

# AS 5327 - Earthmoving Machinery Access Systems

29<sup>th</sup> New South Wales Mechanical Engineering Safety Seminar

Sydney, Australia

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*Representing: CMEIG - Construction & Mining Equipment Industry Group*



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# Agenda

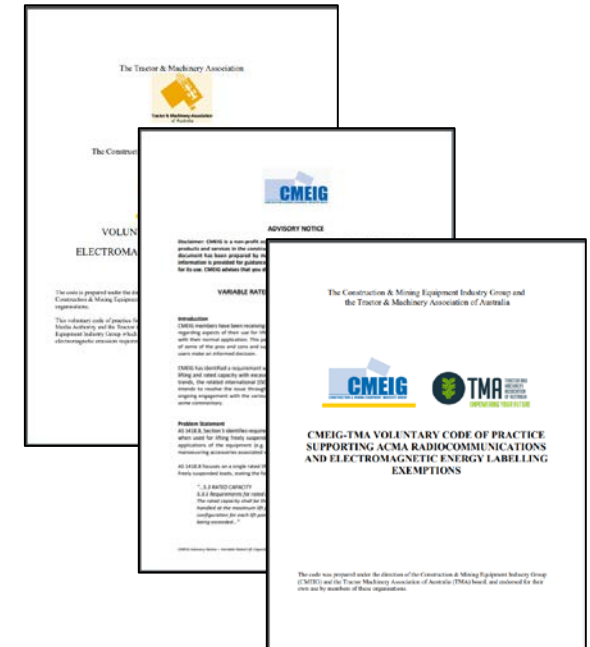
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- CMEIG EWG
- Topic Introduction
- History and catalysts
- AS 5327 Development process
- AS 5327 Details
- Some additional considerations
- Summary

# CMEIG Engineering Working Group

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- A 'branch' of CMEIG
- Technical SME's from various CMEIG members
- Group aim:
  - Represent the industry on various Australian Standards committees
  - Liaise with regulatory bodies in all States/Territories
  - Industry standards and regulations harmonisation
  - Advise on technical issues relating to the operation of construction and mining equipment



# AS 5327:2019 – New Australian Standard

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- *AS 5327:2019 – Earth-moving Machinery – Design Guide for Access Systems*
  - Earthmoving Machinery
  - Enclosure Openings, Stairways, Steps, Ladders, Walkways, Platforms, Guardrails, Handrails etc
  - Access to operator station and routine\* maintenance points
  - Parked machines\*
  - Slips, trips and falls, postures and excessive effort



# Watershed Moment (2016)

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Department  
of Industry  
Resources & Energy

Mine Safety

## MINE SAFETY INVESTIGATION UNIT

INFORMATION RELEASE

### Serious injury

**Incident date** 1 February 2016

**Event** Worker seriously injured in fall from articulated dump truck

**Location** [REDACTED]

#### Overview

A plant operator was preparing to unload a [REDACTED] articulated dump truck that was transported to site on a low loader. During preparation, the operator accessed the top of the right front wheel arch to adjust the side mirror. After making the adjustment, the operator turned and walked toward the access steps where he fell to ground level. The operator suffered a skull fracture in the fall.

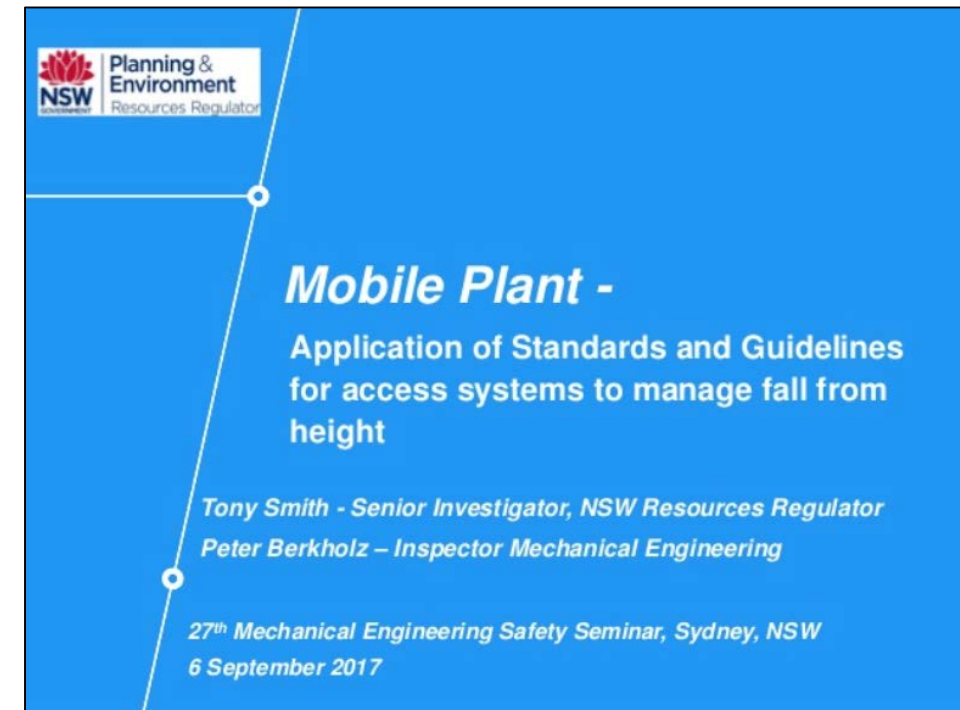


Photograph of the access ladder provided on the off-side of the [REDACTED] dump truck.  
The red arrow indicates the direction of the fall from the front wheel arch.

# Presentation at NSW MESS (2017)

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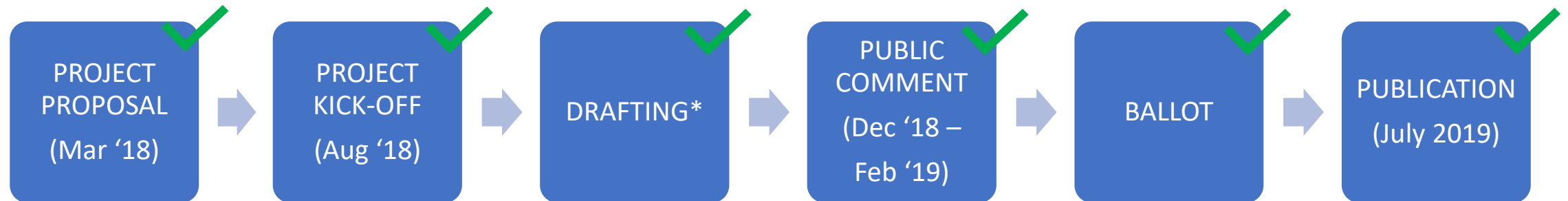
- Confusing, often-conflicting guidance being sought by industry
  - NSW MDG 15
  - AS 3868
  - AS 1657
  - ISO 14122 (4 part series) - \* AS DR 4024.2201-AS 4024.2204
  - ISO 2867
- Variability in approach
- Specific standards conformance concerns
- Need for one\* safe source of guidance



# AS 5327 Development

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- Ad-hoc working group formed (Oct '17) - commenced review and scoping





# Standards...who writes them?



# Who really writes them?

- Consensus document
- By industry for industry
- Net benefit of Australia

## **ME-063 – Standards Australia committee for Earthmoving Equipment**

### **Stakeholders:**

- **AIG** - Australian Industry Group
- **CMEIG** - Construction and Mining Equipment Industry Group
- **QLD DNRME** - Department of Natural Resources, Mines and Energy (Qld)
- **IICA** - Institute of Instrumentation, Control and Automation Australia
- **MCA** - Minerals Council of Australia
- **MEMMES** - Mining Electrical and Mining Mechanical Engineering Society (Engineers Australia)
- **NSW RR** - NSW Department of Planning and Environment
- **SafeWork NSW**
- **UQ** - University of Queensland

# WHS and NSW COP (AS 5327 Review)

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- WHS Regs (e.g. Part 4.4)
- NSW COP – *Managing the risk of falls at workplaces:*

## 10. DESIGN OF PLANT AND STRUCTURES

### 10.2 PLANT

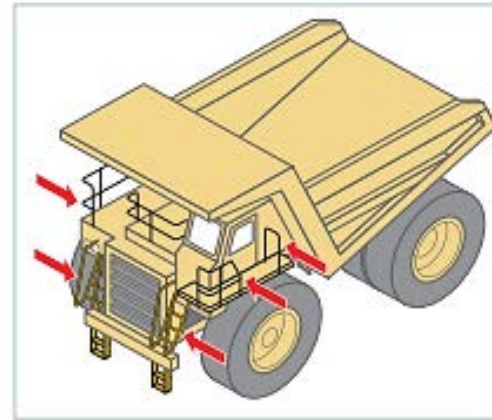
Safety considerations at the design stage could include:

- providing adequate steps and hand rails on vehicles (see Figure 34)
- incorporating a fall prevention system in silos and overhead conveyors
- ensuring workers who will be maintaining or cleaning the plant are able to do so safely
- considering the safety of passengers.

#### Section 22

*Designers must provide information to each person who is provided with the design that includes information on the purpose for which the plant was designed and how to use the plant safely.*

Figure 34 – Dump trucks.



# MDG 15 (AS 5327 Review)

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To minimise the potential for accidents relating to mobile plant access three points of contact should be provided on access systems, with access systems being positioned to provide an ergonomic safe access, which is intuitive for a person to use. So far as reasonably practicable access systems should be in accordance with either:

→ AS 3668 and AS 1657 or

→ ISO 2867 and ISO 14122 Parts 1 to 4.

To minimise the risk of falling, plant operators and maintenance personnel should be able to carry out normal duties without leaving a designated walkway, access platform, or the ground.

Where this is not reasonably practicable and there is a potential that a person could fall, consideration should be given to the provision of harness points or other methods of safe access provided for (such as mobile work platforms).

# MDG 15 (AS 5327 Review)

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To minimise the risk of falling:

- stairs should be provided wherever practical
- ladders should be installed in the 'preferred' or 'recommended zone' as set out in AS 1657 or ISO 14122.1
- the bottom step of the primary access should not be more than 400 mm from ground level as measured on flat ground.

Where this is not reasonable practicable then retractable stairs or ladders should be installed.

Flexible bottom steps should be avoided unless there is no reasonably practicable alternative.

A means of preventing retractable stairs from being damaged should be provided. Measures should be implemented to prevent the stairs or ladder being in the lowered position while the vehicle is being moved.

# MDG 15 (AS 5327 Review)

*Images shown here are for illustrative purposes only*

To minimise the risk of slips, trips and falls:

- handrails should be in a continuous length without sudden changes of direction to assist evacuation with minimal visibility
- walkway surfaces should be non-slip and self-cleaning
- openings in guardrails for access to ladders should be fitted with a hinged or sliding guardrail gate where reasonably practicable. Chains should not be used
- hinged gates should open onto the platform and should be self-closing



# MDG 15 (AS 5327 Review)

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Two means of egress should be provided from the operator's cabin to the ground including:

- a) at least one means of easy egress (normal access e.g. cabin door) and
- b) at least one means of emergency egress

At least one means of egress should be useable in the event of a hazardous condition such as, mobile plant roll-over or where the normal access is blocked such as fire, or other hazard

The emergency egress should be suitably marked and could be achieved by a second door, a push out window or other alternative means.

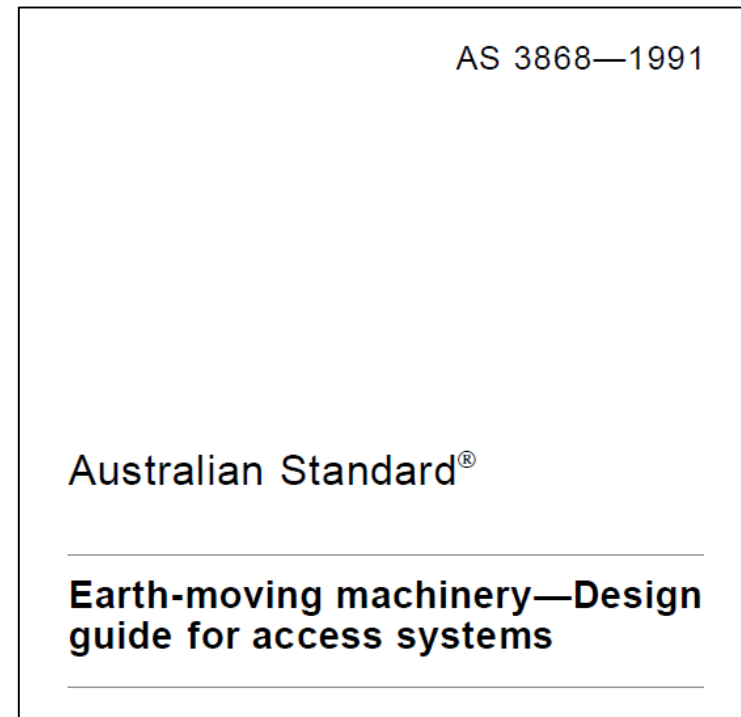
At least one of these means of egress should not be near a potential fire source, that is, a potential source of fuel that can be ignited and sustain a fire.

Except for escape chutes, all means of egress should have provision for three points of contact (for example, handrails on both sides of escape ladders).

# AS 3868 (AS 5327 Review)

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- *AS 3868-1991 – Earth-moving machinery – Design guide for access systems*
  - Modified adoption of ISO 2867-1980
  - Withdrawn (2019) - Revised and redesignated AS 5327:2019





# AS 1657 (AS 5327 Review)

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- *AS 1657-2018\* – Fixed platforms, walkways, stairways and ladders – Design, construction and installation*
  - Fixed plant focused, not written with EMM in focus (e.g. intended compatibility with Nat'l Construction Code for buildings)
  - Reviewed, good practice aspects from AS 1657 adopted in AS 5327
  - Consideration of unintended consequences when applied as a 'strict compliance' standard to mobile EMM



# Sidebar - AS 1657:2013 vs AS 1657:2018

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- **AS 1657:2013**

NOTE: This Standard may also be used for guidance in providing access to some parts of mobile plant, light and telecommunication towers, wind turbine towers and water and sewerage facilities. While such access may not be capable of complying with all the requirements of this Standard, the principles and imposed actions should be followed.

- **AS 1657:2018**

NOTES:

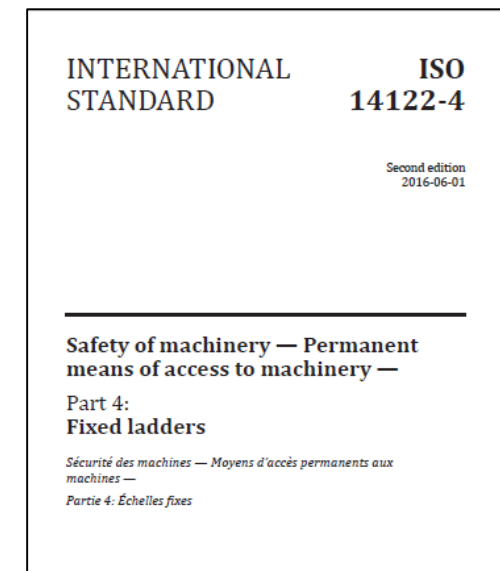
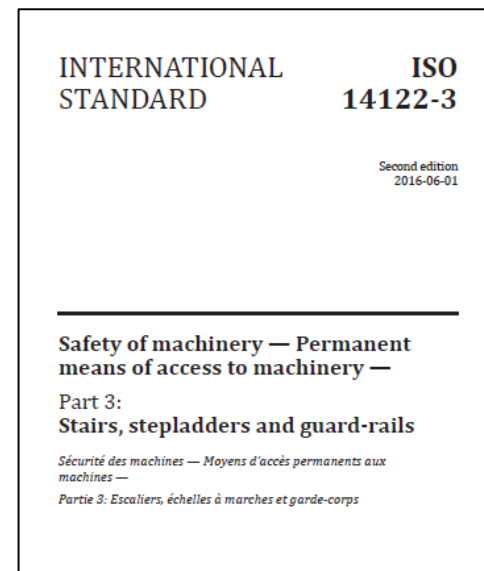
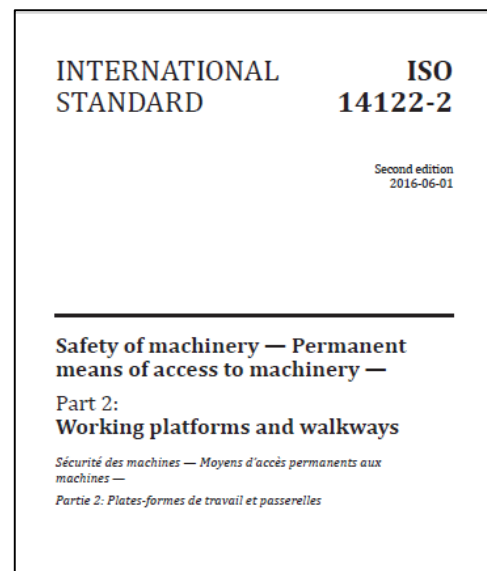
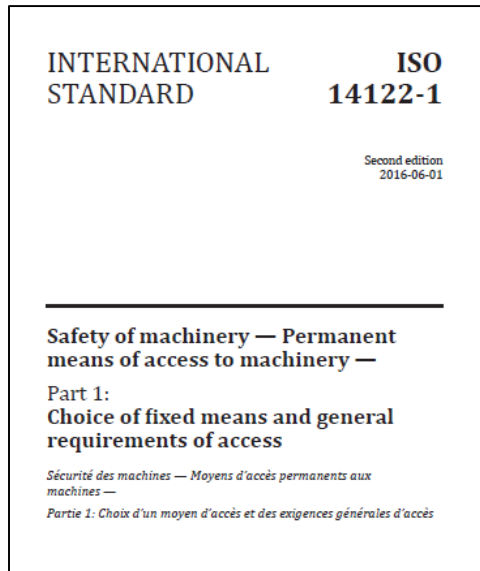
- 1 In the absence of a directly applicable Standard, this Standard may be used for guidance in providing access to some parts of stationery and mobile machinery, light and telecommunication towers, wind turbine towers and water and sewerage facilities. While such access may not be capable of conforming to all the requirements of this Standard, the principles and imposed actions should be followed.

→ **AS 5327:2019**

# ISO 14122 Series (AS 5327 Review)

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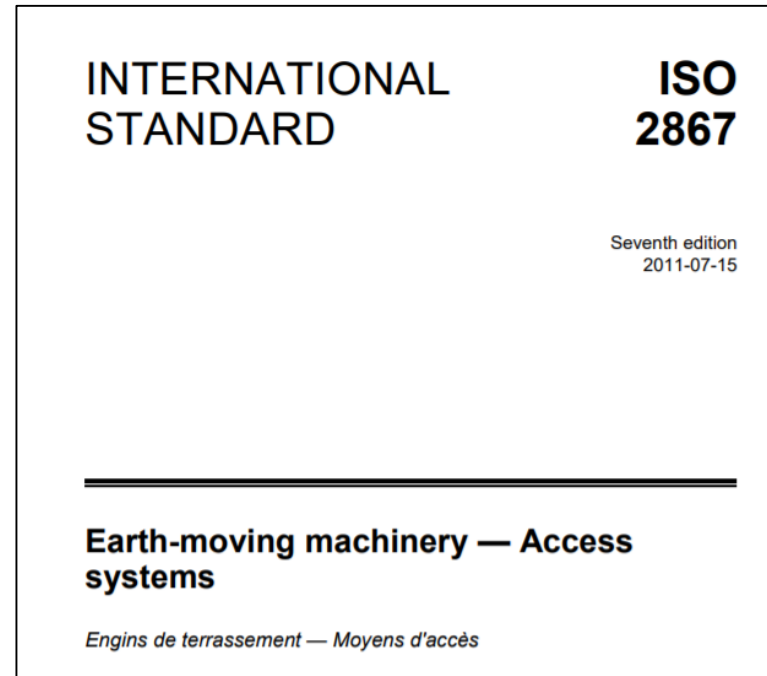
- **ISO 14122:2016 (Parts 1-4) – Safety of Machinery – Permanent Means of Access to Machinery**
  - AS DR 4024.2201-2204\*
  - Type-B standard



# ISO 2867 (AS 5327 Review)

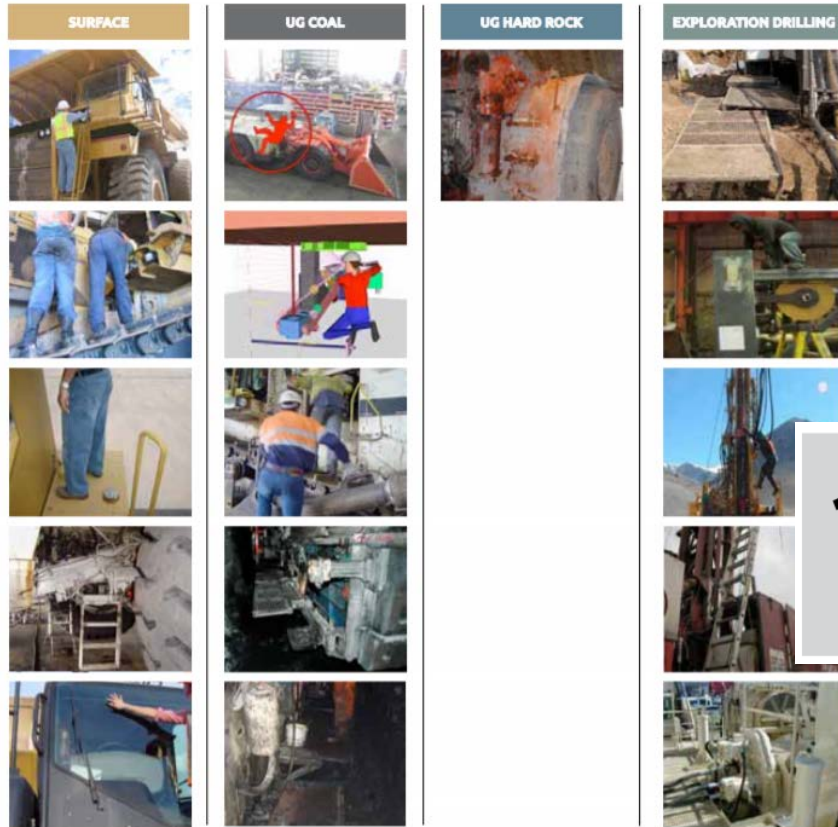
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- *ISO 2867:2011 - Earth-moving machinery — Access Systems*
  - Earthmoving machinery specific
  - Type-C standard (takes precedence over related Type-B standard – ISO 14122)



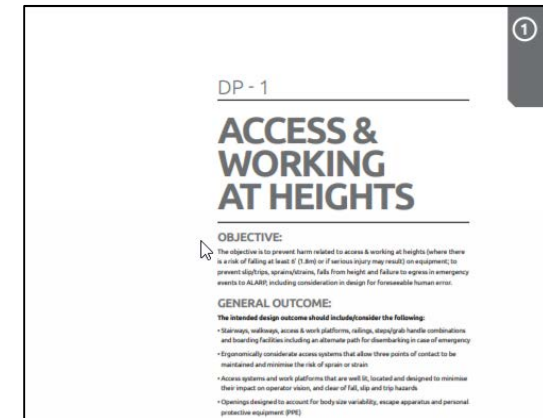
# EMESRT Design Philosophy – 1 (AS 5327 Review)

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## 1.1

**Injury during access to equipment and its routine service and inspection points, work platforms and operator workstation due to poor location of service and inspection points, lack of fall from height protection, premature failure of components due to corrosion, slippery surfaces, accumulation of dirt or other material, or poorly lit environment**



# AS 5327 Details

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- AS 5327 is a modified adoption of ISO 2867:2011
  - Harmonise/standardise into one primary source document
  - Addresses issue of conflicting guidance due to previous reference to AS 1657, AS 3868, ISO 14122 series
  - Complementary to ISO 2867:2011
  - Internationally aligned + significantly more detail relevant to EMM (e.g. powered access)
  - Optionality to influence next ISO revision in '20-'21 timeframe
- Includes a number of good practice recommendations
  - Adapted from reviewed guidance (MDG-15, AS 3868, AS 1657, ISO 14122 series, EMESRT DP)
- Includes guidance on hierarchy of selecting access systems types
  - Adapts AS1657 concept of 'unsafe zone' to EMM context
- Guidance on hinged gates retained from MDG-15
  - Note: not the intent that all platforms/walkways have gates, i.e. "where practicable"



# AS 5327 Details

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- Visibility contrast of access systems touch points
- Visibility or textural contrast of leading edges of steps
- Logic sequence for  $\leq 400\text{mm}$  first step height recommendation
  - 400mm where practicable → retractable steps where practicable → flexible steps where practicable → lowest practicable height
- Guardrails  $\geq 2\text{m}$ 
  - Where there is a significant risk of fall @ $<2\text{m}$ , alternative protective measures (e.g. **handrails** to enable 3 points of contact, job site/task management etc)
- Powered access system and functionality
  - e.g. hold to run, interlocks, manual release etc
- Change management for modifications

# A few clarifications

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- Common misunderstanding of what is a Guardrail and what is a Handrail  
*[Paraphrased] “you need handrails to protect service technicians from a fall hazard...”*

**AS 5327 (ISO 2867) Definitions -  
guardrail**

device *installed along the open sides* of walkways or platforms *providing protection from falling*

**handrail**

device *for hand placement that aids body support and balance and permits hand movement* on the device while moving on an access system

- ‘We use AS in Australia...’
  - Many AS are actually adoptions of ISO standards
  - Mix of approaches depending on context (e.g. ISO DTA, ISO MOD, AS, AS/NZS)
- The ‘biggest’ or ‘smallest’ may not always be the ‘best’ or ‘safest’ approach e.g.  
*[Paraphrased] “we require strict compliance with AS1657...”*

- AS 1657 not written with earthmoving machinery considerations in mind – strict compliance approach can result in unintended consequences!





# For consideration

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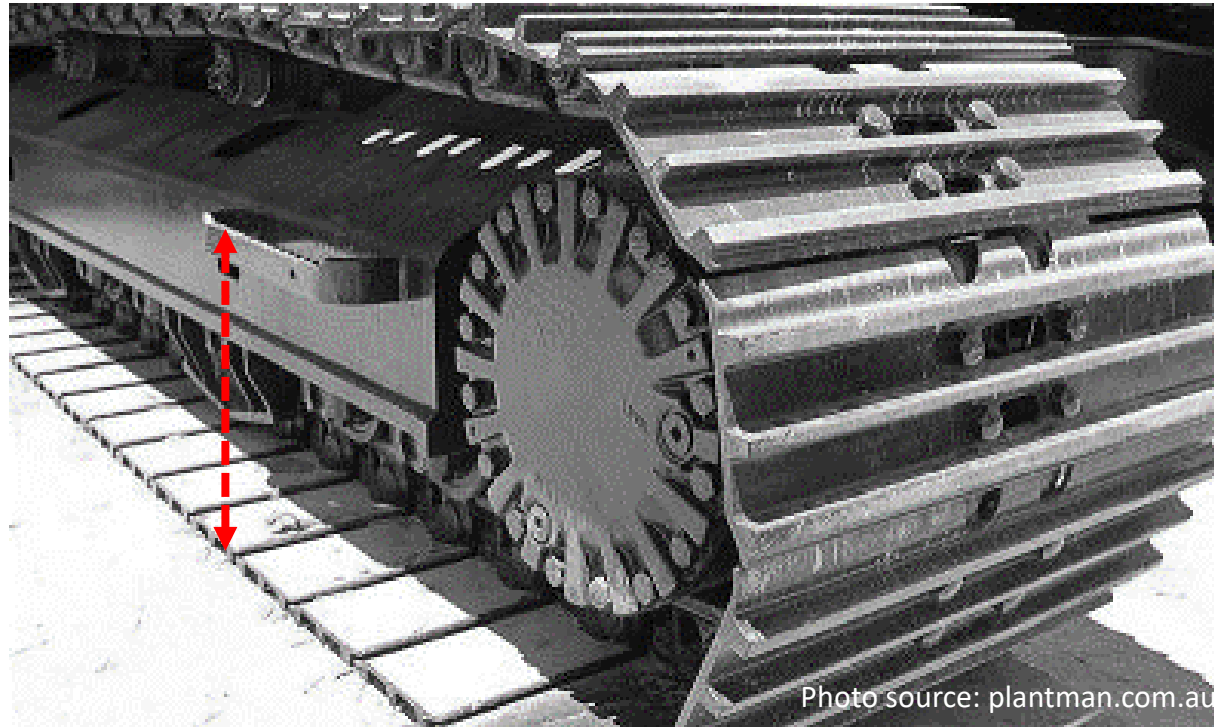
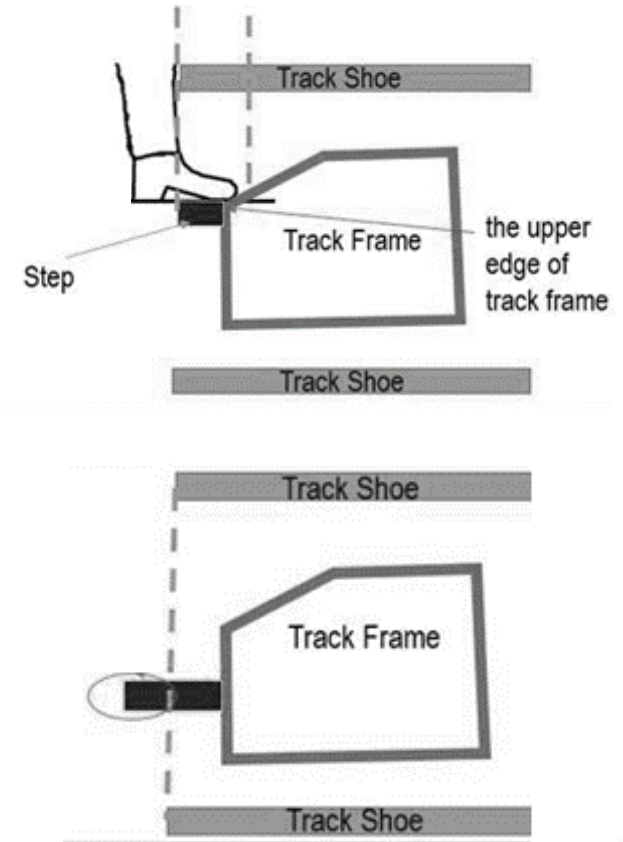
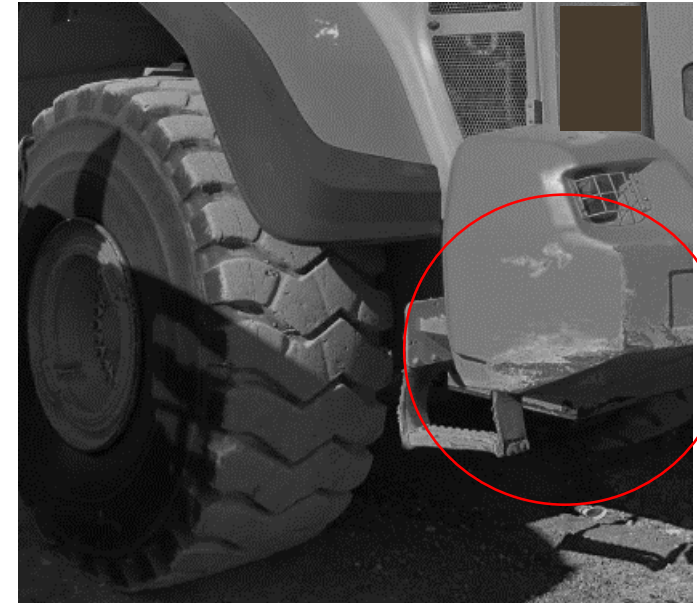
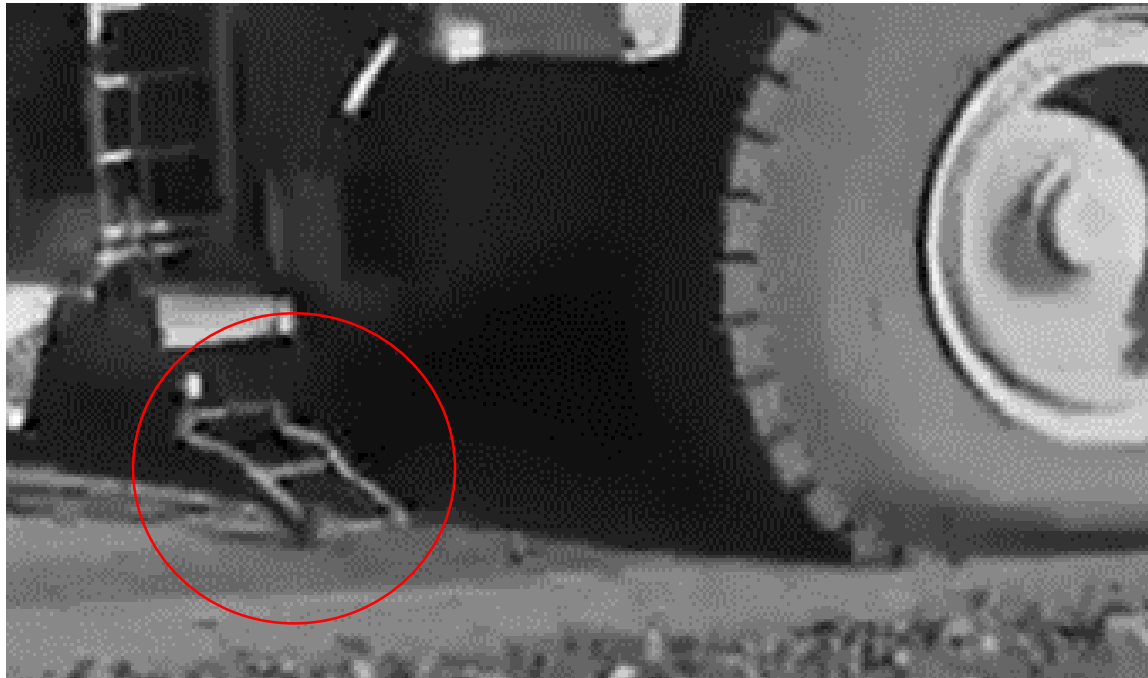


Photo source: plantman.com.au



# For consideration

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# Balancing of many variables – a holistic approach

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# Summary

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- New earthmoving machinery access systems standard – AS 5327:2019
  - Complementary to ISO 2867:2011
- Developed by industry for industry
- Development process reviewed relevant aspects of all of the following:
  - MDG 15
  - EMESRT Design Philosophy - 1
  - AS 3868:1991
  - AS 1657:2018
  - ISO 14122 (4 part series) - *aka. AS DR 4024.2201-AS 4024.2204*
  - ISO 2867:2011
- Intended to be the primary source of reference for earthmoving machinery access systems in Australia

## NATIONAL FOREWORD

This Standard is the primary source of guidance for designers, manufacturers, importers, suppliers, end-users and maintainers in relation to the design of earthmoving machinery access systems in Australia. This Standard was prepared to address the preceding issue of multiple, conflicting guidance relating to the design of access systems for earth-moving machinery.

A modified text adoption, rather than a direct text adoption of ISO 2867:2011, has been chosen to provide further clarity and guidance on specific aspects of earthmoving machinery access systems. This is to account for Australian incident history, current practice, as well as Australia's relatively high level of earthmoving machinery health and safety expectations. It is the intention of the Standards Australia Committee ME-063 that as ISO 2867 comes up for further revision, the ME-063 committee would prefer to influence its direction, rather than continuing with a modified text adoption, i.e. it is envisaged that this modified adoption will be withdrawn subject to the next revision of ISO 2867.

In addition, this Standard is intended to be the primary reference in relation to the design of access systems on earthmoving machinery. Formerly AS 3868—1991, AS 1657 and ISO 14122 were used for access systems on earthmoving machinery.



<https://www.cmeig.com.au/working-groups/engineering/>