it does not become dislodged during transport to site. Do not stack cones more than 25 cones high on the back of the TTM vehicle. Delivery vehicles should be parked safely without restricting the visibility of road users.

Where TTM equipment is being delivered to multiple locations, do not travel on the rear of the vehicle between stopping points and ensure the load is secured between stopping points.

Loading and Unloading of TTM Equipment

TTM operatives should park safely and use designated zones for unloading and loading where provided. Unacceptable TTM equipment must not be used.

When loading or unloading equipment:

- Order of loading equipment required;
- Get out of non-live side of vehicle;
- Do not load / unload equipment from the live traffic side of the vehicle;
- Load / unload TTM equipment without delay;
- Point sign legs away from traffic if laid down for re-use;
- Beware of risk of finger entrapment in A frame signs; and
- Check and record condition of equipment.



Figure 0.3.2.2.1: Examples of TTM operatives exiting the vehicle on the safe side of the vehicle and a TTM operative working on the wrong side of the vehicle next to live traffic.

Securing Equipment

TTM operatives should secure signs so that they do not pose a hazard to road users or road workers. The sign frame should be placed on a firm level footing. For larger A frames, four sand bags should be placed on the lower two sandbars and not on upper frames. For frames where sandbars cannot be used, place a sandbag at the base of each frame leg. Sand bags must not be used to secure cones.



Figure 0.3.2.2.2: Examples of A frames secured with sand bags

0.3.2.3 Vulnerable Road Users

Pedestrians

Pedestrians must be protected from the works and vehicular traffic by providing a footway.

Temporary footways should:

- Be delineated with pedestrian barriers;
- Be delineated from vehicular traffic with a pedestrian barrier and traffic cones;
- Be clearly signed;
- Have a good quality, even surface; and
- Include ramps where a kerb or other obstruction is crossed.



During roadworks operations:

- Footways must be kept clear of mud and debris;
- TTM operatives must not create obstructions on a footway;
- Open chambers, excavations etc. must be guarded; and
- Unattended hazards must be covered, plated over or protected by barriers.

Cyclists

Advance warning signage should not be placed on a cycle track. Surface height differences greater than 30mm should be marked for cyclists. The maximum ramp gradient should be 1 in 3 with a recommended ramp gradient of 1 in 10. When using a barrier to block a cycle track, it should be visible for 35m.

If practicable, the temporary cyclist route provided at roadworks should mirror the permanent arrangements. Changes to cycle tracks should be clearly signed well in advance of the roadworks.

Temporary cycle facilities should:

- Be defined from the works area with barriers;
- Be clearly signed;
- Have a suitable even surface – plywood should not be used; and
- Be kept free of hazards such as potholes, gullies and cable protectors etc.



During roadwork operations:

- Operatives should not place equipment, vehicles or materials in the temporary cycle facility;
- The facility should be kept clear of debris e.g. loose gravel, broken glass, wet leaves; and
- Operatives should ensure equipment does not encroach on the facility.

Where it is not possible to provide a temporary cycle track, they need to be accommodated within a shared running lane with traffic.

People with Impairments

A pedestrian barrier that can be detected by a visually impaired person using a stick must be provided. A pedestrian barrier should be installed around obstructions that restrict pedestrian flows or are accessible to pedestrians, whether or not pedestrians with impairments are expected at the location. Where required, provision should be made for people crossing the road.

0.3.2.4 Inspection Stops

An inspection stop involves activities such as visual inspections and surveys. During an inspection stop, park the vehicle off the roadway and carry out the inspection from this position. If the vehicle has to be parked on the roadway then this should be positioned as close to the edge as possible. Where appropriate the vehicle should be parked using the fender position. During inspection stops, the following hazards should be considered:

- Traffic - speed, volume and type;
- Vulnerable road users;
- Environmental conditions;
- Vehicle manoeuvres; and
- Being struck by an object (road chippings, dust, etc.).

Control measures that should be considered to help reduce risks associated with these hazards are:

- Where possible, works vehicle should not cause an obstruction;
- Have a minimum of two persons in inspection team. Lone working is not encouraged;
- Designate a spotter to watch passing traffic;
- Avoid times when there are high traffic flows on road where works are planned; and
- Inspections to be carried out only when there is sufficient visibility.

Fend Off – this is preferred where a full hard shoulder is present.

- Advantages
 - Fills the lane;
 - It is clear that the vehicle is stationary;
 - Vehicle gets larger on approach;
 - Impression vehicle emerging; and
 - Occupants get view of approaching traffic.
- Disadvantages
 - If struck, vehicle could end up in live lane.

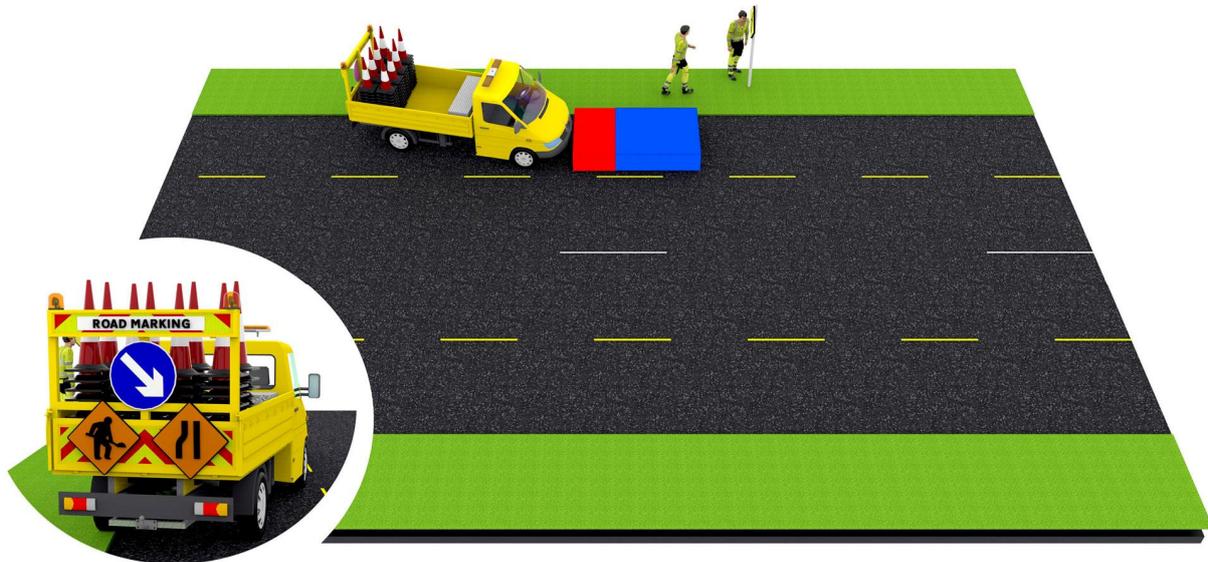


Figure 0.3.2.4.1: Single vehicle works with vehicle in Fend Off position

Fend In – this is preferred where a full hard shoulder is present and road curves significantly to the left.

- Advantages
 - Fills the lane;
 - It is clear that the vehicle is stationary; and
 - Driver not exposed to impact on exiting vehicle.
- Disadvantages
 - If struck, vehicle could travel along a crash barrier; and
 - Vehicle gets smaller on approach.

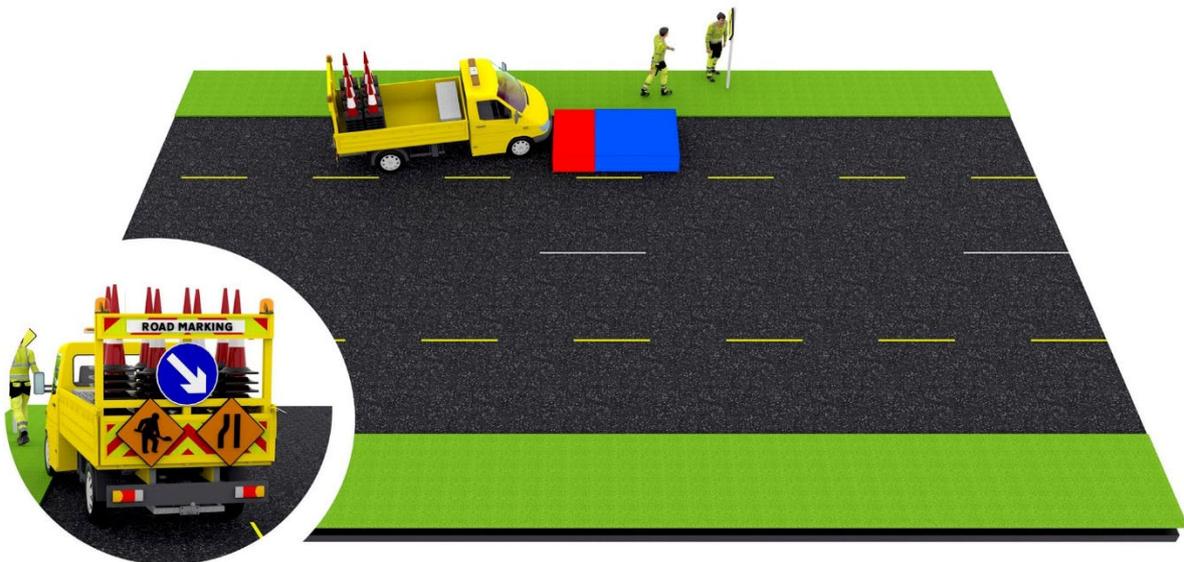


Figure 0.3.2.4.2: Single vehicle works with vehicle in Fend In position

In Line – this is preferred where narrow or no hard shoulders are present.

- Advantages
 - Rear lights aimed at approaching traffic;
 - Rear vehicle markings most visible
- Disadvantages
 - May appear to approaching traffic that vehicle is moving;
 - Does not fill the lane; and
 - If struck, vehicle could travel into workforce.

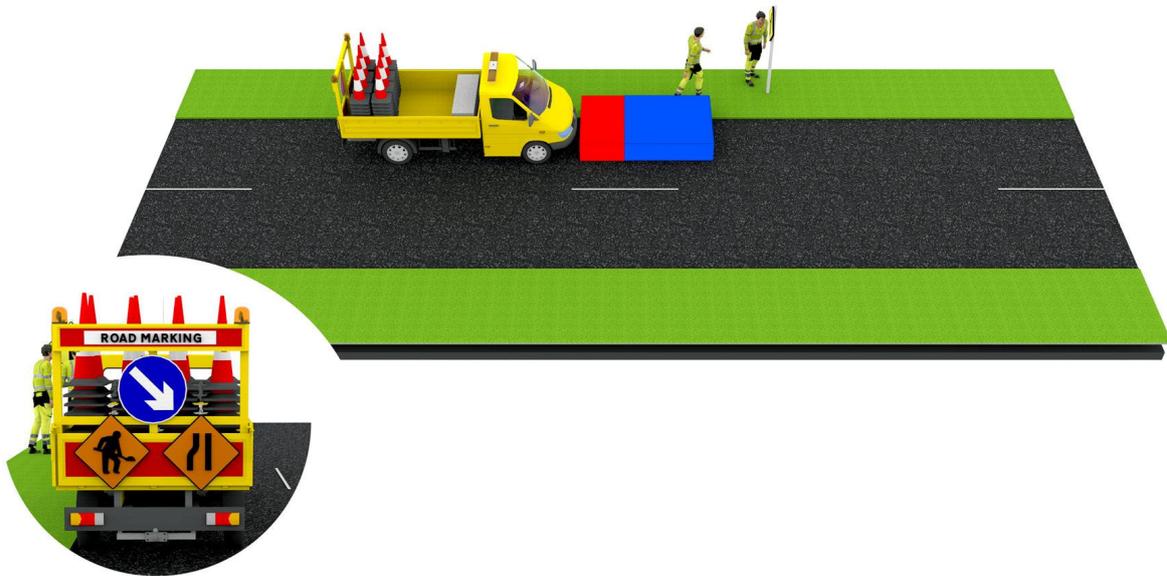


Figure 0.3.2.4.3: Single vehicle works with vehicle In Line position

0.3.2.5 Night-time Work

Traffic flows and other factors dictate that some TTM is conducted during the hours of darkness. Traffic flows are generally reduced while working during the night. However other factors, such as poor driver behaviour, higher speeds, fatigue, difficulty in judging distances and limited visibility, increase the risks of working during the night for road workers and road users.

Daylight checks before night-time work:

- Identify vehicle stopping points;
- Propose locations for signs, tapers and coning;
- Check verges for hazards;
- If possible, pre-place signs during daylight;
- Check crossing point visibilities;
- Identify any overhead lines.

TTM operatives should ensure that road users are sufficiently warned of TTM and are clearly guided past or through the works throughout the hours of darkness. Lamps, rotating reflectors or reflective strips should be installed on barriers to highlight their presence.

0.3.2.6 Unattended Works

TTM operatives should remove as many hazards as possible from the site before it is left unattended with all plant and machinery removed or secured. Materials and equipment left on site should be secured or stored so that it cannot fall or be tampered with by the general public. Continuous barriers should be erected around the site to ensure that pedestrians do not enter. The size of the works area should be reduced when unattended and made safe, secure and stable. Sites that are unattended still require the TTM to be routinely checked and maintained. Where TTM is required at unattended works, signage that was used during the works stage and is no longer relevant should be removed (or turned in). This will ensure that signage retains credibility with road users and additional hazards are not presented. The TTM should be recorded / photographed before leaving the site.

0.3.3 Principles of Setting-Out and Placing TTM Equipment

0.3.2.7 Other Factors / Restrictions

Weather Conditions

Weather conditions need to be considered including wind, rain, snow, ice, fog, and low sun. Weather forecasts should be consulted to confirm the likelihood of satisfactory visibility throughout the operation. Operatives should be aware of the effects of adverse weather, such as reduced visibility in fog or heavy rain, increased stopping distances, the reflective glare of sunlight on a wet road surface and dazzle from a low sun. TTM signs and frames should be stabilised with ballast in the form of sand bags or secured to permanent fixtures.



During the works consideration should be given to the possibility of removing the TTM to deal with adverse weather conditions. If poor weather conditions persist, it may be necessary to stop work and to clear the site of all personnel in the interests of their own safety and that of the road users.

Traffic Speed and Queue Management

Traffic speeds should be monitored, particularly where relying on lower speeds to use reduced lateral safety zones. Works that reduce the number of traffic lanes on busy commuter routes should be avoided at anticipated peak times.

Advance warning signage should be checked and, if necessary, adjusted to ensure that road users are warned of queues.

If significant queues are present due to the TTM in place, then a review of the type of TTM system or operation should be carried out and a decision made whether to change to a different system.



0.3.3 Principles of Setting-Out and Placing TTM Equipment

0.3.3.1 General Steps

1. Look at the TTMP (site specific plan / standard TTM layout). Look at the cross section. How are you going to apply the TTMP? Items covered in this part of the guidance documents such as the Job Information Pack, effective planning checks and items that should be in place before starting operations should be reviewed at this point.
2. Decide where to start and end safety zones, tapers.
3. Decide where the advanced signage is going to be placed.

0.3.3.2 Lane Widths

Where adequate lateral clearance cannot be provided due to restricted road width, the following options may be considered:

- If appropriate, the road may be closed and traffic diverted along a suitable diversion route;
- A Convoy operation may be put in place - a lateral safety zone is not required when a Convoy operation is in place; or
- Traffic speed to be reduced to 20km/h, using physical safety measures in association with enforcement of the speed limit where appropriate.

The TTOS should ensure that lane widths are maintained as per the tables below without compromising safety.

Max Lane Width (All Classes) (m)	Optimum Lane Width (All Classes) (m)	Minimum Lane Width (All Classes) (m)	Absolute Minimum (Cars & Light Vehs only) (m)
4.3	3.3	3	2.5

Table 0.3.3.2.1: Lane Widths

Road Width	Normal Traffic incl. buses & HGVs (m)	Cars & Light Vehs only (m)
Desirable Minimum	6.75	5.5
Absolute Minimum	6	5

Table 0.3.3.2.2: Road Widths

Lane Widths where Cyclists are to be accommodated

In urban areas for sites greater than 50m in length, see Section 1.6.3.1 of Part 1 for advice on lane widths. Refer to Section 2.3.3 of Part 2 for advice on accommodating cyclists in rural areas.

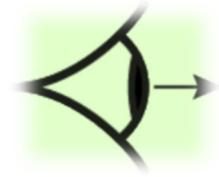
Cyclist Interaction with Railways

Cyclists should be instructed to cross at right angles to rail tracks. This interface should be considered in the risk assessment.

0.3.3.3 Visibility

Operatives should ensure they are clearly visible to road users and other operatives. If you cannot see traffic, then traffic cannot see you.

Drivers approaching the site should have good visibility of the temporary route through the site. The road user should have visibility to the sign and of the sign face. Minimum visibility requirements are as follows:



Level		Carriageway Type	Speed / Speed Limit (km/h)	Sign Visibility (m)	Visibility to Stop and Go & Traffic Signals (m)
Main	Sub				
Level 1	i	Single	≤ 30	25	25
	ii	Single	40	35	35
	iii	Single	50	50	50
	iv	Single	60	60	60
		Multi-lane / Dual	≤ 60	60	60
Level 2	i	Single	80	90	90
	ii	Single	100	120	120
Level 3	i	Dual and Motorway	80	90	120 ¹
	ii	Dual and Motorway	≥ 100	160	N/A ²

Table 0.3.3.3.1: Visibility Requirements

Notes:

1. Use of Stop and Go or Traffic Signals on Level 3(i) require a site specific TTMP by a TTM Designer.
2. Stop and Go and Traffic Signals are not applicable on Level 3(ii).

Additional advance warning signage should be provided if there is reduced visibility on the approach to the works. Examples include works on a bend, on a dip in the road, on the brow of a hill or at times of adverse weather. This additional signage will need to be placed first. TTM operatives should not start work if visibility is poor or during adverse weather conditions, except in an emergency.

0.3.3.4 Location for Traffic Control Operatives

The traffic control operative should stand at the head of the advance central coning approximately 20m away from the start of the lead-in taper. A safe area should be made available in which to locate the Flagman at this point. A safe area should have the following:



- Visibility;
- Safe refuge: and
- Escape route.

Pick a location that is safe, for example a gateway. If a gateway is not present and works are adjacent to a wall, then a build out should be constructed using cones.

It is essential that the minimum visibility distance to the flagman is maintained and the flagman is not positioned around blind bends, parked vehicles, in dips or hidden by hedgerows or street furniture.

A traffic control operative has a responsibility to be positioned in advance of these hazards rather than follow the operation at a fixed distance behind. This distance may range from 50 to 215m depending on the stopping sight distance required.

0.3.3.5 Dealing with Conflicting Permanent Signage

Where TTM signs conflict with permanent signs, the following procedure applies:

- The Local Authority's permission must be obtained to cover, alter, or remove an existing sign;
- There are three ways to deal with a conflicting sign;
 - Remove it;
 - Cover it - ensuring not to damage the sign face. The cover should be fit for purpose, durable, and suitable for the weather conditions; and
 - Mask it (using masking spray).
- Upon removing the TTM, signs that have been covered or removed should be reinstated immediately ensuring that they are not damaged in the process.

0.3.4 Post Installation Review

0.3.4.1 Design Objectives

The two primary objectives of the TTMP are to:

- Keep uncontrolled traffic separate from the workforce; and
- Let the road user know what is happening and what is expected of them.

When the TTMP is installed, these two items must be achieved.

0.3.4.2 Dynamic Risk Assessment

Dynamic risk assessment (DRA) is the continuous process of on-site assessment and identification of hazards, assessing risks and taking actions to remove or reduce these risks. This is particularly relevant where site circumstances change.

It can be reviewed or updated at any time during the works and can form part of the SSWP and it equates to the ongoing reviewing of the SSWP. It also ensures that the TTMP continues to be fit for purpose. Items that should be considered during monitoring and control include the following:

- Fading light;
- Low sun;
- Vehicle breakdowns or faulty TTM equipment;
- Changing traffic conditions; and
- Changing weather conditions.

Then carry out the following:

- Evaluate the situation and identify the hazards;
- Ensure the benefit justifies the risk taken to execute the action; and
- Make amendments if required and continue if it is still safe to do so.

0.3.5 What if there are problems with the TTMP?

If the TTOS has significant safety concerns for either road users or road workers regarding the information provided in the Job Information Pack, they should not implement the TTMP on site.

Site Specific TTMP

The TTOS should revert to the TTM Designer and inform them of their concerns. Only when the issues have been resolved, should the TTOS implement the TTMP on site.



Standard TTM Layout

The TTOS should be satisfied that the appropriate standard TTM layout has been chosen and that it is suitable for the work to be carried out and the site conditions. If the TTOS is not satisfied that this is the case, they should refer any issues to their supervisor. Only when the issues have been resolved should the TTOS implement the TTM layout on site.

0.3.6 TTM Operation Methods

0.3.6.1 TTM Installation

The signage installation sequence may vary depending on the road type and TTM required. The installation sequence is described in detail in Parts 1 to 3 of these guidance documents for Level 1, Level 2 and Level 3 roads.

The following methods should be complied with during the TTM installation.

- Work within the coned off area and work facing oncoming traffic.
- Use work vehicle(s) to protect yourself from errant vehicles, work on non-live traffic side of the vehicle and allow for potential shunting.
- When installing use footway, verge or hard shoulder when travelling on foot.
- Where it is necessary to put signs on a footway, sufficient space should be left for pedestrians to pass.
- Signs and equipment should be positioned where they are not hidden by other signs, vegetation, etc. and do not pose an undue risk to pedestrians or other road users.
- Secure signs and equipment with sand bags unless works are Type C.
- Temporary signs should not interfere with permanent signs.
- Remove or cover existing permanent signs that contradict temporary signage.

0.3.6.2 TTM Maintenance and Inspections

Regular maintenance and inspections should be carried out to ensure that the TTM layout is fit for purpose, is correctly installed and is in a satisfactory condition. This section outlines the requirements for TTM maintenance and inspections. The use of photographs and / or video is an effective and useful tool when carrying out TTM maintenance and inspections.

TTM Maintenance

- Signs, cones and any other equipment or road markings should be maintained and checked regularly.
- As part of planning, sufficient resources should be made available to carry out checks and maintain the TTM in a safe condition.
- Damaged equipment should be replaced as soon as possible.
- Operatives should work within the coned off area and work facing oncoming traffic.

Inspections

- Inspections should be carried out by the TTOS or a competent person designated by the TTOS.
- Inspections may be carried out during the installation, modification and removal stages of TTM. Such inspections should be recorded in accordance with the Organisation's safety management system.
- The frequency of inspections may vary from site to site. Sites with high traffic volumes should be inspected at more frequent intervals. This is also the case during bad weather.
- Inspections are critical where works are ongoing overnight and / or over weekends.
- Inspections should note whether the site is operating as per the TTMP and should set out actions to rectify any issues identified.
- Inspections should include the following items:
 - Review of site details;
 - On-site hazards and specific risks such as power lines;
 - Review of specific control measures; and
 - Ensure that appropriate controls are in place.

0.3.6.3 TTM Modification and Phase Changes

TTM modifications typically refer to unplanned changes that may be required to fix issues identified during inspections on the TTM layout. Phase changes are planned changes to the TTM layout where a phase of works is complete and the TTM is then switched from one lane / location to another. The following principles should be followed where modification or phase changes are required.

- A three day SLG CSCS cardholder must be on site when modifications are made to the TTM layout.
- Operatives should work within the coned off area and work facing oncoming traffic.
- Remove signs and equipment that are no longer required and store safely, ensuring they do not obstruct pedestrians.
- Do not lay redundant signs flat on the ground as they may become a trip hazard. The general public could pick them up, thinking they have been knocked over.
- TTOS should carry out a check or drive-through when changes are made.
- TTM modifications and phase changes should be documented.

0.3.6.4 TTM Audits

Audits are carried out to ensure that requirements relating to TTM are properly applied. The following items provide further information on audits of TTM layouts.

- Employers / Organisations should have an audit regime in place.
- Audits should be carried out by a suitably qualified person that is not directly involved in the roadworks or the TTM design, such as a Line Manager or Health and Safety Officer.
- The frequency of audits is dependent on the duration of the roadworks, see Table 0.3.6.4.1 for details.

Roadworks Duration	% of Sites to be Audited per Annum	Audit Frequency
< 12 hours	Random	Single
> 12 hours, < 1 month	10%	Single
1 month to 6 months	50%	Single
6 months to 1 year	100%	Two
> 1 year	100%	Quarterly

Table 0.3.6.4.1: TTM Audit Frequency

0.3.6.5 TTM Removal

The following principles should be followed when removing TTM.

- Construction work should be complete and road surface suitable for class of traffic using the road, before removal of TTM equipment begins.
- Removal of TTM equipment should be coordinated with other activities on site.
- TTM equipment should be removed in a linear operation working from the end of the roadworks signage.
- The Roadworks Ahead sign should be the last sign to be removed.
- Operatives should work within the coned off area and work facing oncoming traffic.
- Removal of TTM equipment should be done promptly so that road users are not confused.
- TTM equipment should be carefully loaded on to the non-live side of the vehicle.
- TTOS should carry out a check or drive-through when removal of equipment is done.

0.4 Emergencies and Incident Traffic Management

0.4.1 Introduction and Context

The advice within this section should be considered when roadworks come under the definition of ‘emergency roadworks’, which means the works are immediately required to prevent, or reduce the risk of, loss, injury or damage to persons or property. This may be in the form of:

- Incident response, typically undertaken by the Road Authority, statutory undertakers or agents of either; or
- Emergency response, typically undertaken by one of the emergency services.

Incidents, e.g. fallen trees, flooded roads etc., are typically dealt with by the Road Authority or their agents. In some cases, statutory undertakers must also undertake incident response when the condition of their property, situated on a public road, will present a hazard to persons or property.

Emergencies on the road network are typically dealt with by the emergency services; Gardaí, Fire Service and Ambulance Service. Emergency Traffic Management is typically undertaken by the Gardaí or Fire Service, if it does not last more than two hours. If such emergencies extend beyond a couple of hours, the Gardaí or Fire Service typically request that the Road Authority take over and erect signs in accordance with Chapter 8 of the Traffic Signs Manual.

0.4.2 Signage Requirements

0.4.2.1 Incident Response

Where an incident occurs, one of the following signs should be deployed to give advance notice to road users:



W 170:
Other Hazard
P 069: Incident
Ahead



W 170:
Other Hazard
P 069: Collision



W 170:
Other Hazard
P 069: Road
Closed



W 170:
Other Hazard
P 069: Flood



W 170:
Other Hazard
P 069: Fallen
Tree

W 170 + P 069: Incident Ahead has the broadest application. These signs can be used as a temporary sign to warn of a temporary hazard in accordance with the Traffic Signs Manual.

The sizes required and siting distance are given in Table 0.4.10.1.

Siting distance and visibility is required to allow sufficient time for the warning message to be absorbed and any necessary action taken before the hazard is met.

The signs should be positioned in the left-hand verge. However, on roads with restricted visibility, it may be necessary to position a second sign in the right-hand verge. On one-way roads, slip roads, dual carriageways and motorways, signs may be positioned on both verges for approaching traffic following a risk assessment.

0.4.2.2 Emergency Response

Emergency response will follow the protocols of the attending emergency service. Please refer to the National Directorate for Fire and Emergency Management '*Guidance on Emergency Traffic Management (ETM)*' by the Fire Service at Road based Incidents and the Chief Fire Officers' Association document '*Recommendations on Scene Safety Arrangements at Road based Incidents for Fire Service Personnel*'.

0.4.3 Emergency Traffic Management

The primary aim of Emergency Traffic Management (ETM) used at incidents and emergencies is to provide immediate basic guidance to road users and to create a sterile area for the protection of those involved with an incident / emergency.

ETM will typically be provided by the first to arrive at the incident, such as Gardaí or Fire Service.

ETM should only be deployed to:

- Provide short-term protection to those dealing with or involved in the incident / emergency;
- Prevent escalation of the incident / emergency;
- Protect and give direction to other traffic approaching the scene;
- Protect the scene of a crime until the Gardaí take over; or
- Help manage incident-related congestion.

Examples of where ETM may need to be deployed include:

- Road Traffic Accidents;
- Road Flooding;
- Fallen Trees;
- Broken down or abandoned vehicles, where these present a hazard;
- Debris on the road.

0.4.4 Training

Personnel involved in the deployment of ETM should be trained appropriately.

0.4.5 Dynamic Risk Assessment

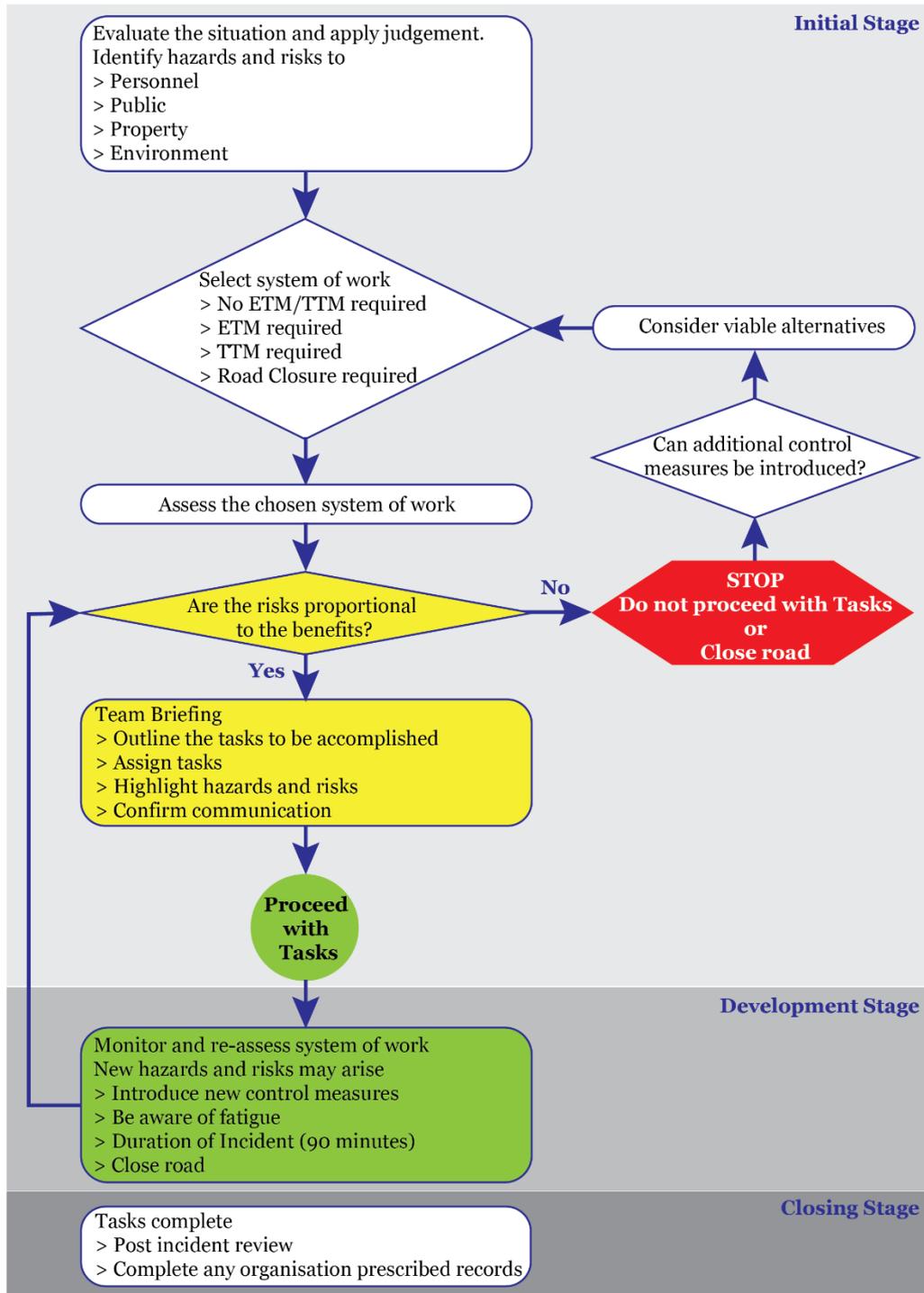


Figure 0.4.5.1: ETM Dynamic Risk Assessment Stages

Dynamic Risk Assessment used during an incident / emergency should allow responding personnel to undertake the required duties in order to protect persons and property, while allowing risks to be evaluated on scene. This can be achieved by viewing the emergency / incident through a number of stages.

In the flowchart, ETM represents Emergency Traffic Management in accordance with emergency services protocols or the requirements of this section, TTM represents Temporary Traffic Management in accordance with Chapter 8 of the Traffic Signs Manual.

It may be helpful to responding crews, for Organisations to categorise ETM into different levels so that there is a clear understanding among the crew of ETM requirements. An outline example of this level classification is as follows:

ETM Level	ETM Requirements
Level 1 No traffic control necessary	a. There may be no immediate requirement for ETM / TTM to protect those involved in the incident or the public
	b. The incident / emergency may be dealt with on foot, e.g. the incident/emergency only involves the removal of debris from a low risk situation to a safe place. The debris can be removed later
	c. It may be possible to move the incident / emergency to a safe place, e.g. the hard shoulder where it then may not require ETM.
Level 2 Use fend vehicles only	If the incident / emergency can be cleared quickly, the use of a stationary vehicle with high-visibility markings and warning beacons may be appropriate
Level 3 Protect scene, including lane closure	a. Deployment of ETM
	b. Deployment of TTM
Level 4 Road Closure	Close the road to traffic, including the use of additional resources such as the Roads Authority or implement approved detour plans.
Level 5 Rolling Road Block	The use of a Rolling Road Block using Gardaí vehicles or vehicles with high visibility markings and warning beacons

Table 0.4.5.1: ETM Level Requirements

During the Dynamic Risk Assessment process, the level of TTM may be increased or decreased according to conditions or equipment available.

0.4.6 Duration of Incidents / Emergencies involving ETM

Where an incident is likely to last longer than 90 minutes, the ETM may be replaced by TTM as soon as practicable following a Dynamic Risk Assessment. This time can be increased or decreased depending on the nature of the incident and the availability of suitable traffic management resources. The likely length of time to deal with the incident should be continually monitored so that additional support is not requested only after this time has elapsed.

0.4.7 ETM Layouts

An ETM layout should take account of the road users likely to be affected. An ETM layout should be appropriate to the nature of the incident and the resources that are available during the incident. Consideration should be given to the following under which the ETM will be deployed:

- Incident Type;
- Location;
- Road Geometry;
- Visibility;
- Traffic; and
- Available equipment.

ETM should be continually assessed to ensure it remains appropriate to the circumstances and duration of the incident and to decide if it needs to be replaced by TTM.

Each site and situation is unique, and the attending crew should evaluate the scene and any action required taking their available equipment into account. A non-exhaustive list of such equipment and methods have been covered within this document, including:

- Vehicles used in ETM;
- Fend parking;
- Use of Impact Protection Vehicles; and
- Crossing the carriageway on foot.

0.4.8 ETM Installation

The following principles should be adhered to when installing ETM.

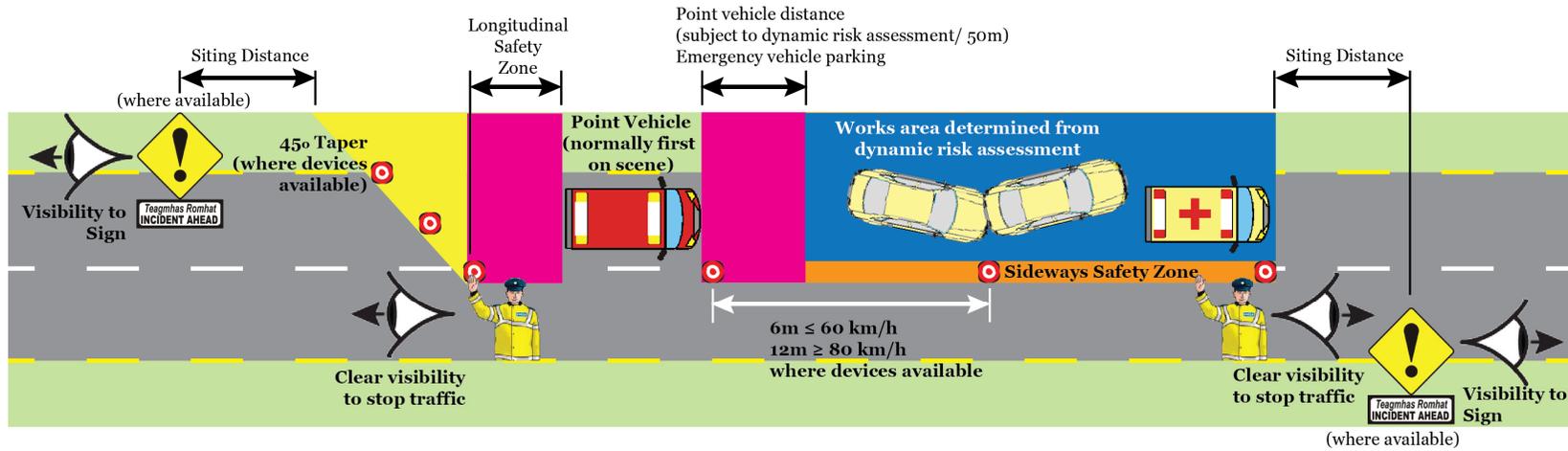
- A Dynamic Risk Assessment is carried out by the first to arrive at the incident. This is continually monitored and updated as the incident is dealt with.
- The first vehicle on the scene should stop approximately 50m in advance (upstream) of the incident. On single carriageway roads, this distance should be amended to a safe distance as assessed by the Dynamic Risk Assessment. In deciding this, take account of the requirements to provide a safe scene and visibility requirements for approaching motorists. The vehicle should have all warning beacons in operation.
- Where the visibility to the vehicle does not meet the requirements of Table 0.4.10.1, then the appropriate sign (where available) should be erected and appropriately sited. Note the “Siting Distance from the hazard” now becomes the distance from the vehicle.
- If ETM / TTM equipment is available, then consideration should be given to setting up an appropriate layout for the scene.
- Under no circumstances should a vehicle reverse in a carriageway, unless protected by Gardaí, banksman or TTM
- Cone spacing should not be greater than 12m in the final ETM layout. This should be continued longitudinally past the incident if resources allow
- ETM should be deployed across full lane widths only.
- On dual carriageways with ≥ 3 lanes, cone from verge / lane 1 or lane 2 to avoid forming an island.
- The working space required for the incident should be determined according to the nature of the incident / emergency. Emergency services should always work under the protection of the ‘Points Vehicle’ when provided.
- Where Fire Service attendance at the scene is required, access to both sides of the tender vehicle will be required. This may require an additional lane closure.
- Where an ambulance is required at the scene, the ambulance will usually park in front of the incident to permit quick removal of the injured.
- During conditions of reduced visibility, the layouts should be supplemented by warning lamps to delineate the incident. These should be set to steady state to avoid confusing the motorist. Flashing lamps can only be used to supplement this.

0.4.9 Rolling Road Blocks

During an incident / emergency, a rolling road block may be provided by a Garda vehicle, Fire Service vehicle or vehicles with high visibility markings and warning beacons (and crash cushion, if available). A rolling road block should be considered for the following tasks on Level 3 roads:

- Placing or removing ETM in the central median;
- Removing debris from the carriageway;
- Setting out or removing an ETM lane closure;
- Recovery of a broken-down vehicle to the hard shoulder; and
- Stray animals on the carriageway.

0.4.10 Incident / Accident Response Guidance



Carriageway Type	Speed (km/h)	Clear Visibility to Stop Traffic (m)	Visibility to Sign / Point Vehicle (m)	Minimum Sign Size (mm)	Siting Distance (m)	Lateral Safety Zone (m)	Longitudinal Safety Zone (m)
Single Carriageway	30	25	25	450	9 - 11	0.5	0.5
	40	35	35	450	25 - 35		5
	50	50	50	600	35 - 45		15
	60	60	60	600	35 - 45		
Multi-Lane / Dual	≤ 60	60	60	600	35 - 45		
Single Carriageway	80	90	90	600	220 - 260	1.2	45
	100	120	120	750	360 - 440		60
Dual / Motorway	80	90	90	750	220 - 260		45
	≥ 100	120	160	1200*	540 - 660		60

* A 600-750mm vehicle mounted VMS sign may be used

Figure & Table 0.4.10.1: Incident and Accident Response Guidance

0.5 Summary

The TTM general principles and operations methods described in this part of the guidance documents apply to the layouts contained in these guidance documents as a whole.