Worksite Safety Update

Promoting safety in road construction

No 115 January 2012

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Safety Excellence Award for West Gate Bridge Strengthening Project

The West Gate Bridge Strengthening Alliance has received the VicRoads Major Projects Safety Excellence Award for the consistently high standard of safety achieved during the rehabilitation of the bridge over more than two years of construction.

The West Gate Bridge is twice as long as the Sydney Harbour Bridge and each day carries up to 160,000 vehicles including 24,000 trucks. This vital infrastructure project has clearly benefitted business and industry. Since the extra lanes opened in June, significant reductions in traffic congestion have been achieved, with welcome travel time improvements over and along the West Gate Bridge and Freeway, and along the 75 km M1 route between Werribee and Narre Warren.

In addition to bridge strengthening and general upgrade of facilities, the project involved the addition of two more lanes to the bridge increasing lanes to five in each direction, installation of a lane management system and installation of public safety barriers to enhance bridge security and safety.

These complex works required the installation of more then:

- 1600 Tonnes of steel
- 400,000 new bolts
- 500 cantilever props
- 38 kilometres of carbon fibre

Most of the work was conducted inside the bridge structure or from work platforms suspended underneath the bridge, so works were mostly out of sight of the public. Up to 700 workers worked beneath the bridge or inside tight spaces within the bridge structure. About 3,300 people were inducted onto the project over the duration of the works.

High risk construction work presented many challenges which were well managed. High risk work included:

- **Work at height**: Significant work was required underneath the bridge and special suspended work platforms were designed for this purpose. Riggers trained in rope access systems were engaged to install and remove these platforms and to certify their safety prior to hand-over to the work crews. Tools were secured to prevent them being dropped, and as a back-up no access drop zones were established below the work areas. Access to these platforms was over the side of the bridge parapets for which enclosed access stairs were designed and installed.

Does your site isolate mobile plant from pedestrians where practical?

View of suspended work platforms

One of the largest bird cage scaffold structures. Two of these were installed to facilitate the placement of showers, change and lunch rooms close to but isolated from the work areas. This was necessary to contain the spread of the red lead paint dust.

Does your site isolate mobile plant from pedestrians where practical?

Closer view of one of the suspended work platforms

View inside one of the suspended work platforms

Does your site isolate mobile plant from pedestrians where practical?

Works personnel required a head for heights!

- **Work with Hazardous Substances / Work in Confined Space:** Red lead paint removal was required for steel inspection and installation of strengthening components. This paint contained hazardous substances such as lead and the removal reclassified the bridge interior to a confined space during the paint removal process.

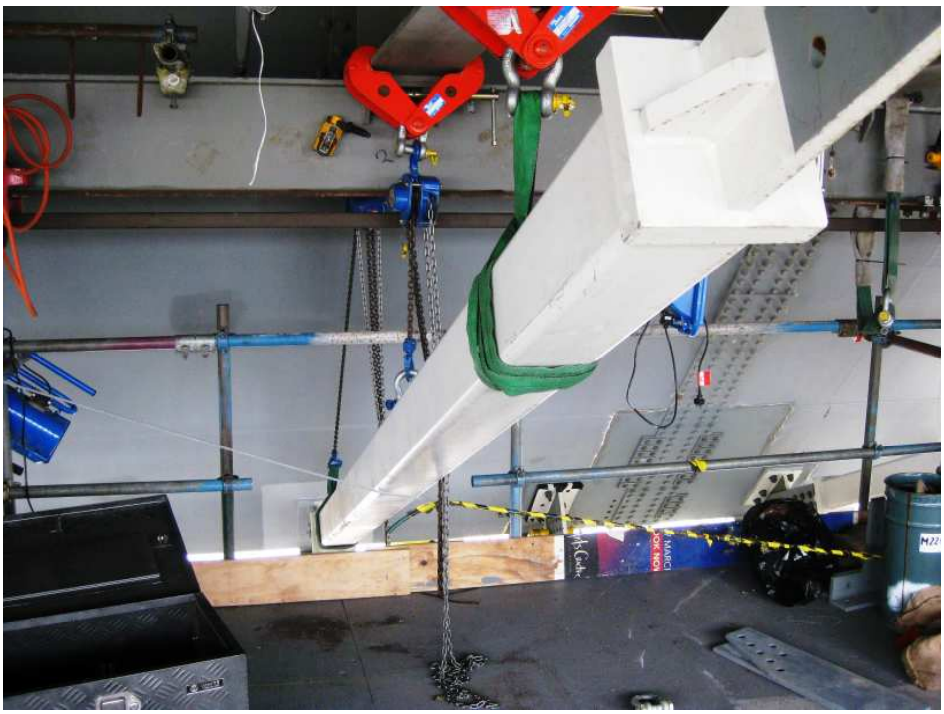
  Significant safety precautions were necessary including isolation of the work areas, red lead paint dust extraction at source, personal protective clothing and equipment, showers and change rooms convenient to the work areas, air quality and medical monitoring for airborne contamination from lead. Site exposure levels were reduced to below national exposure standards to further protect works personnel and frequent blood lead level monitoring was conducted.

Paint removal areas were isolated close to the work to prevent the spread of paint dust

Does your site isolate mobile plant from pedestrians where practical?

- **Ergonomics Considerations:** Internal bridge access was upgraded to provide modern walkways and larger access doors provided within the structure and remain as a legacy for the benefit of VicRoads maintenance personnel. Transporters were designed and hoists installed to eliminate or reduce manual handling and special installation jigs were designed for this purpose. For example the props for the extra cantilever traffic lanes were installed by mechanical means utilising jigs and hoists.
  An ergonomist was engaged to help seek solutions to working in areas requiring constrained postures such as the invert of the bridge sections.

Cantilever bridge section prop transporters

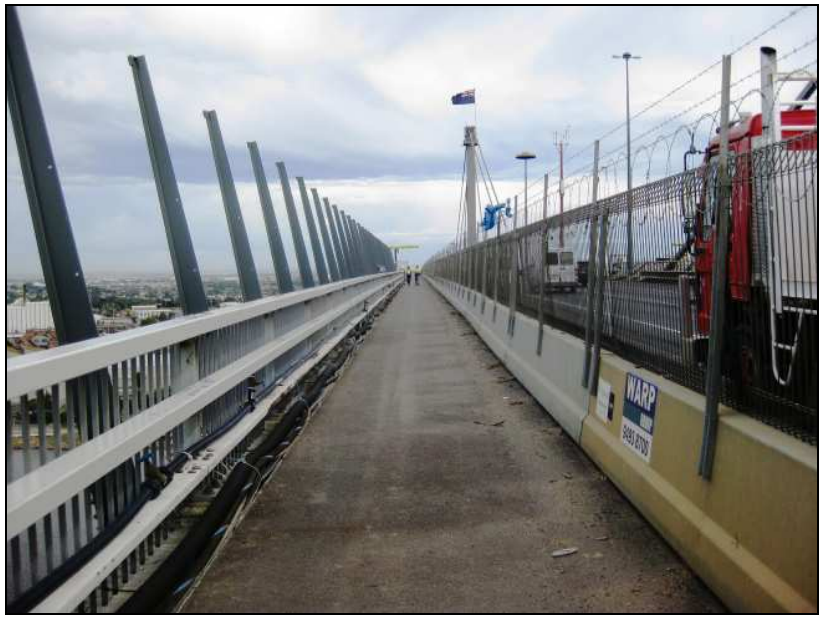


Chain hoists and slings were used to lift prop into position for attachment to bridge for the construction of the new cantilever traffic lanes.

Enlarged Bulkhead entry doors replaced 'crawl holes' where possible, significantly improving people access

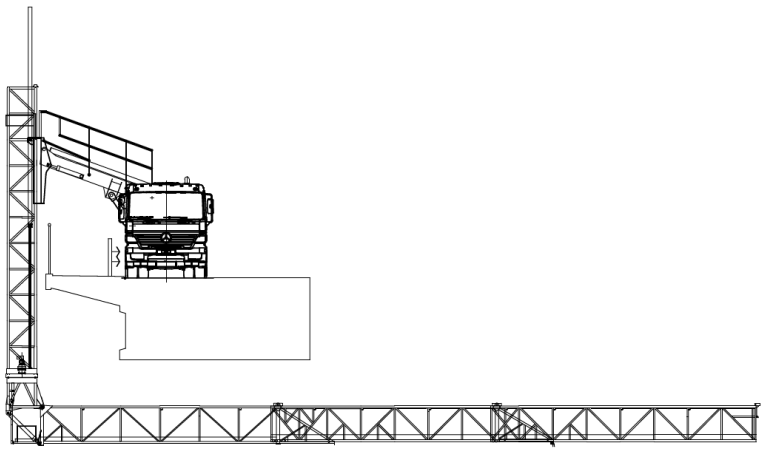
Modern standard walkways with guardrails and step access to invert of bridge under construction.

- **Work near traffic**: Access to some areas of the bridge was only practical via the bridge deck and temporary safety barriers or TMA protected lane closure/s. The barriers presented weight and wind loading restrictions and the need for anchoring the lighter steel barriers without compromising the safety of workers or bridge integrity under heavy vehicle impact.



Anchored high performance Barrier Guard 800 temporary safety barrier protected construction access way. In addition the barrier screens were modified to provide a temporary public safety barrier pending construction of the permanent barriers
(Posts for the final public safety barriers may be seen on the left)

- **Maintenance Safety:** The VicRoads Bridge Maintenance Team were consulted and involved with design of maintenance provisions as required under the design obligations of section 28 of the OHS Act. Refer also to maintenance access above. The design of the bridge inspection and maintenance unit (which will replace the older gantry units) heavily involved the team.



Drawing showing typical arrangement of the bridge inspection and maintenance unit when fully deployed under the bridge. A lane closure and TMA will be used to protect the unit.

Does your site isolate mobile plant from pedestrians where practical?

Lowered Boom of trial inspection unit being slewed into position under the bridge.

Group photograph of some of the award recipients

The Safety Excellence Awards were presented by George Mavroyeni, Executive Director Major Projects

Certificates being presented by George Mavroyeni to Sherrin Xerri (left) and Renee Connor (right) who were both part of the bridge safety team.

Certificates were also presented to Alliance Partners John Holland as the Principal Contractor, SKM and Flint & Neil for Design.

The award recipients are to be congratulated. They were actively involved in safety and made significant contributions to the project. They included employee health and safety representatives, supervisors, managers, communications and safety personnel recognising that safety is indeed 'everyone's business'.

It was also acknowledged that all personnel who worked on the project made the award possible and are to be congratulated for working safely, providing input to the resolution of difficult safety challenges and contributing to the excellent outcome.

Good outcomes cannot be achieved without the active participation of everyone working on a project. In addition to the excellent safety management systems the Alliance management team fully lead and supported a safe work environment.

The West Gate Bridge Rehabilitation Project and the M1 Upgrade also received numerous other awards including:

- The Australian Engineering Excellence Award presented by Engineers Australia.
- The Australia Smart Infrastructure Award for the Freeway Management. System, including overhead lane signs, variable speed limit signs and linked ramp signals.
- The Australian Construction Achievement Award 2011.
- The VicRoads Major Project Safety Excellence Award for the M1 West Gate Freeway Alliance.

Does your site isolate mobile plant from pedestrians where practical?

VicRoads Guidelines for Truck Mounted Attenuators (TMAs)

After extensive and on-going consultation with TMA Operators in Victoria the VicRoads TMA Guidelines have been revised to take into account stakeholder feedback as well as considering standardisation within Australia. The guidelines have been developed so that consistent TMA operating practices are agreed within Victoria taking into account our states experience and the evolving deployment practices in Australia. A copy has been provided with the e-mail circulating this Update.

Application in Victoria: Consistent with the hierarchy of controls expectations under Victorian OHS Legislation and the Code of Practice for Worksite Safety – Traffic Management, the Guidelines now mandate TMAs on high speed high traffic volume roads such as Urban Freeways. They are also applicable as a level 3 hierarchy of control protection where road closure or safety barriers are not practical, typically short term works, adjacent to high speed roads in general.

Functional Specifications: We have standardised the TMA functional specifications where practical, taking into consideration the significant dependence on hired and contractor provided TMAs in Victoria, as detailed in the November edition of this newsletter.

At this time only 3 out of an identified 34 TMAs operating in Victoria are 15 tonne GVM (gross vehicle mass). This is because the focus has been on achieving the recommended TARE weights to comply with the crash testing and US Federal Highway Administration (FHWA) acceptance letter weight requirements. The line marking industry first commenced the use of TMAs after they were mandated in Victoria over a decade ago but the use of TMAs by the traffic management industry has seen more TMAs recently purchased for that purpose protecting both road construction and maintenance work.

Many TMAs in Victoria are relatively new and it would impose a significant cost to our Operators if the transition period was less than 5 years. The larger size TMAs are suitable for the freeways and main arterials but less practical for lower speed narrow winding roads which are also experienced in some applications such as the protection of line marking works.

Consequently Victoria has not mandated 15 tonne GVM TMAs at this time. Any future change to this policy would be subject to consultation and agreement with our TMA operators and a transition period of at least 5 years.

Naturally a TMA Operator may choose to purchase 15 tonne GVM TMAs and they will then be able to operate their TMAs in all states, if they wish to do so. States which may mandate 15 tonne TMAs, such as Queensland and New South Wales, already have large government operated fleets and have tentatively proposed a transition period of 3 years, after which lighter TMAs may not be permitted to operate in their states.

VicRoads Road Services has indicated their intention to operate 15 tonne TMAs in future, they operate on rural highways and freeways where they are exposed to many heavy vehicles and drivers who may be fatigued.

The VicRoads Guidelines still specify 10.4 tonne GVM as the minimum and has also referenced the U.S. Department of Transport (FHWA) in their *Field Guide for the Use and Placement of Shadow Vehicles in Work Zones* (which includes TMA application for both mobile and stationary operations) and specifies that the mass of the vehicle should be within 5 percent of the mass of the shadow vehicle on which the TMA was crash tested (9000 kg) or 9 tonne TARE.

The VicRoads Guidelines are performance based and are less prescriptive then the predominantly road authority operated guidelines which need to specify their respective choices. We consider that an operator should be able to choose options such as type of transmission, type of VMS display, need for standby power supply, elevating and lowering arrow boards, etc. and our guidelines recognise this should be an operator choice.

Safety features: have been specified for guidance and standardisation. Where possible the functional specifications reflect the currently released guidelines of NSW and Queensland which are currently undergoing fine tuning as we move toward national guidelines which require stakeholder consultation.

Ballast has also been commonly applied to achieve the 9 tonne TARE and the VicRoads Guidelines now specify that the anchoring of this ballast must now be engineered to achieve at least 20 times the weight of the ballast.

The heavier 15 tonne GVM TMAs do not require ballast because the truck weight and fittings including crash attenuator, arrow board, VMS and cabin fit out already achieves the 9 tonne TARE to comply with FWHA acceptance letters and crash test TARE weights.

Although the TMAs are designed and tested to TL-3 type impacts they have frequently been subject to high speed impacts by heavier vehicles such as trucks and no one was injured. However, it is the operating companies choice, in consultation with their operators, should they wish to increase the size of their TMAs and eliminate the need for ballast, obtain the mechanical protection provided for their operators and also achieve the expected reduced shunt forward distance of a heavier TMA under impact.

QUEENSLAND 15 TONNE GVM TMA EXAMPLE HERE IN VICTORIA

Queensland have arranged for two 15 tonne GVM TMAs to be built by A1 Roadlines in Victoria to demonstrate some of the features proposed in their future model standard.

The example is shown on the next page has smaller diameter wheels. The other example which is not shown has larger size wheels which makes it appear as a much larger unit.

Multi message type signs are shown on the TMA example on the following page, and are carried on the TMA for the establishment of mobile temporary speed zones, they require manual sign changes. VMS are also gaining popularity because of the extended range of displays possible and are changed / operated from within the operators cabin so they are not exposed as a pedestrian to traffic.

The December edition of Worksite Safety Update provided details of some of the more recent developments in Australian produced TMAs, many of which are manufactured here in Victoria.

A new 15 tonne GVM TMA constructed by A1 Roadlines at Knoxfield to demonstrate the intended fit out of a Queensland TMA Unit. The attenuator is retracted for travel in the left hand photograph and extended in the right. The illuminated arrow board may be lowered for travel and elevated above the cabin for display the lower profile improving overhead clearance and reducing wind drag.

PREVENTING FALLS FROM EARTHMOVING EQUIPMENT - WORKSAFE GUIDANCE NOTE

WorkSafe have released a new Guidance Note for *Preventing Falls from Earthmoving Equipment.*

This guidance is applicable to road construction sites and applies during on-site inspection, maintenance and repairs.

A copy has been appended to this Update for your convenience. They may also be downloaded from the WorkSafe web site at:

http://www.worksafe.vic.gov.au/wps/wcm/connect/wsinternet/worksafe/home/forms+and+publications/guidance+notes/preventing+falls+from+earthmoving+equipment#

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

Preventing falls from earthmoving equipment

This information sheet provides advice on preventing falls from earthmoving equipment during on-site inspection, maintenance and repairs.

January 2012

Background

Falls from earthmoving equipment may result in death or serious injury such as fractures, spinal cord injuries, concussions and brain damage. Plant operators and service personnel may be at risk of falls from earthmoving equipment during on-site inspection, maintenance or repairs. These risks must be managed.

A key principle of health and safety is that workers be given the highest level of protection that is reasonably practicable in the circumstances.

WorkSafe considers the most practicable and economical method to protect workers from falls from earthmoving equipment is to have physical fall protection fitted. Where it is not reasonably practicable to have physical fall protection, other control measures must be in place.

Identifying the hazard

Workers may be at risk of a fall from earthmoving equipment when they perform tasks such as:

- accessing service and inspection points
- refuelling
- scheduled maintenance and cleaning (eg fluid checks and servicing)
- unscheduled or breakdown repairs
- removing or replacing vandal proof covers
- carrying items to service points (grease guns, fluid containers)
- adjusting operator controls, roofs, mirrors and seating.

Does your site isolate mobile plant from pedestrians where practical?

Control measures

Control measures to manage fall risks should follow the hierarchy of control and in many instances a combination of approaches will result in the best solution. Controls should be reviewed regularly and modified, if necessary, to ensure they remain effective.

1. Elimination

Eliminate the risk by working from the ground or a solid construction.
For example:

- Relocate gauges and inspection points for pre-start checks to locations accessible from the ground.
- Use long handle tools to do cleaning tasks from the ground.
- Use designated 'park-up' areas that allow for safe access during service, maintenance and pre-start checks.
- Select equipment that removes the risk of falls through good design, such as:
  - gauges and inspection points accessible from the ground
  - centralised greasing systems.
  - steps that are designed to prevent the build up of dirt.
  - flexible greasing hoses accessible from ground level.
- Regularly maintain steps to repair damage and remove dirt build-up to reduce the risk of slips, trips and falls.

2. Physical fall protection

If not possible to eliminate the hazard, use physical fall prevention such as:

- intergrated guardrails
- scaffolding
- elevating work platforms
- fixed work platforms
- specialised service vehicles to provide safe access.

Integrated guardrails provide physical fall protection that is present at all times and does not rely on people to do the right thing when inspecting, servicing or repairing the equipment.

< The engine bay of this excavator is fully enclosed by integrated guardrails. This enables safe pre-start checks and maintenance on site (including safe access and egress).

Does your site isolate mobile plant from pedestrians where practical?

Note: Unless designed to handle the vibration from the earthmoving equipment, integrated guardrails may be susceptible to fatigue cracking. Inspection of guardrails should be part of regular plant maintenance.

< Guardrails incorporating a section of wire rope to reduce fatigue cracking due to vibrations.

< Guardrails installed beside the engine bay of an articulated dump truck provide physical fall protection for pre-start checks and servicing.

3. Work positioning system

If not reasonably practicable to apply one of the above controls, use a work-positioning system such as a travel restraint system. If considering a work positioning system, you must also provide:

- designated anchor points (15kN capacity)
- a harness and suitable length lanyard (rated fall arrest)
- storage for harness and other system equipment
- training for workers
- a detailed safe work method statement (SWMS) for the task (including inspection, set-up and use of the system)
- increased supervision
- procedures for the prompt rescue of a worker in the event of a fall.

Does your site isolate mobile plant from pedestrians where practical?

Work-positioning systems are not the preferred option for earthmoving equipment as these controls rely on people to do the right thing when inspecting, servicing or repairing the equipment.

Note: Generally, harness systems must be used in fall restraint mode, not fall arrest mode, as fall heights from earthmoving equipment are too low for the system to arrest a fall.

4. Administrative controls and ladders

Administrative controls and ladders can also be used for some tasks; however these controls are the least effective in controlling the risk of falls. Ladders are not suitable for long duration or high force tasks. Administrative controls must be properly used, reviewed and maintained.

Safe work method statements

An SWMS must also be developed and followed if the fall height is more than two metres or the task is performed on a construction site and:

- there is movement of powered mobile plant
- is on or adjacent to roadways or railways used by road or rail traffic
- is over or adjacent to water or other liquids, if there is a risk of drowning.

Industry initiatives

A number of large civil construction projects and larger civil contractors have strict requirements for fall protection on earthmoving equipment. This includes ensuring:

- only plant with physical fall protection is permitted on-site or the operation of the plant is restricted (including prohibiting pre-start checks before sunrise)
- all trafficable surfaces on the plant are to have non-slip surfaces
- tracked vehicles are slewed to the correct orientation to enable safe access/egress to check and service points.

Purchasing earthmoving equipment

When purchasing or hiring earthmoving equipment, consider if workers will be protected from falls during refuelling, servicing, maintenance and repairs.

- are the pre-start check points accessible from ground level?
- are guardrails fitted to the areas where there is a fall risk?
- is there a protected means of access and egress to these areas?

Most manufacturers now produce earthmoving equipment with guardrail mounting points as standard and provide guardrails as an optional extra. There are also several manufacturers that produce after-market guardrails that can be fitted to existing plant.

Consult operators, service personnel and any health and safety representatives when considering purchases of earthmoving equipment or developing fall prevention solutions.

Does your site isolate mobile plant from pedestrians where practical?

Contact details

Call us on: **1800 136 089**
Email us at: **info@ worksafe.vic.gov.au**

worksafe.vic.gov.au

Publications

WorkSafe Victoria Compliance Code,
Prevention of falls in general construction

Civil Contractors Federation Guide,
How to prevent falls when using mobile plant.

Does your site isolate mobile plant from pedestrians where practical?