Worksite Safety Update

Promoting safety in road construction

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Mobile Barrier Trailer Developed in USA

In recent years a number of mobile barrier systems have been developed in the USA with the objective of providing a practical protective barrier for the short term protection of roadwork personnel. One of the key objectives has been to provide lateral protection against intrusion of errant vehicles into the worksite.

The most recent development and successful deployment has occurred in New Jersey with the support of the State Department of Transport (NJDOT). The Mobile Barrier Trailer MBT-1, manufactured by Mobile Barrier, LLC, has been successfully deployed since July 2009 on state workzones to protect workers and vehicles.

The Mobile Barrier Trailer MBT-1. Note the integral screens, TMA and illuminated arrow board.

Currently devices such as truck-mounted attenuators (TMAs), traffic cones, and barrels are used to separate workers from traffic during construction and maintenance activities on the NJDOT highway system. Although, these devices serve well to delineate and protect work zones, they may not provide lateral impact protection for pedestrian workers should an errant vehicle intrude into their area at a high approach angle, unless additional shadow vehicles and TMAs are used to advantage.

While temporary barriers can be used in long-term work zones to separate the work area from live traffic, thus protecting the workers, it is not practical to use these devices for short duration and maintenance-type (Short-Term Stationary, Mobile Work, Work-Vehicle) work zones due to their time-intensive and more difficult deployment characteristics.

This 'ring of steel' approach taken with the MBT-1 includes an integrated arrow board and TMA. A conventional TMA is also deployed should potential exist for an errant vehicle to enter the worksite on the outside of the Mobile Barrier Trailer (MBT-1), such as when more than one active lane or emergency lane is occupied for the works.

The MBT-1 has been successfully crash tested to the NCHRP 350 TL-3 performance level, complies with the new MASH criteria and has been accepted by the FWHA for deployment on the US federal highway system. In principle the trailer functions as a temporary safety barrier with impacting vehicle ride-down energy attenuation for side impacts and an impact crash attenuator for vehicle crashes directly into the rear of the trailer.

The MBT-1 is towed by a semi—trailer prime mover. The following photographs and captions further describe the device:

View from the works side of the mobile barrier trailer with screens installed

Single lane closure deployment

Double lane closure with additional TMA blocking entry to left lane

Emergency lane and lane closure

Because of the length of the MBT-1 an escort is required for its deployment and has a very wide turning circle.

Further details on the MBT-1, including crash test video, may be found at:
http://www.mobilebarriers.com/

The NJDOT are to be congratulated for this innovation and the development and design of another engineering control which may be deployed to protect roadwork worksites.

A similar 'ring of steel' approach was taken last year on the Eastern Freeway in Melbourne, utilising conventional TMAs and heavy works vehicles to prevent side intrusion where the nature of the works made the deployment of safety barriers impractical. A low loader used to deliver a profiling machine, other heavy works vehicles and TMAs were deployed to provide both lateral and longitudinal protection. The site was also subject to a reduced speed limit and speed enforcement by Police and VicRoads Transport Safety Services Officers. The lateral protective vehicles performed a similar function to the MBT-1 except that works personnel were well clear of the trailer section and speeds were reduced through the worksite.

Due to vehicles cutting down the emergency lanes two TMAs are now deployed on the Eastern Freeway barrier works project during the deployment and removal of traffic management signage. The photographs on page 5 illustrate the arrangement which was implemented by Winslow the Contractor in consultation with the Traffic Management Workers, TMA Operators and VicRoads.

Eastern Freeway frequently moving works adjacent to fast lane. Advance warning TMA in foreground and shadow TMA in background protecting traffic management vehicle. The TMAs are protecting against both longitudinal and lateral errant vehicle entry into the work area.

View from traffic management vehicle end of works

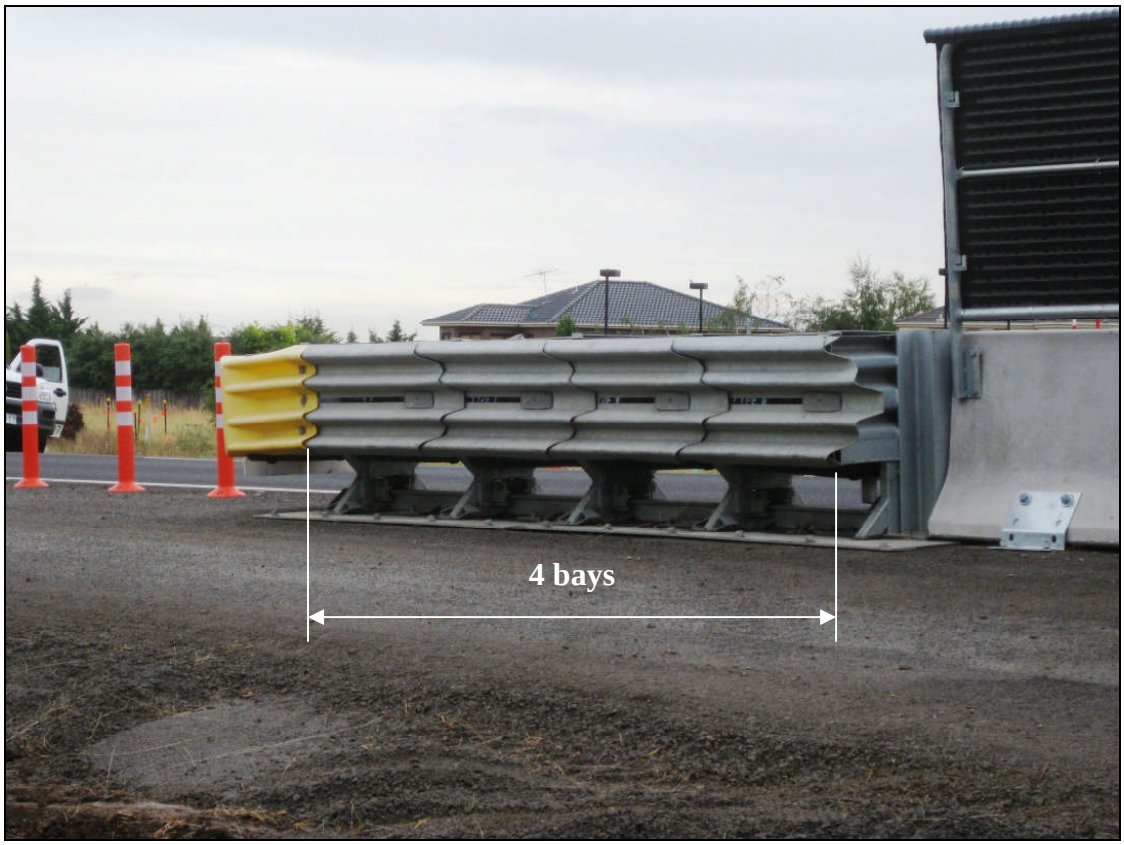
Barrier Crash Attenuators on Urban Freeways

Non - Gating Terminals

Because of the higher speeds through freeway worksites and to provide superior heavy truck protection non-gating re-directive crash attenuators are recommended for urban freeway works. They have demonstrated the ability to safely redirect b-doubles when they have impacted these terminal crash attenuators protecting the ends of concrete barriers deployed for worksite protection on the long term worksites. They were initially deployed on the M1 Project.
Speed limits of 80 km/h maximum are required past temporary barrier systems in Victoria to improve the 'truck proofing' of the installations. However, TL-3 impact performance has been required on freeway worksites for both barriers and terminal treatments since 2004.

They have successfully attenuated many crashes into the terminal without any known serious injuries reported. However, the prevention of crashes has received significant attention (refer following article: Barrier Approach Warning for Drivers).

The Worksite Safety – Traffic Management Code of Practice 2010 requires that all barrier systems deployed where the speed limit is 70 km/h or greater are to be tested to the TL-3 performance level. This means that the barrier crash attenuators need to be capable of attenuating a 100 km/h crash to the TL-3 performance level, or better.



A Quadguard CZ installation for 80 km/h this attenuator has only 4 bays and 5 cartridges (6 bays and 7 cartridges are required for 100 km/h)

The Quadguard CZ type non-gating barrier crash attenuators mounted on a plate and anchored to the road are commonly deployed on urban freeways where the redirection

of heavy vehicles at the terminal point is considered important for site safety. To achieve the necessary TL-3 100 km/h crash attenuation they require 6 bays plus the nose bay (7 cartridges in total). The first following concrete barrier must also be anchored to the road.

A Quadguard CZ installation showing the required anchoring brackets for the first concrete barrier unit

Barrier Approach Warning for Drivers

Driver advance warning of barrier approach needs to be both visual (by means of retro reflective hazard markers and fluorescent coloured delineators) and audio-tactile for fatigued, distracted and inattentive drivers. To be effective this warning needs to provide enough time so that a driver's perception – reaction time is sufficient at the worksite speed limit to facilitate recovery and redirection of the vehicle should a driver stray into the shoulder and be heading for a collision with the barrier crash attenuator.

Perception–reaction time (PRT) includes four distinct tasks that the driver has to perform:

- Detection – in this phase the unidentified object (barrier approach warning) appears in the driver's vision and the driver becomes aware of the need to respond to it AND a warning is also provided should the driver not be looking at the road ahead.
- Identification – at this stage, the driver is able to identify the object or condition because sufficient information about it has been acquired either visually or by audio-tactile feedback.
- Decision – after the approaching barriers are identified, the driver must make a decision to steer back onto the road to avoid the crash.
- Response – after the decision is selected, the physical steering response is implemented.

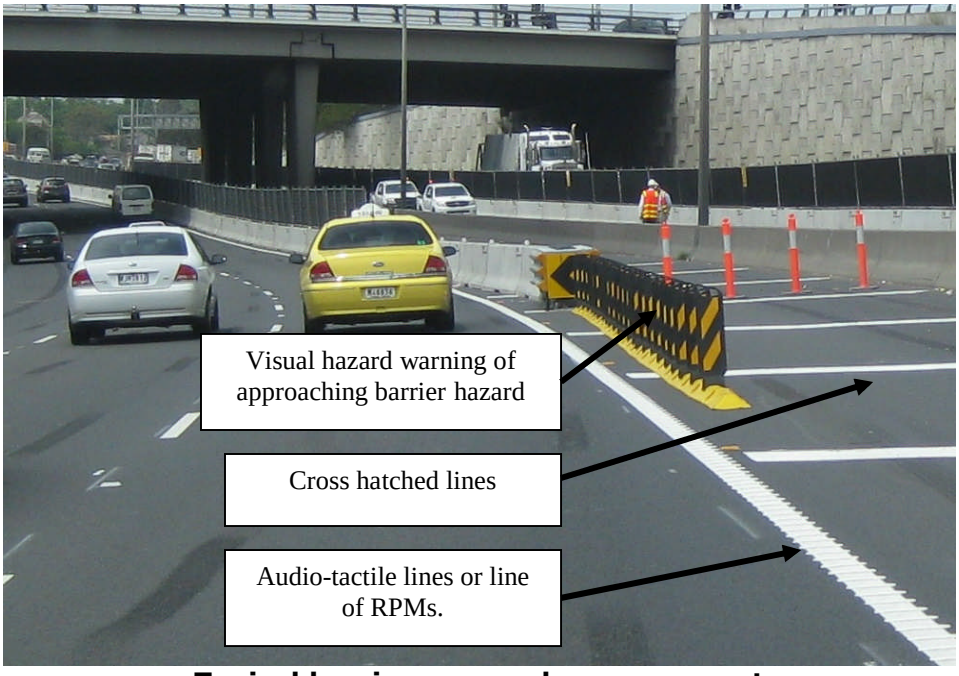
The total amount of time required for these four tasks is called the *perception–reaction time* (PRT). Researchers report that mean PRT for unexpected situations is about 1.1 seconds (s), whereas the 95th percentile time is 2.0 seconds. For an expected obstacle the mean PRT is 0.65 seconds. The consensus in the literature suggests that almost all drivers are capable of responding to an unexpected hazard in 2.0 seconds or less.
From a traffic safety analysis perspective the longest response needs to be assumed, and 0.5 seconds is added for implementing the response action such as braking or indicating lane change. Therefore a value of 2.5 seconds is typically used for design and operation analysis purposes.

The most critical impact of the time expended during perception–reaction is the reaction distance, which is the distance the vehicle travels while the driver goes through the perception–reaction process. Two types of situations are usually observed:

1. the driver travels with a constant speed through the PRT process, and
2. the driver with increased awareness starts to change the initial speed though the PRT process (most likely to decelerate).

This means that in the worse case a driver needs at least 2.0 seconds and preferably 2.5 seconds warning as they approach the barriers. At 80 km/h a vehicle will travel 45 metres in two seconds and 56 metres in 2.5 seconds.

I has been shown that either audio-tactile painted lines or raised pavement markers installed in advance of the toe of the barriers will eliminate / significantly reduce the number of vehicle crashes into the terminals as the result of driver inattention, distraction, fatigue (micro sleeping) if they approach the barriers and are on the wrong side of the painted edge line. Terminal crashes are both dangerous and expensive to repair so advance warning should be seen as a preventive investment.



Typical barrier approach arrangement

Drivers sometimes follow construction vehicles behind the barriers and into the site. Signs and cross hatched lines on the road help to prevent these intrusions.

Typical No Entry Sign at site entry point beside freeway on M80 Alliance Project

Draft Model Workplace Heath and Safety Regulations and Codes of Practice

The draft Model Workplace Health and Safety (WHS) Regulations and Codes of Practice were released for public comment in December 2010 with a closing date of 4 February 2011.

It is intended that all states will adopt the model regulations and codes in the interest of national uniformity in Workplace Health and Safety Law – an objective that should be welcomed particularly by those who currently work intra state.

The drafts are very similar to the current Regulations and Compliance Codes currently in operation in Victoria, so they should see a relatively seamless introduction to Victoria when approved, provided they are not changed significantly in the consultative process.

Draft WHS Regulations

The draft WHS Regulations provides for Infringement Notices and Proposed Penalty Regime. They are currently used by some other states but not in Victoria.

The 582 page draft-model WHS Regulations refer to the elimination or minimisation of hazards as they relate to the management of specific risks. The current Victorian OHS Regulations 2007 are 546 pages long and similar in content. The previously approved Model Work Health and Safety (WHS) Act also refers to the elimination or minimisation of hazards and essentially follows the hierarchy of safety controls although it has not been described as the hierarchy of hazard / safety controls in the Act.

However, specific references to and the application of the hierarchy of hazard control for controlling all risks is a stated requirement in the Draft Codes of Practice together with examples of the hierarchy of hazard controls applicable to the works.

Draft WHS Regulations

The Draft Codes of Practice released for public comment are:

- How to Manage Work Health and Safety Risks
- How to Consult on Work Health and Safety
- Managing the Work Environment and Facilities
- Facilities for Construction Sites
- Managing Noise and Preventing Hearing Loss at Work
- Hazardous Manual Tasks
- Confined Spaces
- How to Manage and Control Asbestos in the Workplace
- How to Prevent Falls at Workplace
- How to Safely Remove Asbestos
- Labelling of Workplace Hazardous Chemicals
- Preparation of Safety Data Sheets for Hazardous Chemicals

Additional model Codes of Practice will be developed to support the implementation of the model WHS regulations in 2012 and will be released for public comment in 2011.

As stipulated in the Draft Codes of Practice, "codes of practice are admissible in court proceedings under the WHS Act and Regulations".

Moreover, the Draft Codes state: "The WHS Act and Regulations may be complied with by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code".

More information including copies of the drafts may be found at:

http://www.safeworkaustralia.gov.au/Legislation/PublicComment/Pages/PublicComment.aspx

Doing our bit for credible roadwork speed limits

VicRoads staff managing roadworks are key players in ensuring drivers don't face inconsistent or needless roadwork speed limits when travelling through our work zones. A revised 'Code of Practice for Worksite Safety – Traffic Management' which released in September 2010, details specific obligations for us and our contractors.

Credible speed limits through roadwork sites are a key concern for all drivers. Poorly signed or inappropriate speed signs undermine community support for worksite safety, and create negative perceptions of speed enforcement to make our roads safer.

Reduced speed limits without visible work, long road lengths under speed restriction for a relatively short work area, or inappropriate out-of-hours speed restrictions damages VicRoads credibility and lead to drivers ignoring worksite speed limits.

It's important for VicRoads staff to exercise discretion and sound judgement when reviewing traffic management plans and speed limits by:

- targeting the length and appropriateness of speed limits commensurate with assessed worksite hazards, and the time and place of the potential hazard.
- designing the worksite so that when workers are not on site the speed limit is never less than 20km/h below the normal posted speed limit **unless in exceptional circumstances** and agreed to by an appropriate senior manager.

Signs that make sense

Variable Message Signs should be used to inform drivers of reasons for reduced speed limits especially when works are not obvious, such as within or under bridges. Remotely activated variable speed signs which can be quickly and easily changed in line with site conditions should be used at appropriate work sites such as on freeways.

It is important to clearly document reasons for speed limit decisions.

VicRoads will increasingly target surveillance and audit activities to ensure that traffic guidance schemes are implemented in accordance with the *'Code of Practice for Worksite Safety – Traffic Management'*. Over the next 12 months there will be a major focus on traffic management pre-qualification and enforcement of work sites.

Action Plan

As part of VicRoads efforts to better manage roadwork speed limits an action plan is being implemented covering:

- **Contracts and specifications** - embedding traffic management principles and use of Variable Message Signs at worksites.
- **Education** - both internally and across the industry covering the Code of Practice, roads rules and work consents.
- **Enforcement and Surveillance** - delegation and authorisation of VicRoads officers and camera-based enforcement on major projects. Issues covered also include traffic management pre-qualification, surveillance, and auditing of work sites

Spreading the word

Information sessions covering the ***Code of Practice*** and ***Memorandum of Authorisation*** have commenced with VicRoads staff, and will continue with our industry partners, municipalities and the wider community. These initiatives will be driven internally by a focus group with representation from Regions and Major Projects.

To help spread the message VicRoads is working as part of a ***Government Reference Group for Worksite Traffic Management*** which includes representatives from WorkSafe, TAC, Victoria Police and relevant members of the traffic management and construction industry.

Info online

VicRoads website provides readily accessible and information and documents to assist in planning and approving roadworks including:

- Code of Practice for Worksite Safety – Traffic Management
- Consents and MoAs for working in the road reserve

SPEED LIMIT AHEAD SIGN IMPLEMENTATION

VicRoads extended the implementation date for the deployment of the Speed Limit Ahead Signs until 28th February, 2011.

All traffic management signage will be required to comply fully with the Worksite Safety – Traffic Management Code of Practice 2010 and display Speed Limit Ahead Signs as required after the 28th February 2011.

A copy of the Worksite Safety Traffic Management Code of Practice 2010 may be obtained from:
http://www.gazette.vic.gov.au/gazette/Gazettes2010/GG2010S351.pdf

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