



Earth Moving Equipment Safety Round Table



Information gateway for improving Human Factors design



Sue Leveritt

Minerals Industry Safety & Health Centre



MISHC role for EMESRT



- Gather input on design requirements
- Source information about unwanted events & leading practice design related to design philosophies (DPs)
- Make information available to sites and OEMs



DP information useful for sites & OEMs



- Practical information about
 - Risks to be mitigated
 - ❖ Safety alerts, safety bulletins, accident reports
 - Industry attempts to mitigate risks
 - ❖ Innovations sourced from industry awards, company programs



How can this info be useful?




- Assist sites with decisions related to equipment procurement
- Assist OEMs to understand how people operate and maintain equipment
 - What happens in practice rather than in theory

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http://www.nrw.qld.gov.au/mines/inspectorate/pdf/incident_report008.pdf

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Queensland
Department of
Mines and Energy,
GPO Box 194,
Brisbane Q4001,
Australia.

SH
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FIRE ON DIESEL ELECTRIC TRUCK

MINE TYPE: Coal Mine - Surface

INCIDENT: A 1982 Diesel Electric Truck burst into flames while undergoing dynamic horsepower testing and adjustment. The truck was being driven down a ramp fully laden with a tradesman strapped into a body harness on the front deck of the truck performing adjustment. After the fire was noticed the truck was brought to rest and two attempts were made to stop the engine using the key switch in the cab and an emergency stop switch at ground level. An attempt was made to activate the fire suppression system which did not work. The fire was extinguished using mobile fire fighting equipment but re-ignited after supplies of water and foam were exhausted at the incident site. The fire was eventually put out almost four hours after it started. No injuries were sustained, the truck has been written off.

EQUIPMENT: Diesel-Electric Off Highway Vehicles - Haul Trucks

HAZARD: Fire on mobile equipment

CAUSE: A fuel hose fitting failure is suspected. Fuel being sprayed onto an engine turbo charger or exhaust manifold and subsequent ignition is the most probable cause of the fire. This could not be established conclusively due to the extensive damage to the machine. Important incident factors include:

The fire suppression system fitted to the truck had discharged on the Hard Stand seven days earlier and had not been recharged. It had been noted as a defect by maintenance personnel but not acted upon. Pre-start inspections on the truck included fire extinguishers but not the fire suppression system.

The stop systems installed on the truck were not fail safe. It is suspected that fire had destroyed wiring making them inoperable. The diesel engine continued to run after the fire started and probably only stopped after the fuel pump vee belt burnt through.

No barriers or guards were installed on the truck to prevent fuel spraying onto hot equipment in the event of fuel line or fitting failure.

Routine truck maintenance and servicing did not include regular inspection of fuel lines and fittings or the fire suppression system, or life cycle replacement of fuel lines and fittings.

COMMENTS & RECOMMENDATIONS:

Designers / manufacturers / suppliers and owners / operators of plant on mines need to be aware of the potentially catastrophic consequences of such a fire and ensure they comply with their statutory duties with respect to such plant. This includes identification of hazards, assessment of associated risks and the elimination and effective control of those risks.

In this case the identification and repair of defective equipment (fuel fitting) and/or the installation of barriers or guards to prevent fuel spraying onto potential ignition sources, could have prevented the fire from occurring.

The timely identification of defective equipment (fire suppression system and water and foam supply)

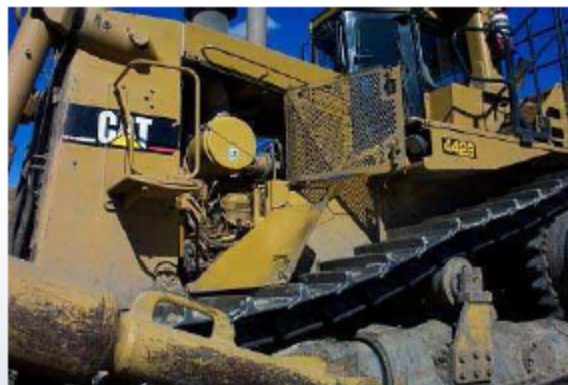
1 of 1

Unknown Zone



Caterpillar D11R Dozer (Engine Access Door)

- **Problem:** Engine bay door opened outwards on an angle creating an angled platform that created an access hazard.
- **Solution:** Redesign of lower hatch so that it created a level work platform, for changing oil filters.



13 September, 2004

8



Information gateway



www.mirmgate.com

**Tool to deliver information about
EMESRT Design Philosophies to
sites and OEMs**



MIRMGate 2001-2004



- Australian State Regulators (2001 - 2003)
 - Initial development
- Mining companies (2004)
 - Official launch



Minerals Industry Risk Management gateway (MIRMgate)



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MIRMGate 2005-2007



- Minerals Council of Australia (2005 – 2006)
 - Australian focus
- International Council on Mining & Metals (2005 - present)
 - Global focus
- EMESRT (2007 – 2008)
 - Equipment design focus



MIRMgate features



Earth Moving Equipment
Safety Round Table


- Resources that assist with management of Minerals Industry Safety & Health Risks
 - Australian & global
- Searchable library of information
 - Browse by hazard, subject & task
 - Search by keyword
- Alert Service (added in 2006)
 - Notification by email of new information about selected topics
- Managed by MISHC

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your one-stop shop for good
practice information about
managing safety and health
risks in the minerals
industry.

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EMESRT focus for MIRMgate



- **Identification of new & existing resources**
 - Information related to equipment design issues
- **Additional 'tag' to enable search for 'EMESRT type'**
- **MIRMgate Alert Service**
 - Customised to enable notification of new information about EMESRT design philosophies



Information related to equipment design issues



- Safety alerts
- Innovations
- Guidance material
- Company standards/protocols
- Research reports



MIRMgate Customisation





What's been done so far

- Search tools customised
 - Search for “EMESRT type”
 - Drill down to specific design philosophy

- MIRMgate Alert service customised
 - Notify MIRMgate users when new information related to EMESRT design philosophies becomes available



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Dust
Isolation
Visibility/ collision detection
Machine stability / slope indication
Guarding
Displays, controls, including labelling
Tyres & Rims
Manual materials handling
Work postures
Confined space

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Results for "MIRMgate.EMESRT:"Visibility/ collision detection"" 1 - 5 of 5 results

- Scraper Driver Injured in Collision with Haul Truck**

Identifier SA 04-22
Identifier http://www.dpi.nsw.gov.au/__data/assets/pdf_file/66877/Safet...

What Happened A large rear dump truck collided with a scraper at a large surface mine. The scraper cabin was extensively damaged in the collision. Fortunately the scraper driver only sustained moderate injuries and the truck driver was uninjured.

Why It Happened The scraper entered the haul road on the blind side of the truck; The truck driver did not see the scraper enter the haul road.

Recommendations All surface mines using similar equipment should: Review Risk Assessments and Safe Work Procedures for the operation of ancillary mobile equipment on haul roads where large dump trucks are operating; Review communication systems for ancillary mobile equipment; Inform the workforce through tool box and safety meetings the hazards associated with ancillary mobile equipment entering haul roads on the blind side of large dump trucks...

Type Lessons Learned | Safety Notice ; EMESRT

EMESRT **Visibility/ collision detection**

Risk Identification ***

Risk Analysis *

Risk Control *****

[More Information](#)
- Dump Truck Trays Hit Overhead Structures**

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Results for "MIRMgate.EMESRT:"Machine stability / slope indication"" 1 - 8 of 8 results

- Articulated Dump Truck Roll Overs**
Identifier SA 03-01
Identifier http://www.dpi.nsw.gov.au/__data/assets/pdf_file/67459/Safet...
What Happened In recent months there have been a number of incidents where articulated all terrain dump trucks have rolled over. All were near misses without significant injuries to operators.
Why It Happened Investigation has identified that the incidents are 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 other vehicles 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 70cm in one rear wheel set was sufficient for the tub to over balance and roll over (see photograph). In the case where the driver failed to negotiate the roundabout, speed, driver inexperience and a wet road were major factors contributing to the incident.
Recommendations 1. Carry out a site specific risk assessment to determine suitability of this style of vehicle for your mine site. The risk assessment should include but not be limited to the following: Operating grades and slopes are within Original Equipment Manufacturers (OEMs) specifications; Operating speeds are within OEMs specifications; Adequacy of your road design...
Type Lessons Learned | Safety Notice ; EMESRT
EMESRT Machine stability / slope indication
Risk Identification ***
Risk Analysis *

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MIRMgate Customisation



What's been done so far

- Search tools customised
 - Search for “EMESRT type”
 - Drill down to specific design philosophy
- MIRMgate Alert service customised
 - Notify MIRMgate users when new information related to EMESRT design philosophies becomes available


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- ALL EMESRT types

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| <input type="checkbox"/> Working at Heights | <input type="checkbox"/> Guarding |
| <input type="checkbox"/> Noise | <input type="checkbox"/> Displays, controls, including labelling |
| <input type="checkbox"/> Vibration | <input type="checkbox"/> Tyres & Rims |
| <input type="checkbox"/> Fire | <input type="checkbox"/> Manual materials handling |
| <input type="checkbox"/> Dust | <input type="checkbox"/> Work postures |
| <input type="checkbox"/> Isolation | <input type="checkbox"/> Confined space |
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☒ Noise

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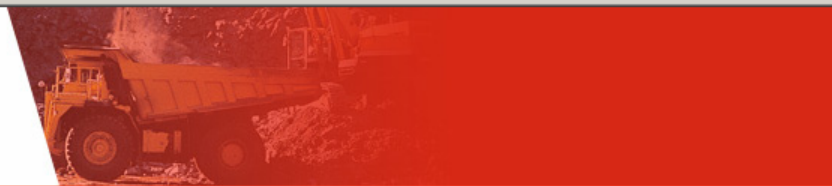


End 2007

- Interactive design philosophy summary sheets (8 in 2007)
- Searching simplified
 - Direct links to list of related search results



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EMESRT



[Click here](#) to access the EMESRT Gateway to information related to EMESRT design philosophies.

Project Name

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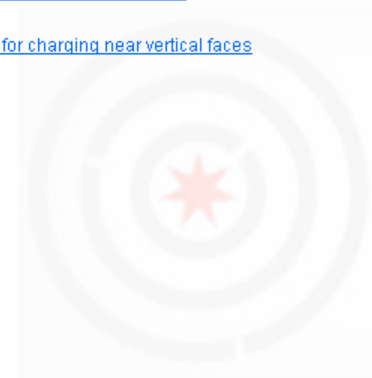
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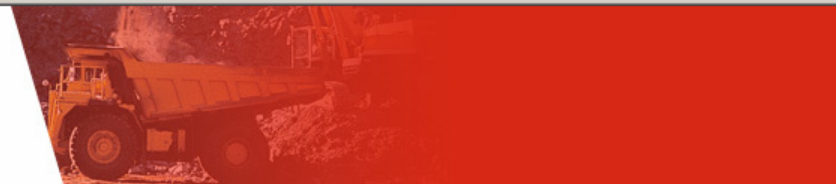
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"The Earth Moving Equipment Safety Round Table (EMESRT) was formally established in 2006 by a group of major mining companies from around the world. Member companies currently are Anglo American, Barrick, BHP Billiton, Newmont, Phelps Dodge, Rio Tinto and Xstrata."

[Click here](#) to read more about EMESRT

EMESRT purpose

Accelerate development and adoption of leading practice designs for earth moving equipment to minimise the risk to Health and Safety through a process of Original Equipment Manufacturers (OEM) and user engagement



EMESRT Design Philosophies

1. Access & Egress
2. Working at Heights
3. Noise
4. Vibration
5. Fire
6. Dust
7. Isolation
8. Visibility / collision detection
9. Machine stability / slope indication
10. Guarding
11. Displays, controls including labelling
12. Tyres & Rims
13. Manual Materials Handling
14. Work postures
15. Confined spaces

Keep up to date with the latest information about EMESRT design philosophies.

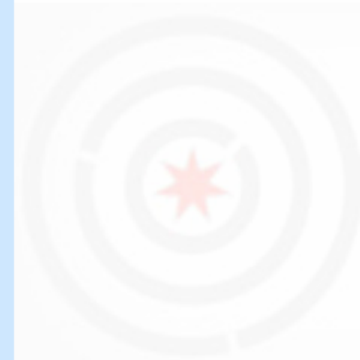
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Risks to be mitigated

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1. Equipment Access & Egress

Objective

The objective is to minimise the risk of operator or primary access events related to approach, access & egress of equipment; as well as slip/trips, sprains/strains, falls from height and failure to egress in an emergency events to ALARP, including consideration in design for foreseeable human error.

General outcome

The intended design outcome should include the following:
Adequate/suitable stairways, walkways, access platforms,
railings, steps/grab handle combinations and boarding
facilities including an alternate path for disembarking in
case of emergency.

Specific to hauling trucks, a priority outcome would also be ground entry to access on driver's side, with the opportunity to locate isolation and other service points (hydraulic, air) near the operator access.

Risks to be mitigated

1. Risk of collisions due to persons and small vehicles being positioned on the operator's blind side
2. Risk of collisions due to restricted operator vision from the cabin being restricted by machine access and other structures
3. Risk of slips trips and falls during access to service points and work platforms due to lack of fall from height protection, slippery surfaces, accumulations of dirt or other material or poorly lit at night
4. Risk of sprains and strains due to ergonomically difficult body positions during accessing equipment
5. Risk of entrapment should normal access be blocked
6. Risk of entrapment from a fire in the engine bay
7. Risk of explosion injury due to tyre heating on positions 1 & 2 tyres

Industry attempts to mitigate risks

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Risks to be mitigated



1. Equipment Access & Egress

Objective	The objective is to minimise the risk of operator or primary access events related to approach, access & egress of equipment; as well as slip/trips, sprains/strains, falls from height and failure to egress in an emergency events to ALARP, including consideration in design for foreseeable human error.
General outcome	The intended design outcome should include the following: Adequate/suitable stairways, walkways, access platforms, railings, steps/grab handle combinations and boarding facilities including an alternate path for disembarking in case of emergency. Specific to hauling trucks, a priority outcome would also be ground entry to access on driver's side, with the opportunity to locate isolation and other service points (hydraulic, air) near the operator access.
Risks to be mitigated	<ol style="list-style-type: none"> 1. Risk of collisions due to persons and small vehicles being positioned on the operator's blind side 2. Risk of collisions due to restricted operator vision from the cabin being restricted by machine access and other structures 3. Risk of slips trips and falls during access to service points and work platforms due to lack of fall from height protection, slippery surfaces, accumulations of dirt or other material or poorly lit at night 4. Risk of sprains and strains due to ergonomically difficult body positions during accessing equipment 5. Risk of entrapment should normal access be blocked 6. Risk of entrapment from a fire in the engine bay 7. Risk of explosion injury due to tyre heating on positions 1 & 2 tyres 8. Risk of injury to persons on the ground caused by objects being kicked off the access platforms 9. Risk of injury caused by fasteners, brackets and fittings that protrude into the walkways
Examples of industry attempts to mitigate risks	<p>For haul trucks</p> <ol style="list-style-type: none"> a. Ground entry to access from driver's side, with the opportunity to locate isolation and other service points (hydraulic, air) near this operator access <p>All equipment</p> <ol style="list-style-type: none"> b. Sufficient independent egresses, one of which is the normal access stairway c. Emergency egress free and unencumbered with path-to-ground as rapid as possible d. Non-slip surfaces and edges suited to operating conditions (ice, mud, etc.) e. Adequate access lighting with two-way switching from cab and ground level, step tread highlighting f. Steps designed to minimise damage in operation, minimise impact on operator visibility and minimise accumulation of material g. Guardrails that protect for fall during access h. A stable, bottom step on the access that is not greater than 400mm (16 inches) from level ground i. Specialised powered access systems designed for primary access only that fail to a safe position and can only be able to lower when the machine has been parked with all implements lowered and the park brake applied. j. Kickboards that prevent objects from falling from platforms onto persons that may be below

Industry attempts to mitigate risks





How can this information be used by sites?



- Purchase of new equipment
 - DP information, Standards
- Retrofits of high risk existing equipment



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