CMEIG Engineering Working Group

National Construction Equipment Convention (NCEC)

Sydney, Australia

16th November, 2018

Presented by

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The Construction & Mining Equipment Industry Group (CMEIG) is a non-profit organisation to represent the construction and mining equipment industry and allied equipment and services on issues impacting on the delivery of business.

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Agenda

- EWG Introduction

- Activity ‘snapshot’
  - Standards Development Activities
    - Access systems
    - Rubber tired equipment, in-service brake testing
  - CMEIG Papers
    - Rated Load Measurement for Wheel Loaders
    - Rated Capacity Indicators for Tracked Excavators

- Questions/Comments

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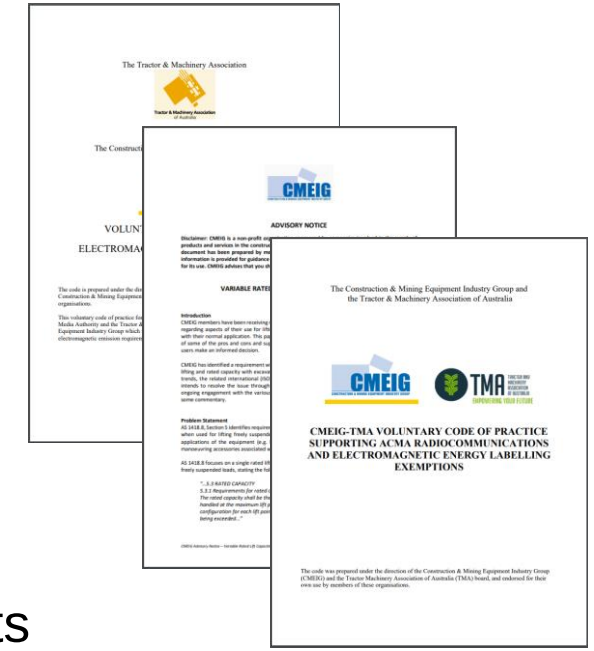
Engineering Working Group

- A ‘branch’ of CMEIG
- Technical SME’s from various CMEIG members
- Group aim:
  - Represent the industry on various committees & forums
  - Liaise with regulatory bodies in all States/Territories
  - Promote standards and regulations harmonisation
  - Advise on technical issues relating to construction and mining equipment
- Publications, presentations, advisory documents, regulatory instruments
  - www.cmeig.com.au/working-groups/engineering



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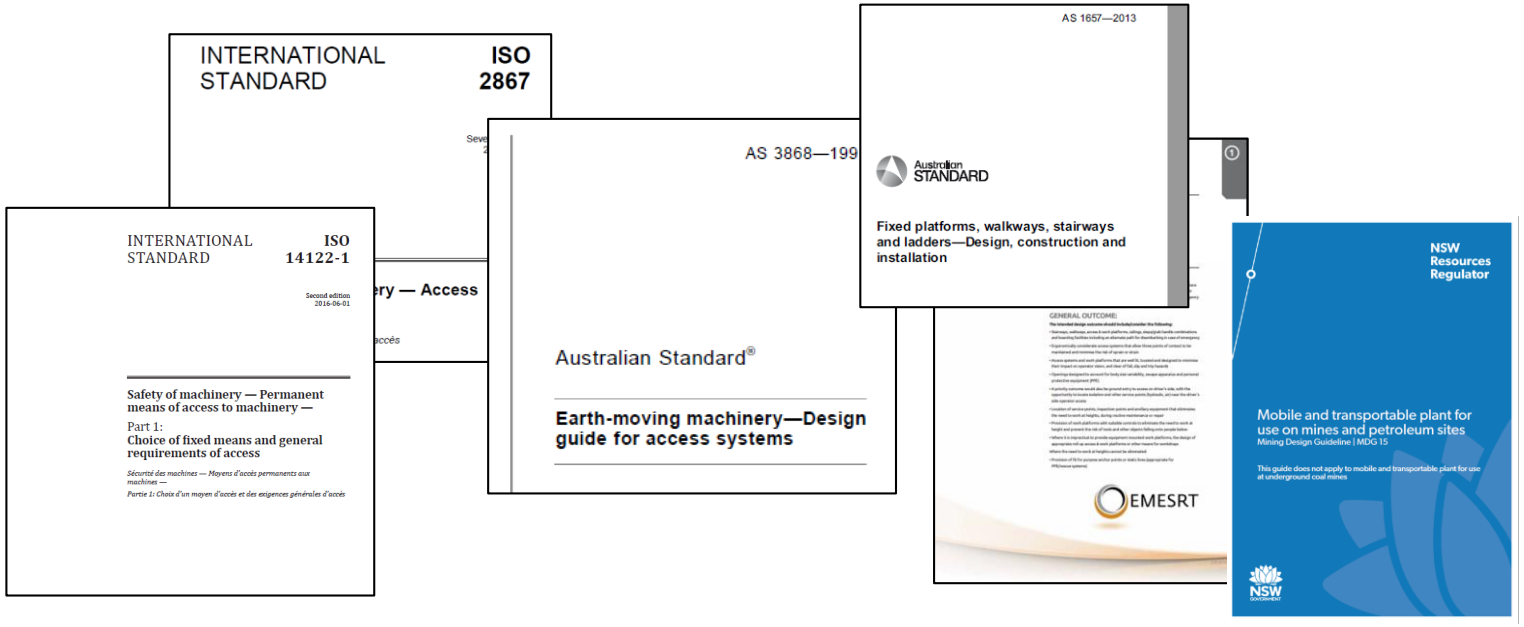
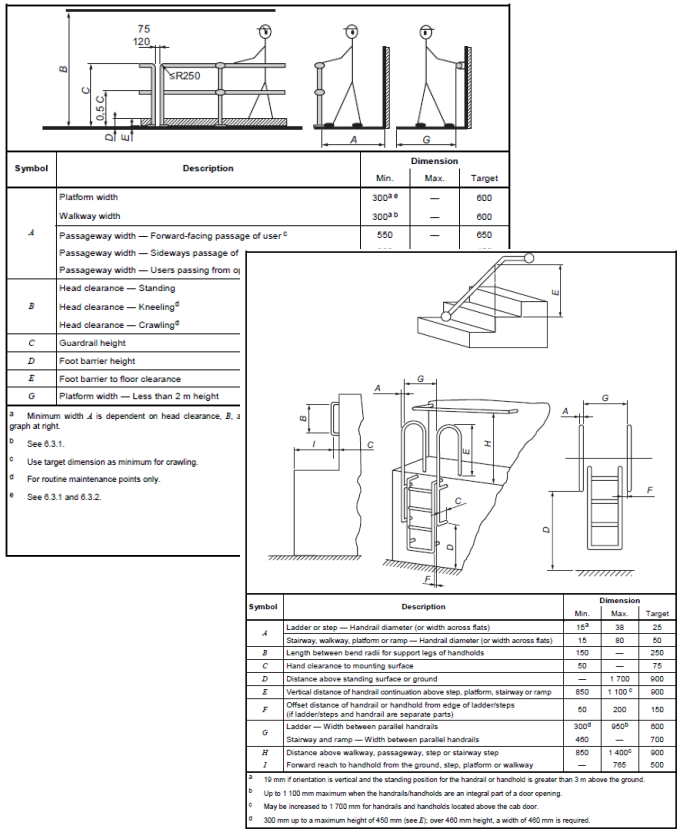
Standards Development Activities

Standards Development - Access Systems

- EMM access to the operator station and routine maintenance
  - Handrails, Guardrails, Steps, Ladders, Doors, Openings etc.

- Burning platform
  - Issue of varying sources of reference currently in Australia





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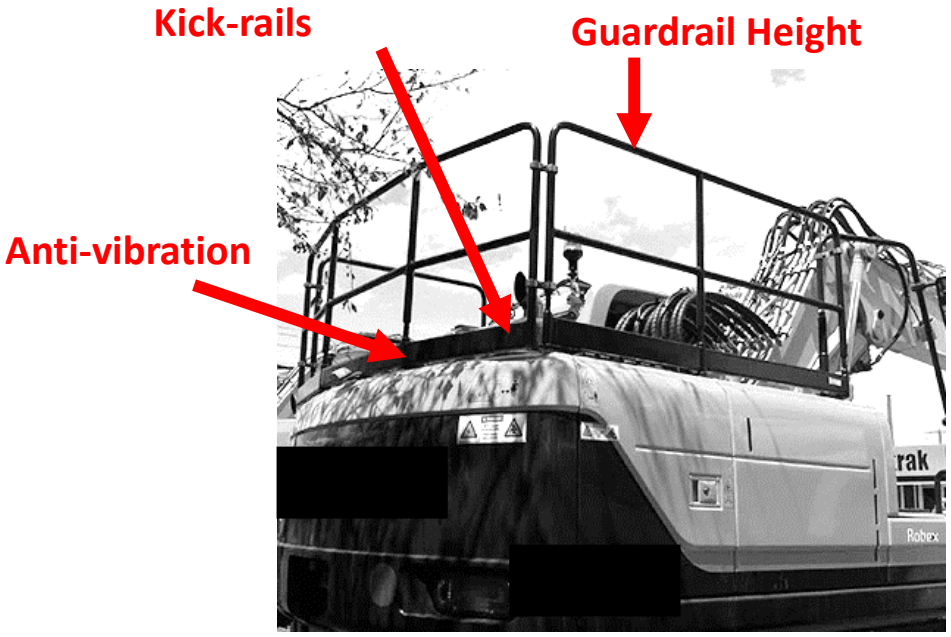
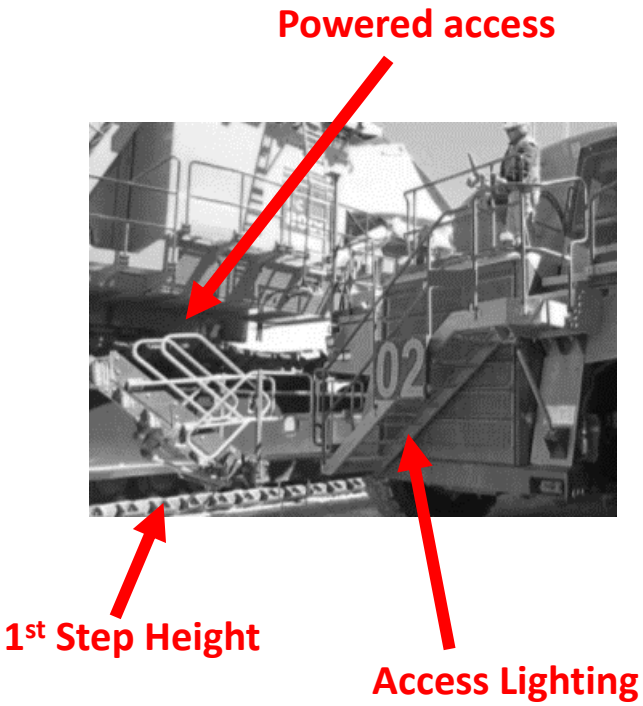
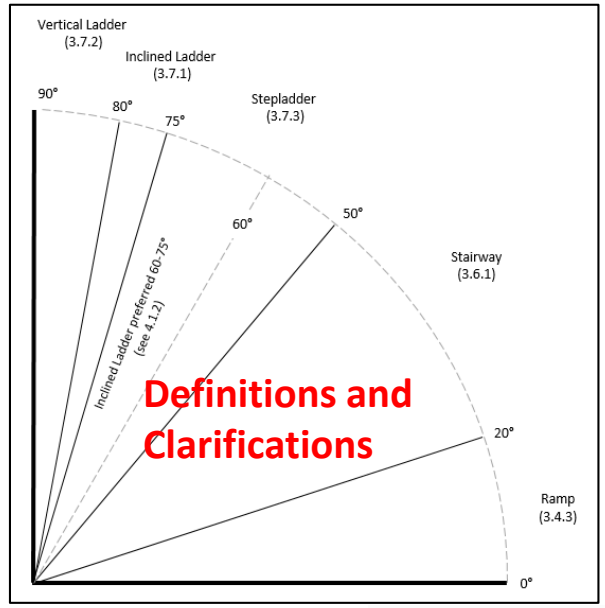
Intent – Additional Clarity for Access Systems Design

- Project underway to re-align and provide design clarity
  - 5-6 Disparate references → 1 document
  - More detailed guidance in specific areas
  - Public comment







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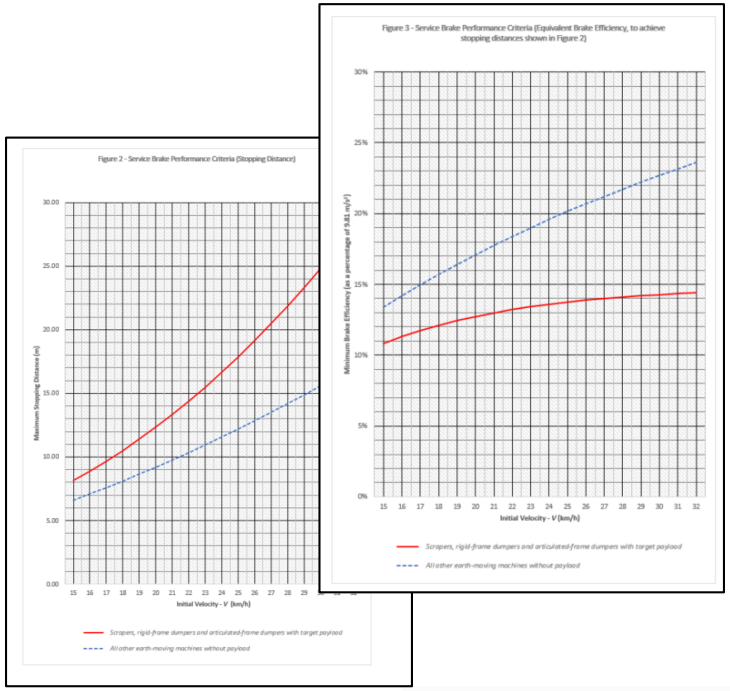
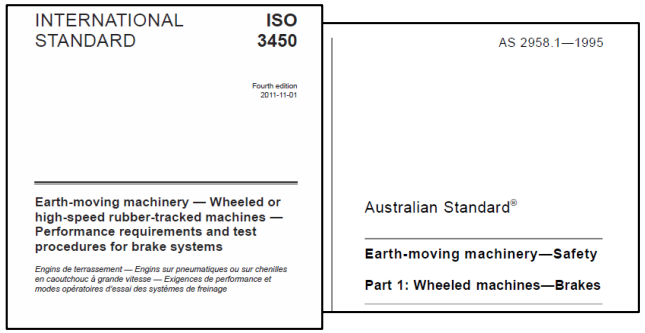
Standards Development - Brake Testing

- Existing drivers (in specific applications) for in-service dynamic brake testing

- Limited guidance
  - Extensive sources of real-world variability
  - Vague pass/fail criteria

- Currently a work in progress
  - Re-alignment of similar AS and ISO standards
  - Practicable guidance for in-service brake testing
  - Objective pass/fail criteria




INTERNATIONAL STANDARD **ISO 3450**

Fourth edition 2011-11-01

Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems

Engins de terrassement — Engins sur pneumatiques ou sur chenilles en caoutchouc à grande vitesse — Exigences de performance et modes opératoires d'essai des systèmes de freinage

AS 2958.1—1995

Australian Standard®

Earth-moving machinery—Safety

Part 1: Wheeled machines—Brakes

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CMEIG Paper
Measurement of Rated Load for Wheel Loaders

Different standards

- No current Australian Standard for determining rated load for wheel loaders
- Different international standards, eg.:
  - **ISO 14397-1:2007** *Earth-moving machinery - Loaders and backhoe loaders - Part 1: Calculation of rated operating capacity and test method for verifying calculated tipping load*
  - **ISO 20474-3:2017** *Earth moving machinery – Safety – Part 3: Requirements for loaders*
  - **EN 474-3:2006** *Earth-moving machinery – Safety – Part 3: Requirements for loaders*
  - **SAE J1197-2011** *Rated Operating Load for Loaders Equipped with Log or Material Forks without Vertical Mast*
  - **(Withdrawn) SAE J818-2007** *(Rated Operating Load for Loaders)*

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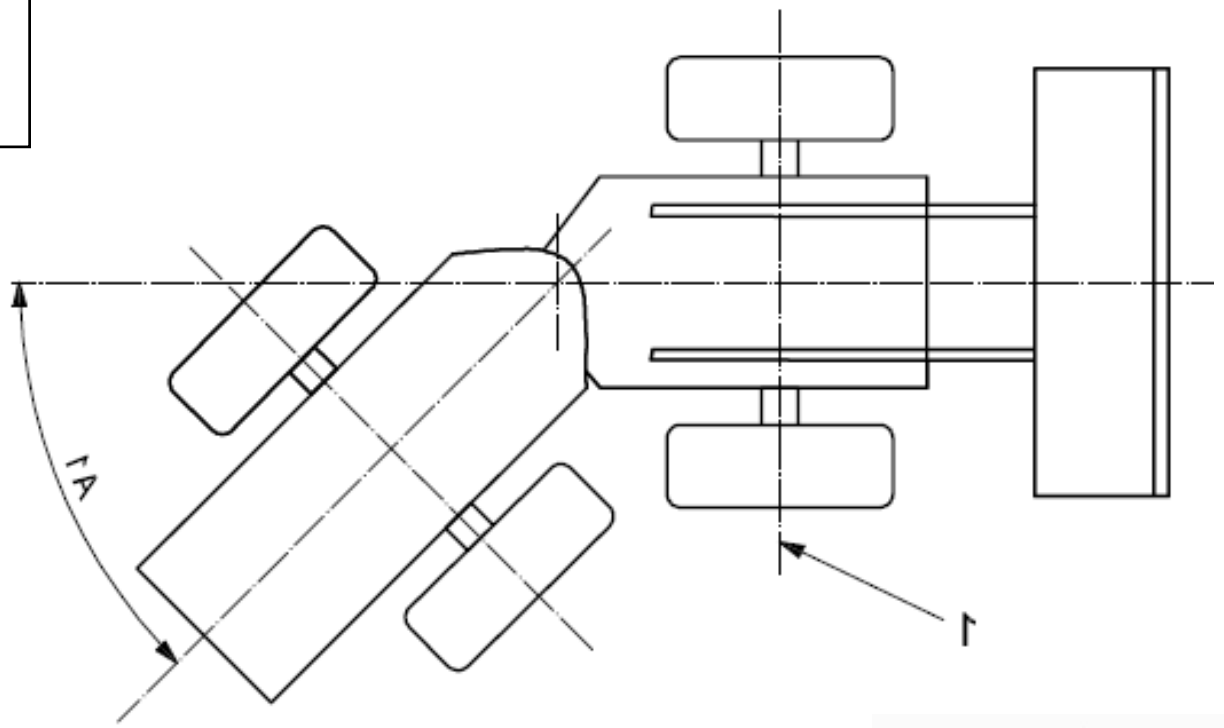
General Principles

- Rated load usually determined by:

m_{tip}		k
(tipping load*)	×	(stability factor)

*under certain conditions

- Configuration most likely to tip
- Include:
  - Mass of load and material density
  - Location of CofG
  - Mass of attachment and coupler
- Variables and conditions, for example:
  - Ground condition (firm and level, rough terrain)
  - Maximum speed of travel
  - Tyre compressibility (rigid vs flexible)



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Example – Fork Applications

Standard	Operating surface	Factor	Max. travel speed
ISO 14397-1:2007	Hard substantially smooth and level	**50%** tipping load, or 100% hyd capacity	15 km/h
ISO 20474-3:2017	Rough terrain	**60%** tipping load, or 100% of hyd capacity	15 km/h
	Firm and level ground	**80%** tipping load, or 100% of hyd capacity	15 km/h
EN 474-3:2006	Rough terrain	**60%** tipping load, or 100% of hyd capacity	15 km/h
	Firm and level ground	**80%** tipping load, or 100% of hyd capacity	15 km/h
SAE J1197-2011	Hard, moderately smooth and level	**50%** tipping load, or 100% hyd capacity	6 km/h

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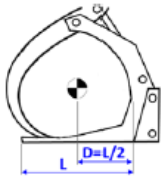
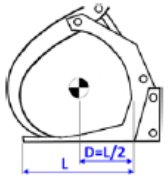
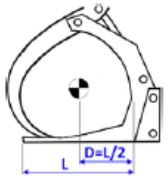
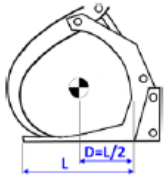
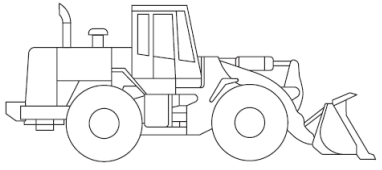
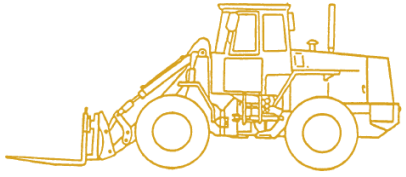
Specific Applications Addressed

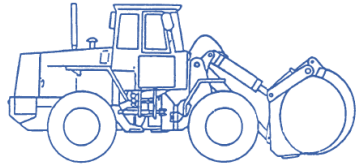
- Bucket applications
- Fork applications
- Log handling applications
- Heavy single object
  - (non palletised) applications
- Lifting freely suspended loads
  - (*Australian Standard exists*)

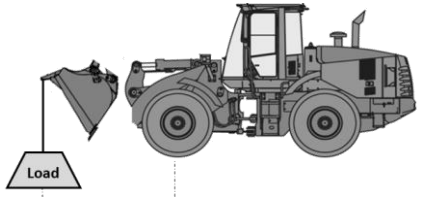
Table 3 – Rated Loads for Log Handling Applications

Standard	Terminology	Operating surface	Description	Max. travel speed	Load Centre of Gravity (C.O.G.) location
ISO 14397-1:2007 *Log Handling is not specifically mentioned.*	Rated Operating Capacity	Hard, substantially smooth and level	**50%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).	15 km/h	Grab tynes must be horizontal with clamp closed. L = grab tyne length 
ISO 20474-3:2017	Rated Operating Capacity	Rough terrain	**75%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).	15 km/h	Grab tynes must be horizontal with clamp closed. L = grab tyne length 
		Firm and level ground	**85%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).		
EN 474-3:2006	Rated Operating Capacity	Rough terrain	**75%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).	15 km/h	Grab tynes must be horizontal with clamp closed. L = grab tyne length 
		Firm and level ground	**85%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).		
SAE J1197:2011	Rated Operating Load	Hard, moderately smooth and level	**50%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser).	6 km/h	Grab tynes must be horizontal with clamp closed. L = grab tyne length 









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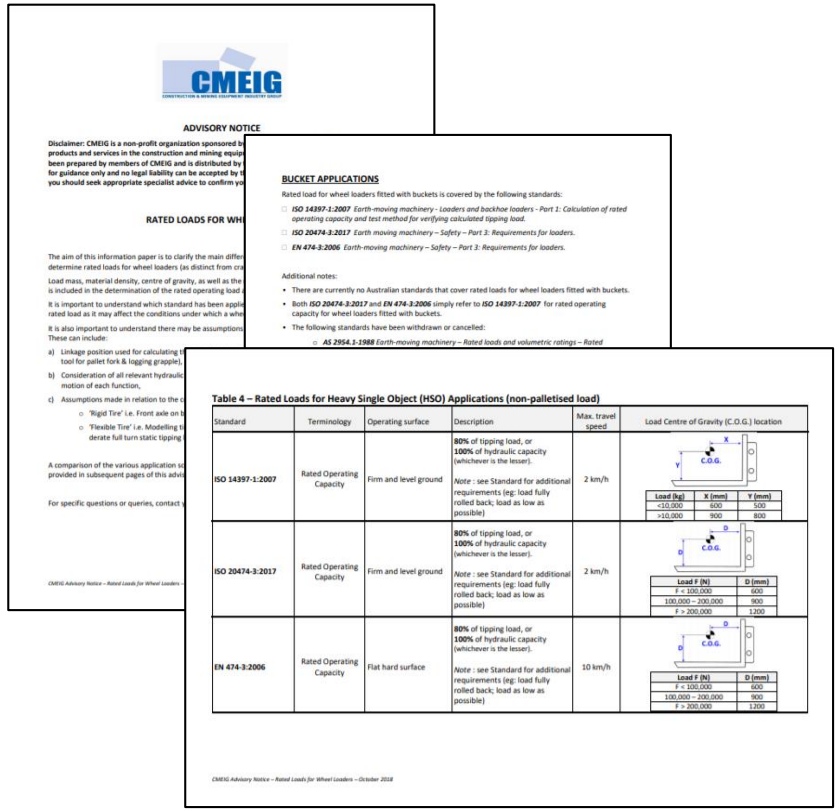
Purpose of CMEIG Paper

- Clarify main differences between main standards
- Update on previous CMEIG advisory
- Does NOT replace details contained in standards
- Ready quick reference
- Available on CMEIG website



ADVISORY NOTICE

BUCKET APPLICATIONS

Table 4 – Rated Loads for Heavy Single Object (HSO) Applications (non-palletised load)

Standard	Terminology	Operating surface	Description	Max. travel speed	Load Centre of Gravity (C.O.G.) location
ISO 14397-1:2007	Rated Operating Capacity	Firm and level ground	**80%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser). *Note* : see Standard for additional requirements (eg: load fully rolled back; load as low as possible)	2 km/h	X, Y, C.O.G. — Load (kg) / X (mm) / Y (mm): <10,000 / 600 / 500; >10,000 / 900 / 800
ISO 20474-3:2017	Rated Operating Capacity	Firm and level ground	**80%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser). *Note* : see Standard for additional requirements (eg: load fully rolled back; load as low as possible)	2 km/h	D, C.O.G. — Load F (N) / D (mm): F < 100,000 / 600; 100,000 – 200,000 / 900; F > 200,000 / 1200
EN 474-3:2006	Rated Operating Capacity	Flat hard surface	**80%** of tipping load, or **100%** of hydraulic capacity (whichever is the lesser). *Note* : see Standard for additional requirements (eg: load fully rolled back; load as low as possible)	10 km/h	D, C.O.G. — Load F (N) / D (mm): F < 100,000 / 600; 100,000 – 200,000 / 900; F > 200,000 / 1200

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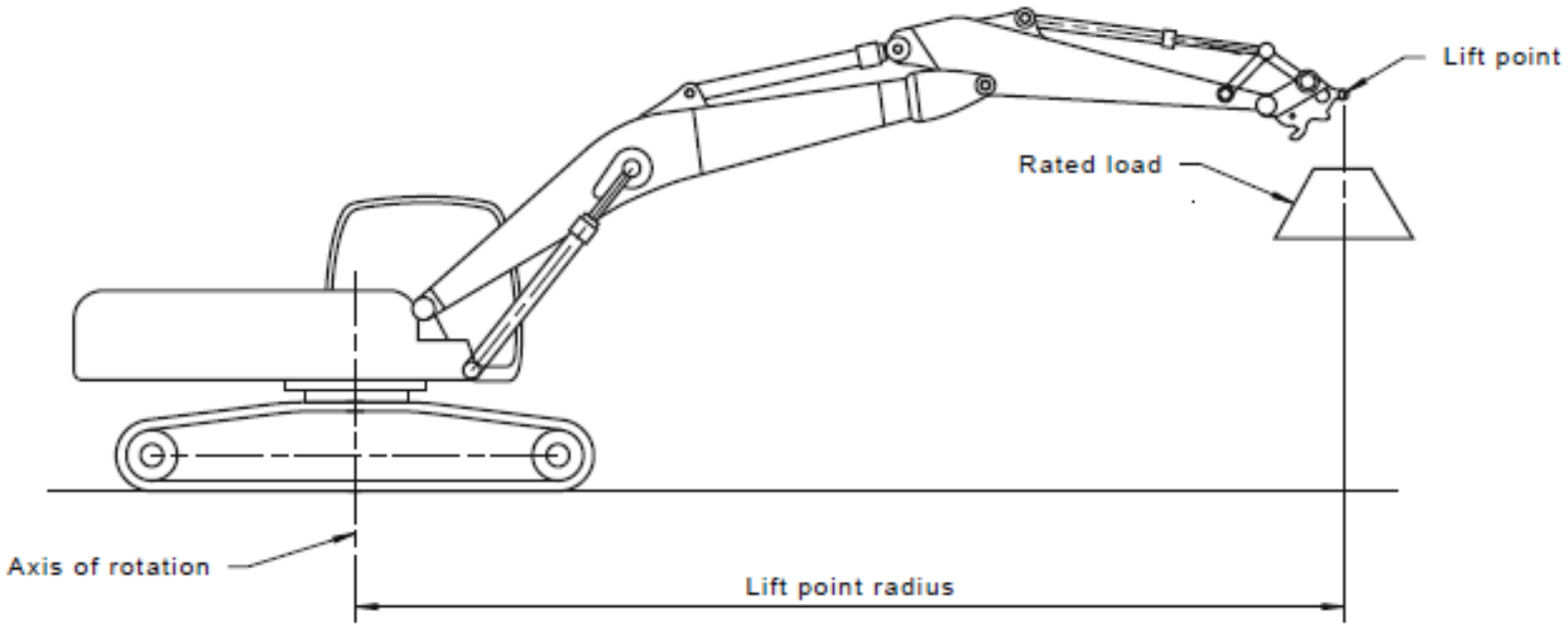
CMEIG Paper
Variable Load Lifting with Tracked Excavators

Variable Load Lifting – Tracked Excavators

- Relates to lifting freely suspended loads <u>as a secondary function</u> associated with the normal THEX applications:
  - lifting and moving pipes
  - unloading construction equipment
  - manoeuvring accessories associated with the equipment



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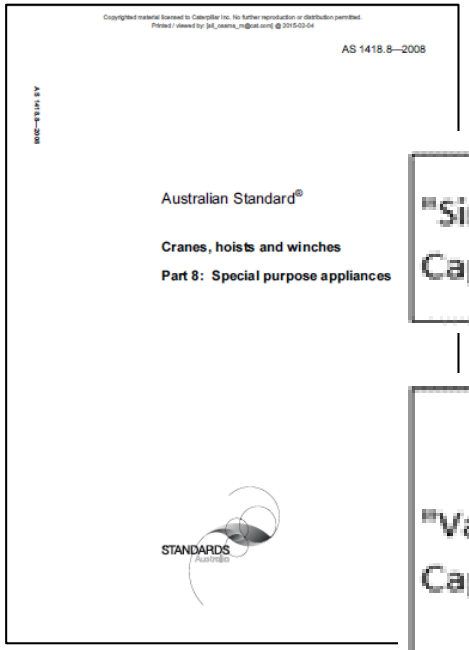
Burning Platform

- Source of ongoing inquiries to CMEIG members
  - *AS 1418.8, Section 5*



"Single" Rated Lift Capacity → Shall comply with AS1418.8 (2008) - Earthmoving equipment

"Variable" Rated Lift Capacities → Shall comply with both AS1418.8(2008) Earthmoving equipment and AS1418.5*(2013)* Mobile Crane (Mod. Text adoption of EN13000:2010)

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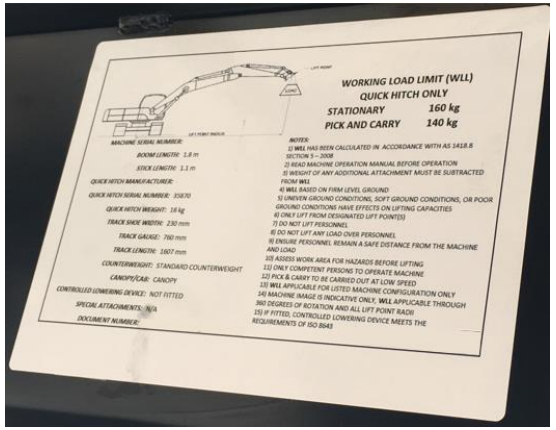
How This Plays Out Today…

		1.5 m (5.0 ft)		3.0 m (10.0 ft)		4.5 m (15.0 ft)		6.0 m (20.0 ft)		7.5 m (25.0 ft)				
														m ft
7.5 m	kg											*2050	*2050	7.75
25.0 ft	**lb**											***4,550**	***4,550**	**25.11**
6.0 m	kg									*3250	2750	*1950	*1950	8.73
20.0 ft	**lb**											***4,300**	***4,300**	**28.47**
4.5 m	kg							*4450	4150	*4150	2750	*1950	1800	9.30
15.0 ft	**lb**							***9,700**	**8,900**	***9,100**	**5,800**	***4,250**	**3,950**	**30.44**
3.0 m	kg			*10 700	*10 700	*6750	6250	*5300	3900	4150	2600	*2000	1600	9.55
10.0 ft	**lb**			***22,750**	***22,750**	***14,550**	**13,450**	***11,400**	**8,350**	**8,900**	**5,550**	***4,400**	**3,550**	**31.33**
1.5 m	kg					*8500	5600	5800	3600	4000	2450	*2200	1550	9.53
5.0 ft	**lb**					***18,250**	**12,100**	**12,400**	**7,700**	**8,550**	**5,250**	***4,750**	**3,450**	**31.26**
Ground	kg			*6250	*6250	8800	5200	5550	3400	3900	2350	*2450	1650	9.22
Line	lb			***14,350**	***14,350**	**18,850**	**11,200**	**11,850**	**7,250**	**8,300**	**5,000**	***5,350**	**3,600**	**30.24**
-1.5 m	kg	*5750	*5750	*9750	*9750	8600	5050	5400	3250	3800	2300	*2900	1850	8.59
-5.0 ft	**lb**	***12,850**	***12,850**	***22,100**	**21,150**	**18,450**	**10,900**	**11,600**	**7,000**	**8,200**	**4,900**	***6,350**	**4,100**	**28.15**
-3.0 m	kg	*9700	*9700	*13 800	10 100	8650	5100	5400	3250			*3700	2400	7.56
-10.0 ft	**lb**	***21,800**	***21,800**	***29,800**	**21,600**	**18,550**	**10,950**	**11,600**	**7,000**			***8,200**	**5,300**	**24.68**
-4.5 m	kg			*11 350	10 500	*7900	5300					*4050	3700	5.93
-15.0 ft	**lb**			***24,350**	**22,500**	***16,900**	**11,400**					***8,900**	**8,300**	**19.26**



Detail	AS 1418.8 - 2008	ISO 10567 - 2007
Rated Hydraulic Capacity Limit	"87% of the hydraulic capacity at maximum reach/radius"	"87% of the smaller of boom or arm hydraulic lift capacity at specific lift-point positions"
Stationary Stability Requirement for Load Rating Condition	75% of tipping load	75% of tipping load
Pick and Carry (General) Stability Requirement for Load Rating Condition	66% of tipping load	75% of tipping load

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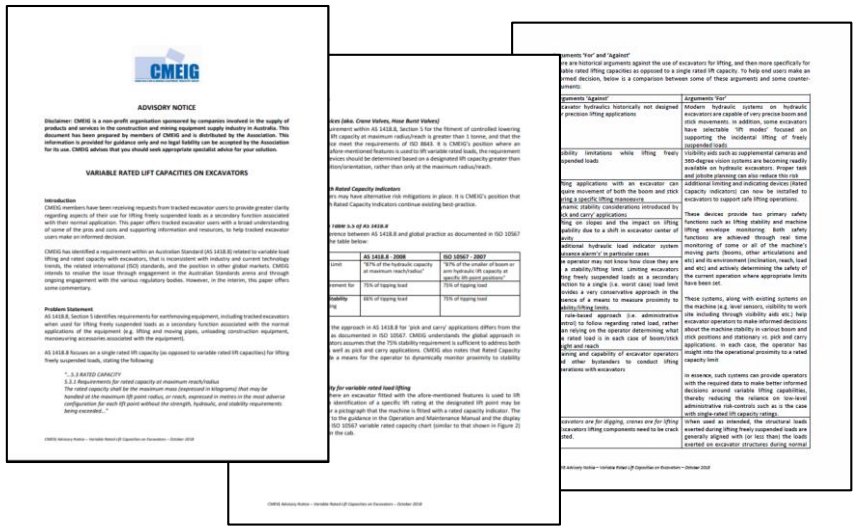
Purpose of CMEIG paper

- Number of historical drivers for these differences in position
  - Advises on how new technologies can address some of these historical drivers
- AU Approach inconsistent with ROW



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Questions / Comments?

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