Worksite Safety Update

Promoting safety in road construction

No 113 November 2011

In this Edition:

Recent Road Construction Safety Innovation and Developments

TMAs and Traffic Management Vehicles

As our industry shares TMA and other Traffic Management Vehicle development and innovation the equipment options are increasing and moving toward industry best practice. Four point harnesses for better seat restraint of TMA operators, rear vision CCTV cameras, VMS (colour and monochrome) and better access into trucks for when they are being operated as traffic management vehicles and not primarily as TMAs, are just some of the equipment options sighted recently on new TMAs.

One work vehicle has been equipped so that it may be operated as a bollard deployment vehicle travelling at a walking speed within the worksite OR as a primary TMA without anyone riding in the rear of the vehicle. This TMA is equipped with a lowered step platform, harness connection to prevent personnel falling from the vehicle and guardrails to facilitate its use as a traffic management vehicle.

New TMA equipped with a lowered step platform with drop handrail, harness connection rail for inertia reel lanyard and guardrails to facilitate its use as a bollard deployment vehicle, crash attenuator for potential back-up crash protection with arrow board and VMS at low speed within the worksite. This is similar to the approach taken in the United Kingdom where the integral attenuator is sometimes used as back-up protection for the vehicle during placement and removal of bollards. A primary TMA is also recommended on high speed high traffic volume roads (see next page).

Movement of Plant and Vehicles on Site. Does your SWMS identify this risk and are effective controls documented?

Victoria The Place To Be

It is recommended that for high speed high traffic volume roads that a primary TMA should also be used to protect against high energy impacts, given that personnel deploying the bollards are not restrained against longitudinal impacts.

Four Point harness protection is now commonly fitted to newer model TMAs. This harness is intended to keep the operator securely restrained in the event of a heavy truck impact. A glancing impact by a heavy vehicle could roll the TMA onto its side as was demonstrated once in Queensland. These harnesses are used during primary TMA operating mode.

Four point harness to be worn in TMA operating mode.

The standard lap sash seat belts are also fitted and may be used during other truck applications.

Rear view CCTV cameras are now fitted to many TMAs. They enable the operator to monitor approaching vehicles and to warn the work crew they are protecting if any speeding vehicles are approaching or if a vehicle approach is likely to impact the TMA.

Air Horns are often used as a warning device and the UHF radios for communication.

Rear view CCTV camera monitor

Automatic Impact Brake system (AIB) are fitted to ensure that rear brakes are applied should the TMA be struck while moving or stationary without brakes applied. Such an impact could result in the TMA being shunted a greater distance and into the work crew being protected. The operator's leg is likely to release brake pressure if only the foot brake is applied and an impact occurs resulting in a far greater shunt forward distance.

AIB activation strip mounted on rear of crash attenuator.

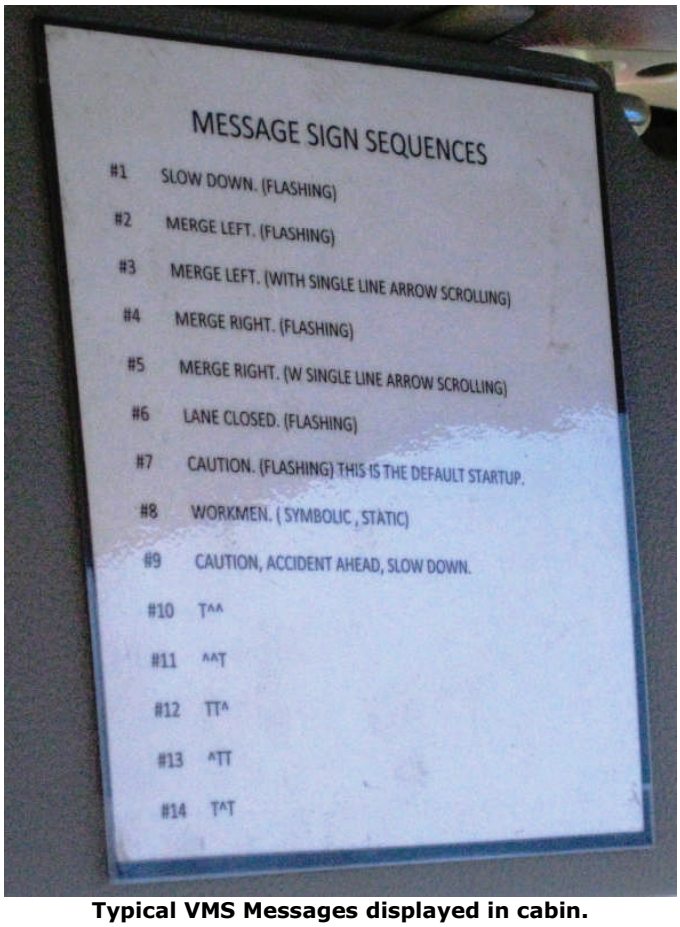
Electronic Variable Message Signs (VMS) are increasingly being fitted to TMAs. They are located so they appear below the illuminated arrow board. This enables the TMA operator to communicate to drivers approaching the worksite in advance of the worksite in a similar way to conventional lane closures, with the exception that TMAs are highly mobile. There are typically a finite number of standard displays available for selection by the TMA operator via the control console in the TMA cabin.

TMAs as protective vehicles are frequently operated at the traffic approach end of worksites so visibility and communication are important attributes.

Some are monocolour displays (yellow / orange frequently) and others are capable of full colour displays which enable them to display speed limit signs where permitted, such as mobile temporary speed zones.

Two TMAs are frequently deployed in Victoria in high traffic volume (160,000 VPD) areas where no verge or emergency lane exists - the first TMA is deployed on the shoulder as advance warning that a lane is closed ahead. Small narrow wheelbase TMA pre-warning vehicles are also used in other states where narrow width verges exist.

TMA showing typical arrangement of illuminated arrow board and VMS
The VMS was displaying MERGE LEFT.



Typical VMS Messages displayed in cabin.

Typical VMS Control Console.

Illuminated Arrow Boards are standard issue on TMAs. UHF Radio's are becoming standard because of the need to communicate with the works team on the worksite and to coordinate operations with other TMAs involved.

Illuminated Arrow Board console and UHF Radio in cabin.

Small Mobile Tracked Crane on M80 TSA Alliance

Excavators have been used for many years to lift objects on road construction sites. However, Changes to *AS1418.8 – Cranes, hoists and winches-Special purpose* and *AS4772 – Earth moving machinery – Quick hitches for excavators and backhoe loaders.*

WorkSafe Victoria issued a Guidance Note: *Earthmoving equipment used as a crane* in May 2010 to provide guidance in this area.

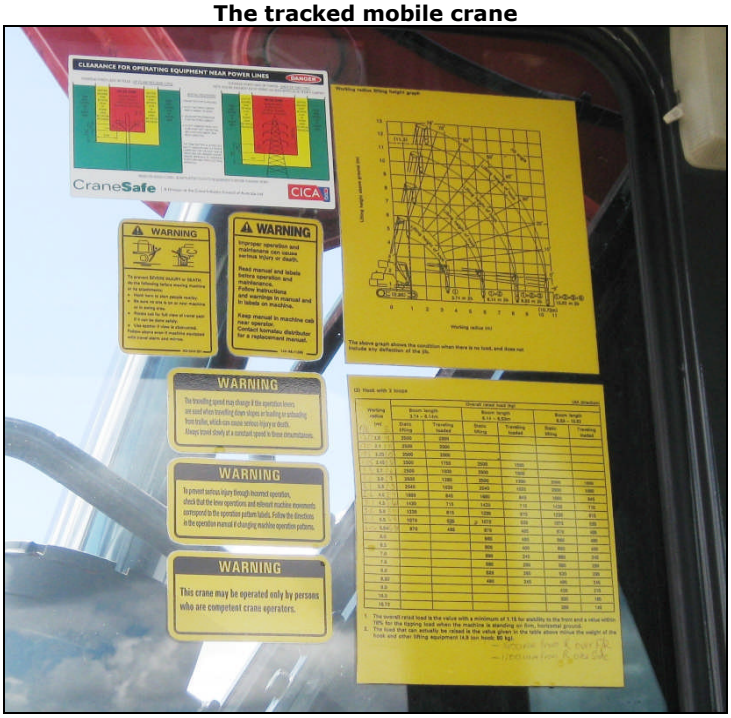
The use of earthmoving plant for precision lifting purposes is now restricted because of lack of 'inching' or creep speed control. Hydraulic hose burst protection is also mandatory for equipment with a rated capacity greater then one tonne.

One of the reasons that excavators were used is because of its suitability to access rough terrain areas, something that limits conventional cranes.

The M80 Tullamarine Sydney Alliance has introduced a small mobile crane which retains the rough terrain access capability and yet fully complies with the new standards and the requirements outlined in the WorkSafe Guidance Note.

The photographs on the following pages illustrate the features of this all terrain crane:

The tracked mobile crane



Load charts and operational warnings inside cabin

Stability warning lights visible to crane operator and dogger.

Exterior emergency stop button

Crane working load limit WLL is required by WorkSafe is the maximum safe working load recommended by the manufacturer.

Personal Plant Hazard Warning Device – 'MyZone' Worker Alert System

Given that a traffic controller has been reversed into and killed in Victoria (making this the forth such fatality in road construction in Australia during a twelve month period) the prevention of reversing incidents involving pedestrians on road construction sites presents an obvious challenge to our industry.

Obviously the separation of pedestrians from plant operating areas should be the first objective under the hierarchy of safety controls (remove the moving plant hazard) where ever reasonably practicable.

Where it is not practical to eliminate or isolate plant from pedestrian work areas there are a number of warning devices currently available such as:

- Reversing cameras
- Reversing alarms (newer broad band and traditional beepers)
- Proximity reversing detectors
- Personal plant proximity alarms (more recent innovations)

The South Morang Rail Extension Project Alliance are utilising the 'MyZone' Worker Alert System which is a personal device warning of approaching mobile plant on their site.

The 'MyZone' alert system consists of a transmitter attached to mobile plant and personal receiver / alarms attached to each workers safety helmet. When a worker comes into the hazard zone the personal alarm vibrates for a few seconds so does not depend on hearing in a noisy work environment.

More information may be obtained from MyZone at: www.myzone-aus.com or by contacting: info@myzone-aus.com.

Wavetronix SmartSensor for Traffic Speed, Volume, Occupancy and Classification

The VicRoads M80 Project Team have deployed a trailer based solar powered Wavetronix SmartSensor to measure traffic speed, volumes, occupancy and vehicle types on the M80 project. The SmartSensor is mounted on a mast which may be retracted for transport and the trailer is parked adjacent to the freeway behind the safety barriers for measurement. This compares favourably with traditional measurement methods and does not require access to the freeway traffic lanes. The SmartSensor utilises high definition radar to detect up to 10 lanes of traffic. Since its duel radar technology detects both directions at the same time.

The data is collected for a number of reasons including requirements for traffic impact analysis to determine the most effective traffic management strategy. From a worksite safety viewpoint we are able to monitor traffic speed limit compliance and the type of vehicles (cars or trucks) that are the primary speeding offenders. The data may be utilised to justify speed enforcement or reinforcement measures and plan enforcement strategies.

The data collected has been validated against parallel measurement by the traditional methods.

Contact Tom Dabic, M80 Traffic Manager on 0413452616 for more details.

Trailer with elevated SmartSensor

Towards National TMA Guidelines – VicRoads TMA Survey Results

Subsequent to the Road Authorities TMA Conference in Sydney during October a survey was conducted of TMA equipment currently deployed in Victoria. Eight TMA Operators have responded to date. We wish to thank the Linemarking Industry Association Australia and the Traffic Management Industry Association of Victoria for facilitating this process and the companies for responding – if your company has not yet responded please do so we value your contribution.

The following summary of results provided to date is provided for the benefit of all concerned:

Weight of TMAs

Only 25% of responding TMA operators currently operate 15 tonne GVM vehicles. All comply with manufacturer's weight recommendations and the majority complies with the 10.4 tonne recommendation for shunt forward protection of 30 metres with a 100 km/h impact by a 11 tonne vehicle.

Number of TMAs Deployed in Victoria by responding operators

The responding operators currently have 21 TMAs operating in Victoria and have access to 40 TMAs in other states. VicRoads Road Services operate up to 4 TMAs.

Ballast Used and Type of Ballast

The majority of responding operators use some type of ballast. The type of ballast varies from water tanks with and without baffles secured with tie down straps, chains or welded to vehicle and concrete blocks to heavy steel plate construction of the truck tray and head board. Tie down straps are of concern but most of the responding operators do not use them. TMA manufacturer recommendations exist that the ballast securing devices must be capable of restraining 20 times the weight of the ballast.

Some but not all operators also seek to use their TMAs for other purposes and remove the crash attenuator so it may be used as a truck for transporting material. Naturally if the ballast is integral with the truck the load carrying capacity will be reduced, so this factor combined with the cost of heavier trucks explains why removable ballast is used. The crash attenuators vary in weight in the range 800 to 900 kg.

Preferred transition Period Should Victoria Agree to 15 tonne GVM TMAs as proposed for TMAs operated in Queensland and New South Wales

Preferred transition period to achieve 15 tonne GVM varies between 3 and 7 years with the majority below 5 years. It depends on the age of their TMAs and the purchase/payback period. Queensland and NSW have stated that they will not permit less than 15 tonne GVM TMAs to operate in their states after three years (This standard has already been established in their respective states).

Estimated Cost of Upgrading to 15 tonne GVM TMAs

Two operators responded with an estimate of $40,000 and one of $180,000 per TMA. Others indicated they already comply or intend to do so.

Colour Vision Deficiency Considerations for Electronic Displays

Aproximately ten percent of the male population suffers from colour vision deficiency, sometimes called colour blindness. Less than one percent of women suffer colour deficiency.

Although there are a few types of colour vision deficiency the most prevalent is confusion between **red and green** frequency colours. In another type of colour deficiency 1 to 2 percent of men suffer from a difficulty in perceiving differences between **blue and yellow**. Those suffering a colour deficiency usually see the colour but cannot differentiate between the colours affected by their colour deficiency.

Safety Critical Colour Displays

The main area of concern is the use of colour to warn or cue a person with colour deficiency. Designers of colour displays need to take into account potential red/green and yellow/blue confusion particularly where the consequence could be serious.

Colour vision deficiency may be accommodated by not relying entirely on colour coding. An additional cue is necessary such as a shape or location.

Traffic Signals are an example which is relevant to the road environment. In Australia traffic signals are arranged with the red, yellow and green aspects arranged one above the other, with the red always at the top and the green at the bottom. This allows people with a red green colour vision deficiency to use the aspect location cue to see which lamp is illuminated and stop for the top lamp (red) and go or proceed for the bottom lamp (green). By the recognition of the lamp location as top or bottom a colour deficient person can identify the meaning of the lamp display without perceiving the actual colour.

In practice many colour deficient people can identify colours provided they are not displayed superimposed on one another, but they see them differently and by association with a known object or signal meaning.

The colours used reflect the colour convention expectations associated with controls and displays which are used by the 90 percent of the population who do not suffer from colour deficiency:

1. **Red**: Critical, malfunction, error, failure, no go, action stopped, stop action.
2. **Green**: Safe, go, ready, normal.
3. **Yellow**: Caution.
4. **Amber**: Cautionary, check, recheck, delay.
5. **White**: General status (read legend), not right or wrong, testing, warming up.
6. **Blue**: Not recommended, use for colour coding in status. Interestingly blue is the universally recognisable colour.

Variable Message Displays (VMS)

VMS Displays should follow the guidance provided in the Worksite Safety – Traffic Management Code of Practice 2010. The Austroads Guide to Traffic Management Part 10: Traffic Control and Communications Devices (Chapter 5 Electronic Signs).

The Austroads Guide recommends that: "The colour of the pixels used for VMS wording must be either white or yellow. Other colours may be used to replicate regulatory signs,

and for pictograms and other symbols. "Symbols should generally be limited to arrows and lane status symbols to support the VMS messages. Symbols used on VMS must be consistent with static sign symbols described in relevant parts of AS 1742 and the Australian Road Rules."
Yellow was used extensively in early computer displays because it is a frequency that the human eye is very receptive too, green was also used but both colours would not have been seen as such by people deficient in these colours.

Pictograms such as the symbolic traffic controller, symbolic road worker and speed limit signs should not be shown unless the VMS display has sufficient resolution for them to be properly defined.

Blue and red should never be shown close together or superimposed on one another because the eyes will have difficulty focussing on the two colours.

Guidelines need to take into account new technology and any new guidance necessary for its deployment. Colour displays are relatively new and have been used to advantage in VMS displays where used, however, it is not necessary to use every colour available unless it emphasises something. Usually the pictograms have combined colour and shapes to aid discrimination. Flashing displays are used to draw attention to changes an example being the flashing annulus when a speed limit sign has changed to a reduced speed limit display.

90% of the population can see colours intended to convey meaning. However, we need to accommodate those people with a colour deficiency, so far as is reasonably practicable, particularly where the message is safety critical.

The use of VMS to display pictograms such as symbolic traffic controller and speed limit signs obviously has an advantage for most of the population but where the colours convey a colour convention useful to the majority of drivers e.g. showing a red for worksite entry and green for traffic route these colours will not be evident to red/green deficient people. Therefore this type of display needs to be supported by a symbolic bar or arrow as is used for lane status symbols and has been used on the M80.

M80 Example

The introduction of mobile short term worksites and mobile temporary speed zones has seen the need for visual displays to communicate to drivers, typically they are displayed on TMAs and move with the work group.

Electronic speed limit signs need the annulus to be red (otherwise they are advisory) and include a system to log the display, time and GPS coordinates if they are to be used as evidence for speed limit enforcement.

This is intended as a general overview of the needs of colour vision deficient people. More information is available on the internet and ergonomics and human factors specialists are available in this area.

High Visibility Clothing near Traffic - Guidance Note

WorkSafe developed guidance information for High - Visibility Clothing in 2006, as part of their Safety Workers and Traffic campaign.

Because of frequent queries about the use of high visibility clothing on road construction work (works near traffic) the guidance has been updated to reflect the Worksite Safety – Traffic Management Code 2010, endorsed by VicRoads and re-issued as a *Guidance Note for High-Visibility Clothing near traffic.*

The Guidance Note may be found at:
http://www.worksafe.vic.gov.au/wps/wcm/connect/wsinternet/worksafe/home/forms+and+publications/educational+material/high+visibility+clothing

A copy has been appended to this update for your convenience.

Worksite Site Safety Update is produced monthly by VicRoads Major Projects Division to communicate industry safety information and initiatives within VicRoads and to our contractors. It is also circulated via the WorkSafe Safety Soapbox to industry. The content reflects civil road construction and maintenance safety and includes works conducted on or beside operational roads. The editor may be contacted at: michael.rose@roads.vic.gov.au

Guidance Note

High-visibility clothing near traffic

November 2011

Background

High-visibility clothing is a form of personal protective equipment worn so workers can be easily seen by drivers and pedestrians. High visibility clothing should be used alongside other safety measures when working near traffic.

Workers on or near the road complete tasks including plumbing connections, tree planting and pruning, unloading vehicles, and repairing roads.

The Code of Practice for worksite safety – *Traffic management* (clauses 77 to 82) states that high-visibility clothing should comply with Australian Standard 1742.3 – *Manual of uniform traffic control devices.*

Types of high-visibility clothing

There are three different classifications for high-visibility clothing:

1. **Class D** – Outdoor daytime use only, with fluorescent or other non-retroreflective high-visibility material
2. **Class N** – Night-time use only, with retroreflective material on a 'non-specified' background
3. **Class D/N** – Day or night use, with a combination of fluorescent and retroreflective material.

Note: retroreflective material reflects light back. Non-retroreflective material does not. If retroreflective strips are applied to a garment, they should be 50mm wide.

Which type should I use?

There are many types of high-visibility clothing, including garments with high-visibility panels, safety vests, overalls or jumpsuits.

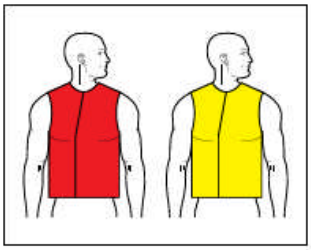
Before purchasing a garment, a risk assessment should be conducted to determine when and where the clothing will be worn, and what work tasks are to be completed.

Environmental factors that may influence your choice of clothing include:

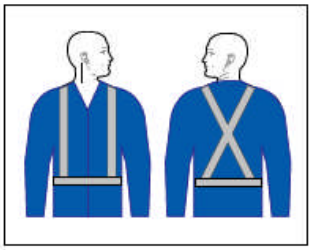
- temperature
- lighting and visibility (including during the day or night and different types of weather).

Task factors include ensuring:

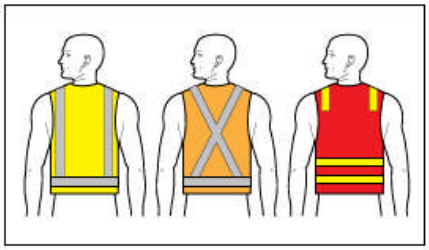
- a non-flammable garment is worn while completing hot works
- works being undertaken near rail lines meet the specific requirements for this application
- the colours of the vest being worn do not blend in with background colours.



Class D
Garments are for outdoor use only.



Class N
Garments are for night-time use only.



Class D/N
Garments are for day or night use.

identify this risk and are effective controls documented?

Guidance Note High-visibility clothing near traffic

Do your garments meet the Australian Standards?

Check with the supplier that the garment meets the requirements of AS4602, *High-visibility safety garments* and AS1906.4 – *Retroreflective materials and devices for road traffic control purposes.*

In general, AS4602 specifies garment types and areas of fabric required for visibility, and AS1906.4 specifies the criteria for the performance of the materials used.

Should I wear a VicRoads orange vest?

Traditionally in Victoria, a VicRoads orange vest has been worn when completing roadwork activities. This vest has orange fluorescent material with retroreflective strips in a particular layout. The Code of Practice for worksite safety – *Traffic management* now refers to garments meeting the Australian Standards instead.

VicRoads or any other principal or company may specify in their contract or agreement that a particular type of high-visibility clothing must be worn while completing work. Check that you are not under any contractual obligations before purchasing.

Care, handling and storage

Check with the supplier for advice on laundering and storing the garments to ensure they are maintained to the required standard. High visibility clothing should be regularly inspected to ensure it is clean and in a good condition. Replace clothing that is worn out, faded or no longer suitable.

Further information

Call us on: **1800 136 089**

Email us at: **info@worksafe.vic.gov.au**

For more information on occupational health and safety, go to WorkSafe's website: **worksafe.vic.gov.au**

Note: *This guidance material has been prepared using the best information available to the Victorian WorkCover Authority and should be used for general use only. Any information about legislative obligations or responsibilities included in this material is only applicable to the circumstances described in the material. You should always check the legislation referred to in this material and make your own judgement about what action you may need to take to ensure you have complied with the law. Accordingly, the Victorian WorkCover Authority cannot be held responsible and extends no warranties as to the suitability of the information for your specific circumstances; or actions taken by third parties as a result of information contained in the guidance material.*