A rock under a wheel caused this overturn. Fortunately the operator was wearing their seat belt.
INDEX

1.0 INTRODUCTION Page 3

1.1 Reasons why mobile plant and vehicles overturn. Page 3
1.2 Unsuitable ground conditions. Page 3
1.3 Plant operator awareness of risks
   – Pushing the boundaries. Page 3
1.4 Most mobile plant will overturn. Page 3
1.5 Seat belts prevent injury. Page 3
1.6 VWA Safety Alert February 2014. Page 4

2. PREVENTING MOBILE PLANT OVERTURNS
   (VICTORIAN WORKCOVER AUTHORITY ALERT). Page 4

3. ROLLER OVERTURNS. Page 6

4. TRUCK & TRAILER OVERTURNS. Page 11

5. ARTICULATED DUMP TRUCK OVERTURN. Page 14

6. WATER TANKER RUN AWAY & OVERTURN. Page 16

7. LOW LOADER OVERTURN. Page 17

8. BELLY DUMP TRUCK OVERTURN. Page 19

9. TIPPER TRUCK MAINTENANCE & OPERATION. Page 20

10. MOBILE CRANE OVERTURN. Page 21

11. EXCAVATOR OVERTURN. Page 22
GUIDELINES FOR PREVENTING MOBILE PLANT OVERTURNS IN ROADWORK

1. INTRODUCTION
These Guidelines have been produced to highlight known causes or significant contributing factors identified in plant overturn incident investigations over more than a decade. The significant contributing factors have been previously shared through the circulation of VicRoads Safety Alerts and articles in the VicRoads Worksite Safety Update Newsletters. However, the human factors considerations need much more attention if mobile plant overturns are to be prevented, so far as is reasonably practicable. Action is necessary by both mobile plant operators and those who have management and control of the roadwork sites.

1.1 Reasons why plant and vehicles overturn
The safety of mobile plant operation during road construction and maintenance work depends significantly on:

- Competency and experience of the operator on the type of machine;
- Operator competency based RTO training into the hazards /risks associated with plant operation;
- Ergonomics incorporated into the design of the plant;
- Limitations of the plant (stability / overturning);
- Unsuitable site ground conditions; and
- Human error.

The reasons why plant and vehicles overturn should be well known, yet they continue to occur. Most mobile plant incidents commonly involve human factors considerations – if these are not met than these types of incidents will continue to occur with potential collateral risk to other people in the vicinity (too close to the plant).

1.2 Unsuitable ground conditions. Construction practices do not always plan the works to reduce the risks; unprepared ground conditions and slopes often cause mobile plant to overturn. Works planning and poor ground conditions are a significant contributing factor in many incidents.

1.3 Plant operator’s awareness of overturning risks – Pushing the boundaries. Operator competency based training may not always include the overturning risks for the type of plant. Operators may knowingly push the boundaries / limits of the machine and a swaying machine or swinging load may exceed stability limitations. Operator error often results in overturns.

1.4 Most mobile plant will overturn at some time if the safe operating conditions of the plant are exceeded. However, some plant types are known to be more susceptible because of the prevalence of incidents demonstrated in certain types of work as will be described in these Guidelines.

1.5 Seat Belts must be worn. No serious injuries have occurred to date when seat belts have been worn on road construction work. Mobile plant operations are high risk construction work and the overturning hazard (as well as other mobile plant related hazards) must be identified in the Safe Work Method Statement (SWMS) and suitable controls identified, clearly described and communicated to those concerned.
1.6 VWA Safety Alert February 2014
In February 2014 WorkSafe (now Victorian WorkCover Authority (VWA)) issued the following Alert due to the high number of mobile plant overturns experienced in Victoria at mine and quarry sites.

The following VWA Alert is also applicable to roadwork sites where significant numbers of mobile plant is operated. The significant contributing factors / key lessons obtained from investigated incidents on VicRoads worksites have been included in these guidelines to support the VWA Alert and better manage mobile plant and prevent overturns.

2. PREVENTING MOBILE PLANT OVERTURNS - VWA ALERT
Information for employers about risks associated with mobile plant (such as dump trucks) overturning at mines or quarries.

Background
In a recent incident, a fully loaded articulated dump truck overturned while travelling along a section of sealed road inside a mine. The truck was turning into an intersection when the rear of the truck (the tub) overturned, leaving the truck’s prime mover upright.

Since January 2010, thirty reported mobile plant overturn incidents have occurred in the Victorian earth resources industry. Of these, fourteen related to dump trucks, with the remainder comprising light vehicles (four), loaders (four), excavators (three), scrapers (two), water trucks (two) and one dozer. Nine incidents involved articulated trucks.

Mobile plant overturns commonly involve the following factors:
• Unstable ground conditions – soft ground that is unable to support the vehicle's bearing load can cause it to overbalance. This could occur along the edge of a road or when a vehicle is dumping overburden material at a tip head;
• Uneven ground – different surface levels can raise the body of a vehicle causing an overbalance. Uneven ground may be common around tip heads;
• Uneven roads – vehicles can lose control while travelling on roads that are uneven or incorrectly cambered around bends;
• Loss of vehicle traction on the road surface;
• Vehicle failure caused by defective, worn out or poorly maintained vehicle components including brakes, steering, tyres or suspension; and
• Collision with other vehicles or objects.

Other factors can include:
• The type of load – some materials (e.g. soft, sticky clays) may remain in the vehicle body, potentially causing an overbalance while dumping;
• Uneven vehicle load distribution; and
• Poor road signage, traffic management and communication practices.
Recommended risk control measures:

- Ensure appropriate safe systems of work are in place and these are regularly monitored, reviewed and, if necessary, revised. When reviewing systems of work;
- Consider any changes in a vehicle’s design limits (e.g. speed, load or gradient limits) or technological developments and the availability of the latest operator protective devices (such as reversing cameras etc);
- Provide employees with training on new or revised systems of work (e.g. drivers unfamiliar with the make or model of the vehicle they are expected to operate should receive appropriate training);
- Ensure onsite roads are safe and properly maintained taking into account changing environments and conditions;
- Establish appropriate rules and standards for safe onsite road use, including speed limits for travel and manoeuvres, taking into account changing environments and conditions;
- Ensure before new or hired plant is used in the workplace, any necessary information is obtained from the supplier or manufacturer about its features and design limits;
- Communicate any necessary information to drivers and others (e.g. load information for those responsible for loading and driving vehicles) to enable them to perform their work in a way that is safe and without risks to health;
- Ensure the surface of any off-loading area is appropriate for the vehicle’s requirements/manufacturer’s recommendations;
- Ensure mobile plant is operated in accordance with manufacturer’s recommendations (including load limits and other specific features);
- Ensure regular vehicle inspections and maintenance are undertaken on essential components such as brakes, steering, tyres (including pressure) and suspension in accordance with the manufacturer’s recommendations, or where practicable, by the manufacturer’s authorised service provider to enable a safety standard comparison;

If a mobile plant overturn incident occurs:

- Ensure an investigation is conducted into the cause of the incident by a suitably qualified and competent person having regard to the relevant manufacturer’s specifications. The outcome of the investigation should be documented and retained;
- Notify Victorian WorkCover Authority (VWA) immediately if the incident occurred at a mine.

Disclaimer: This Alert contains information following the Victorian WorkCover Authority’s (VWA’s) inquiries into the incident at the date of this report. The information contained in this report does not necessarily reflect the final outcome of the Victorian WorkCover Authority’s action with respect to this incident. The VWA does not warrant the information in this report is complete or up-to-date, and does not accept any liability to any person for the information in this report, or its use.
3. **ROLLER OVERTURNS**

Roller Overtures have been the most common source of mobile plant overturns at VicRoads in the past decade.

**Significant Contributing Factors / Lessons:**
- High centre of gravity of rollers;
- Rolling / compacting too close to uncompacted soft edge of batter /verge;
- Soft ground; and
- Rolling parallel to edge.

![Figure 1: Roller overturn from narrow verge on right](image)

**Common Contributing Factors / Learning from Previous Incidents:**
Investigations conducted into previous incidents have shown that common contributing factors include:
- The roller operating too close to the edge of the embankment;
- The roller quickly develops a lean toward the embankment due to collapse of soft, poorly compacted soil close to the edge;
- The roller commences to slide down the embankment;
- The operator turns his machine away from the edge;
- The roller rolls over onto its side but can roll completely over and down the side of a steep embankment, coming to rest upside down on cabin roof or ROPs;
- The operator is usually inexperienced in this type of roller work, but even experienced operators working too close to the embankment edge can overturn; and
- Compaction vibration rollers are usually involved.
Reasons for Poor Compaction at edges of Fills:
The following reasons have been suggested by experienced operators and road construction engineers:

- Poor supervision;
- Inadequate direction / poor work methods;
- Lack of understanding by operators of consequences;
- Weak edges in underlying material due to:
  - Insufficient detail given in ensuring batter is constructed full width including over width from ground level up, i.e., lack of survey control, poor compaction and / or inconsistent compaction, the practice of cutting wet material over the batter face and leaving it as un-compacted material on the batter face; and
- The use of articulated rollers for compaction. Previously towed rollers and compactors were used and these were able to be reversed up to batter face.

Possible Reason for Incidents:

- When the front roller drum begins to slip, an inexperienced operator's reflex action is to turn the drum of the roller sharply back onto the fill, which in turn articulates the roller with the wheels pointing towards the batter’s edge. As a consequence, if the machine is too close to the edge of the batter the outer wheel will drop over causing the roller to slip sideways; and
- Inadequate sized rollers for the work that is to be undertaken.

Recommended Methods for Preventing Roll Over of Compaction Plant:

- Ensure that all operators are appropriately trained and aware of the consequences of 'pushing the safe operating boundaries;
- Ensure close survey control in setting out of toe and in construction of batters;
- Ensure fill batters where possible are constructed over width from bottom layer up and trimmed back to the design width;
- Ensure that any over wet material cut to the batter face is disposed of wide of the width of layer to be compacted and that the width of the layer being compacted is clearly distinguishable from the discarded material;
- Outside edges of formation layers to be sloped towards the centre of fills such that rollers slightly lean inwards, but do not exceed plant lateral tilt limitations. Middle areas of fill can be topped up after edges are compacted. (Refer Figure 3 forward);
- In confined areas such as fills at bridge abutments, keep outer edges of fill higher and roll at angle to the edge of fills (Refer Figure 4 forward). Roll slowly to the edges of fill, stop machine and vibration if there is any sign of instability and reverse away; and
- If batter widening is required, batters must be benched out from the bottom of the fill to suit the width of the machines then stepped into the existing embankment and maintain machine width until the desired height has been reached.

Operators experienced in this type of work also recommend that windrows be constructed near the edges and that rollers are operated so that they retain a slight lean towards the centre of the earthworks rather than roll with the roller in the vertical when near the edges. Note that if this approach is used the manufacturer’s recommendations for cross falls are not to be exceeded.
This approach will result in the roller leaning away from the edge of the embankment further reducing the likelihood the roller will overturn and possibly roll down the embankment.

**Recommendations**
Principal Contractors need to clearly identify the potential for rollers working near the edge of embankments to overturn and roll down embankments as part of their approved documented Safe Work Method Statement (SWMS). The documented SWMS must include, but is not limited to:

- An agreed method of construction which will control the risk of a roll-over taking into account the recommended methods for preventing roll-over of compaction plant. This must be conducted in consultation with plant operators.
- Typical Rollers are prone to overturning if the cross slope exceeds 10% and rolling on the edge of verge construction is not recommended because the drive wheels can easily slide down the batter. See also the video from WorkSafe British Columbia and recommendations not to use rollers with operators very close to the edge of embankments: [http://www2.worksafebc.com/Publications/Multimedia/SlideShows.asp?ReportID=37540](http://www2.worksafebc.com/Publications/Multimedia/SlideShows.asp?ReportID=37540)
- How the operator will be restrained within the roller cabin and protected against ejection should the machine overturn. Significant injuries are possible if unrestrained even if the operator is not ejected from the cabin and crushed by the rolling plant.

The above roller work practices which proven successful in preventing overturns and contractors are encouraged to consider these and other control measures in consultation with roller operators.
1. Roller near edge of embankment and under 1 metre typically

2. Roller commences to tilt towards the embankment when soil gives way. Driver attempts to steer away and driving wheels go over edge-vibration still in operation.

3. Roller commences to slide and roll - down the embankment

Figure 2: Mechanism of Roller Overturn
Figure 3: Proposed rolling with Windrow and Roller angled toward the centre of embankment.

Where it is necessary to roll closer than one metre to the edge, the rolling should be conducted at an angle of about 45 degrees. This ensures the bulk of the roller is on firm compacted soil and the drive wheels are able to retain traction.

Figure 4: Rolling at angle when close to edge
4. TRUCK AND TRAILER OVERTURNS

A number of Dog Trailers have overturned while dumping / spreading loads on site in the last decade; this is the second most common type of plant involved in overturns. There is potential for a far more serious incident if the tray were to fall onto other people in the area or an operational road. The longer quad trailers place the centre of gravity even higher.

**Significant Contributing Factors / Lessons:**
- High centre of gravity of load and tray when elevated;
- Rough and Uneven ground conditions;
- Soft ground; and
- Loads sticking to tray / tub.

The most common contributing factor is that the ground condition in the area is rough and uneven and has not been properly prepared for such an operation. It may only require one wheel set to drop lower in rough and uneven ground and the swaying inertia of the tray and load can result in an overturning moment to occur.

When the tray is elevated the trailers centre of gravity moves upward – if any of the load sticks high up in the tray than the potential for the trailer to roll-over becomes even greater. All it requires is uneven ground conditions to tilt the trailer sideways and an overturning moment may be produced sufficient to roll the trailer over.
The same mechanism of roll-over is presented by ordinary tip trucks and dump trucks (articulated or otherwise).

**Significant contributing factors / Learning also included:**
- Reversing and dumping loads without supervision / spotter in place (note that radio control of dumping from associated mobile plant used to level the ground has been observed on sites providing supervision, spotting and ground preparation);
- Truck arriving when site is unattended and attempting to dump in areas not properly prepared; and
- Truck drivers not being aware of the risk presented by uneven ground and the need for proper site preparation.

**RECOMMENDATIONS**

The contractor in control of the site needs to ensure that:
- A Safe Work Method Statement (SWMS) is available for this work and it identifies the need for the ground to be properly prepared (flat and level) to prevent overturns;
- All drivers are site inducted and inducted into SWMS;
- The ground is prepared before each load is dumped;
- That dumping is not permitted if the site is not supervised in respect to safe reversing and ground conditions behind trucks and trailers;
- Pedestrians are excluded from immediate dumping area (potential overturn and rear of truck and trailer); and
- Drivers always wear seat belts.

**Quad Trailer and Semi Trailer Dump Truck Overturns**

Quad Trailers and Semi Trailer dump trucks are longer than conventional Dog Trailers and have a higher centre of gravity when tipping. As a consequence, the site ground conditions in terms of cross slopes, grades, and uneven surfaces can result in overturning moments and the rollover of the unit / trailer.

Following two incidents involving the overturning of Quad Trailers the Investigations conducted by the company identified some significant contributing factors / key lessons.

**The key lessons were:**
- PBS Quad Trailers should NOT be used to spread loads;
- Ensure tipper exclusion zone and appropriate traffic management are in place prior to raising body;
- No loads should ever be dumped on a downhill/cross slope; and
- All delivery sites to be inspected. The company concerned uses a truck operation customer site inspection checklist.

**Asphalt Works**

For asphalting the following is recommended to eliminate or significantly reduce the risk of overturns:

- Prior to and part of the site hazard analysis, undertake a review of the area being asphalted to ensure the surface, cross-fall and the stability of the surface
will not cause trailer overturns. Most asphalt sites are generally well prepared, hard standing areas;

• Prior to loading asphalt at the plant, the trailer body is sprayed with a lubricant to ensure loads do not stick in the trailer body when the hoist is elevated;

• The operator of the asphalt paving machine is seated in an elevated position and observes the asphalt delivery trucks as they discharge the asphalt into the paver. The supervisor is also in a position to observe the load discharge so any segregation clumping issues can be attended to. There is generally communication between these two activities and any issues with clumping of asphalt etc. are communicated; and

• Quad Tippers/Semi Tippers are not used for asphalt delivery to a paving machine. The asphalt is not usually discharged completely with the tipper fully elevated. It is discharged in stages of smaller lifts and rarely is the tipper body fully elevated, this would also reduce any risk of tipping over.

We are not aware of any overturns during asphalt paving works and provided the above industry advice is complied with closing of the adjacent traffic lanes is not necessary during asphalt paving works.

Spray Sealing Works
No overturns of spray sealing tippers have been reported so there is not an identified need to stop traffic in adjacent traffic lanes. The following reasons are given by SprayLine:

• Spray sealing tippers are smaller volume trucks generally 8 to 10m$^3$ with a few in the industry up to a maximum of 12m$^3$ capacity and therefore much smaller length bodies with a low centre of gravity not prone to overturns;

• Aggregate is a loose material that flows in the body of the truck and does not compact and become stuck and increase the risk of overturn like other materials may; and

• Spray sealing is carried out on existing road surfaces or well prepared solid pavements.

However, if aggregate is delivered to sites in Quad Tippers / Semi Tippers the risk of overturns will increase when tipping on uneven or softer stack site conditions. Therefore stopping of traffic in adjacent lanes will be necessary.
5. ARTICULATED DUMP TRUCK OVERTURNS

Incidents involving Articulated Dump Truck overturns have highlighted the need for this equipment to be driven within the manufacturer’s recommendations. Care needs to be taken in turns and reversing particularly when the wheels on one side of the tub (dumper trailer) are at a different height to those on the other side, due to ground conditions.

![Articulated Dump Truck Tub Overturn](image)

A dump truck was performing a U-turn when its tub tipped onto its side whilst the cabin remained upright. The tray body was lowered and loaded at the time of the incident and during the turn the vehicle slid sideways resulting in the tub body sliding onto a slight downward slope and rolling over.

The following Alert issued by Mineral Resources New South Wales in 2004 draws attention to other situations where this equipment has been shown susceptible to overturn.

**Incidents**

There have been a number of incidents where articulated all terrain dump trucks have overturned. All were near misses without significant injuries to operators who were wearing their seat belts.

**Circumstances**

In most incidents the circumstances were similar with the operator reversing the truck either up a windrow or a previously dumped load. This resulted in the rear of the truck (the tub) over balancing and overturning leaving the prime mover upright.

In another incident the operator was driving down a properly constructed road which had just been watered down. He lost control and failed to negotiate a roundabout, rolling the prime mover and the tub.
Investigations
Investigations have identified that the incidents were related to the Articulated All Terrain Dump Truck style of vehicle and not specific to one brand of vehicle.

In most cases the driver reversed the truck to either dump a load or allow another vehicle to pass. The rear wheels on one side climbed up the windrow or the previously dumped load. In some circumstances a change in height of 60 to 70 cm in one wheel set was sufficient for the tub to over balance and overturn.

In the incident where the driver failed to negotiate the roundabout, speed, driver inexperience and a wet road where significant contributing factors.

Recommendations / Lessons
Carry out a site specific risk assessment to determine suitability of this type of vehicle for the site. The risk assessment should include but not be limited to the following:

- Operating grades and slopes are within Original Equipment Manufacturer’s (OEM’s) specifications;
- Operating speeds are within OEM’s specifications;
- Adequacy of the site road design;
- Vehicles are not operated in an overloaded state;
- Vehicles have not been operated in an overloaded state;
- Vehicles have not been altered from the OEM’s specifications;
- Vehicles are fit for purpose;
- Review driver assessment and training for both experienced and inexperienced operators. Include situations which could lead to potential overturns and identify appropriate corrective actions;
- Raise driver awareness of potential overturn situations, through toolbox talks and/or driver retraining programs;
- Review loading and tipping procedures to include centralisation of loads and safe tipping zones; and
- As part of your accident / incident investigation and reporting process formally notify the OEM or his representative in writing of any overturn incident and the circumstances of the overturn.

Summary
It is evident that this type of plant is likely to overturn when reversing or lateral forces are applied to the tub during fast turning movements, particularly when the wheels on the inside of the turn are at a higher level (tub tilted outwards). Wet slippery conditions and overloading will also be conducive to creating the dynamics for an overturn to occur.

Please advise relevant contractors of the recommendations above and of the need to operate these machines within the safe operating parameters advised by the manufacturers / suppliers of the plant.
Under the Plant Regulations suppliers of plant are required to provide details of hazards and risks associated with the equipment which is usually supplied in the form of user manuals and manufacturer's safe operating instructions.

**Seat Belts Prevent Injury and Save Lives**
Operators should also be reminded of the need to wear seat belts or similar restraint devices to ensure they are not ejected or thrown around inside their vehicle should an overturn occur. Investigation of numerous overturn incidents has confirmed that the seat belts prevent injury and save lives.

6. **WATER TANKER RUN AWAY AND OVERTURN**
An unattended water tanker rolled down a site access road (7% grade), mounted a windrow, rolled over / down a seven metre long embankment (gradient 2:1), hit the top of a retaining wall and then fell onto an access road adjacent to and about four metres from a freeway.

Fortunately, no personnel were in the area at the time of the incident. The tanker sustained major damage.

![Tanker after it came to rest adjacent to the freeway](image)

**Investigation**
The investigation identified the following significant contributing factors:

- Mechanical failure of the vehicle’s hand braking system due to servicing practices not in accordance with specifications;
- Lack of maintenance of windrow on access road allowing the tanker to pass over it;
- Parking arrangements not made to safely park vehicles away from slope; and
- No instruction (or signage) to inform plant operators not to park on the slope.
Recommendations / Lessons to Prevent a Recurrence
Of the hazard from mobile plant runaways, due to mechanical failures and changing work environments.

Possible actions identified to prevent recurrence were:

- Plant owners to ensure safety critical features on all plant are periodically inspected and serviced exactly in accordance with specifications taking into consideration the impact of harsh working environments;
- Ensure adequate planning and monitoring of work environment for all parking situations to allow for plant to remain stable;
- Maintain all access roads and ensure all road features are adequate for the work environment;
- Monitor the quality of daily plant checks and regular maintenance; and
- Confirm driver knowledge about the need to park vehicles so they are fundamentally stable and not roll, with the engine off if unattended.

7. LOW LOADER OVERTURN
A Low Loader Trailer carrying an Elevating Work Platform rolled onto its side while being transported along a site access road. Fortunately, no one was injured.

The wheels of the low loader dropped into a dip in the access road and the resultant sudden sway of the trailer and the overturning moments produced by the high centre of gravity load resulted in the overturn of the trailer. The truck towing the trailer was not travelling fast at the time.

Investigation
The investigation found the dip in the access road to be a significant contributing factor and required that it be repaired. The dip was not obvious and may have resulted from wet weather subsidence.

See photographs on the next page.

Corrective Action / Lessons
It is recommended that all projects check their site access roads and ensure that they are maintained to provide safe access to the worksite and are monitored over time as part of site safety inspections.
Low Loader after incident. The dip in the road is shown in red circle.
The truck was being driven at a low speed.

View of low loader and EWP.
8. **BELLY DUMP TRUCK OVERTURN**

A Belly Dumper Truck overturned after dumping wet soil.

Fortunately, no one was injured but the dumper was damaged.

Dump Trucks of all types are subject to potential overturning if material sticks to one side of the trailer or tray when material is dumped. For details of overturn cause with conventional tipper type dump trucks refer to other incidents included within these Guidelines.

**Investigation / Lessons**

The contractor investigated the incident and considers the essential contributing factor to have been the use of unsuitable 'sticky / wet' material being used in the Belly Dumper. A large amount of material was stuck on the inside left of the trailer hopper which caused the dumper to become unstable during travel.

As the dumper moved forward some of this loose material was fed under the right hand trailer wheels causing the vehicle to lean further to the left and eventually the trailer to tip over onto its side taking the prime mover with it.

Previously the material had been conditioned, in this instance it was not conditioned and was wet.

**Corrective Action**

The use of Belly Dumpers with this material was discontinued on the project concerned.
9. TIPPER TRUCK MAINTENANCE AND OPERATION
A Tipper Truck when discharging its load of asphalt experienced a failure of the tipper body and overturn. The tipper tray and load broke free of the truck chassis and collapsed to the side of the truck narrowly missing a worker who was standing near that side of the truck – (it is essential that all personnel on site are aware of the potential for tipper trucks to overturn during operation and are kept well clear of the trucks during tipping operations).

Investigations conducted by the contractor involved found the following Significant Contributing Factors / Key Lessons:

• Loose bolts and cracking in welds and support rails were evident in the tipper body chassis connection that failed under tipping load conditions;
• An estimated one tonne of cold asphalt had stuck to the floor of the truck body subsequently contributing to the tip body slewing to the right side;
• The floor of the truck body had not been cleaned prior to loading preventing the hot asphalt discharging and placing extra loading at the top end;
• There had been no slip agent applied to the tipper body prior to loading; and
• The Plant Daily Check Sheet indicated the truck as roadworthy when the tyres were later deemed unroadworthy.

Tipper Body Frame Securing Bolts without Nuts
Recommendations / Learning by asphalt sub-contractor to prevent a recurrence included:

- Revising cartage contract specifications to require frame integrity inspection and roadworthy expectations, in addition to existing requirements for Plant to be maintained in accordance with the manufacturer specifications and Plant Regulation requirements.
- Appointing a qualified person to inspect cartage trucks on a regular basis.
- Asphalt Depot Procedures to include requirement not to load trucks with excessive asphalt build-up in trays.
- Ensure all truck bodies are cleaned out on a regular basis to prevent the build-up of material. Slip agent sprays fitted at loading points to spray truck bodies with ‘Asphaltrent’.
- Implement a training session for drivers of asphalt cartage trucks.
- Ensure all personnel on site are made aware of the risks near operating plant and to keep clear.

Management Responsibilities
All Contract Administrators and Surveillance Managers are requested to inform their contractors of this incident and determine what controls they have in place to prevent such an incident with their own or subcontractor’s tipper trucks.

Specifically:
- Frame Integrity Inspections.
- Roadworthy Requirements.
- Inspections by Qualified person of cartage trucks on a regular basis.
- Procedures for keeping pedestrians well clear of operating plant/trucks.

10. MOBILE CRANE OVERTURN
A Franna Mobile Crane was lifting and lowering two reinforcing cages (while stationary) to the ground when it rolled onto its side trapping the driver in his cabin until the windscreen was smashed to free him.

Franna after overturn

The estimated weight of the two cages was 4.5 tonne and the boom was extended. The crane had been setup on a side slope.
Investigation
The incident investigation was not able to identify a single significant contributing factor but the following factors were identified:

Significant Contributing Factors / Learning:
- The work was conducted on ground not constructed specifically as a crane working area and a 6 degree slope was present;
- The operator's manual suggests not exceeding about 5 degrees but was not specific and the bubble slope indicator is not very accurate. No alarms are fitted to the machine to warn the operator if the safe load operating envelop is exceeded;
- Rubber tyre deflections under load;
- The load was within limits of the crane but subject to being within a safe operating envelope / overturning moments; and
- Possible soft ground under mulch.

In summary the crane type did not suit the environment.
As a consequence the SWMS was revised to include an outrigger equipped crane on slopes.

11. EXCAVATOR OVERTURN
Most mobile plant is capable of overturn if the safe operating conditions with respect to slopes, gradients, cross falls are exceeded. Wet ground conditions will also result in tracked plant sliding down slope and overturning potential.

Incident
A 20 tonne Excavator engaged in benching construction slid down a ramp and overturned. The operator was wearing their seat belt and was not injured.

This incident highlights the hazard presented by wet ground conditions on slopes / ramps. Plant operators may have become accustomed to dry conditions and need to be made aware of the increased sliding risk in wet ground conditions.
The incident was reported to WorkSafe Victoria who attended site. A SWMS was in place, the operator held a certificate of competency for an excavator, was site inducted and not faults were found in the excavator.

**Incident Investigation**
The Incident Investigation found that the 20 tonne excavator slid down the ramp and overturned primarily because of wet ground conditions.

**Significant contributing factors were:**
- Loose spoil on ramp; and
- Affects of wet weather and slippery conditions on ramp.

**Corrective Action Taken:**
- Wet Spoil to be removed from access ramps; and
- Operators to be reminded of the risks when working on slopes following wet weather.

The incident was Tool boxed and a Safety Alert was circulated.

**Further Learning**
This incident is a reminder that all plant, including tracked machines, are likely to slide down slopes when soil becomes wet and slippery. Because of the long drought operators have become accustomed to dry conditions.

The excavator bucket impacted bridgework retaining wall construction at the bottom of the slope but fortunately did not cause any significant damage or cause the collapse of temporary structure supports.

It also highlights the risk of workers / works being down slope of plant in these conditions.

The operator was wearing his seat belt (as was site policy) prevented injury. Once again this demonstrates and reinforces the safety advantages of wearing seat belts at all times during plant operation.

A Prohibition Notice was issued by the VWA requiring the excavator to be provided with a full inspection to ensure it was safe to operate before being placed back into service.