



CMEIG ADVISORY NOTICE

Disclaimer: CMEIG is a non-profit organization sponsored by companies involved in the supply of products and services in the construction and mining equipment industry in Australia. This document has been prepared by the members of CMEIG and is distributed by the Association. This information is provided for guidance only and no legal liability can be accepted by the Association for its use. CMEIG advises that you should seek appropriate specialist advice to confirm your solution.

RATED LOADS FOR WHEELED BACKHOE LOADERS

The aim of this information paper is to clarify the main differences between the various standards used to determine rated loads for wheeled backhoe loaders.

Load mass, material density, centre of gravity location as well as the mass of the attachment and coupler / quick hitch (if fitted) is included in the determination of the rated operating load and the size / capacity of the attachment.

It is important to understand which standard has been applied by a manufacturer when determining a rated load as it may affect the conditions under which a wheeled backhoe loader can be operated.

FRONT PORTION OF A WHEELED BACKHOE LOADER (LOADER END)

All rated loads for the front portion of wheeled backhoe loaders are determined with the backhoe in its transport position as specified by the manufacturer.

Bucket Applications

Rated loads for the front portion of wheeled backhoe loaders fitted with buckets are covered by the following standards;

- *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*

- **EN474-4:2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*

PLEASE NOTE: There are currently no Australian standards that cover rated loads for the front portion of wheeled backhoe loaders fitted with buckets.

A comparison of the standards used to determine rated loads for the front portion of wheeled backhoe loaders fitted with buckets is given in Table 1.

Fork Applications

Rated loads for the front portion of wheeled backhoe loaders fitted with forks are covered by the following standards;

- **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*
- **EN474-4:2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*

PLEASE NOTE: There are currently no Australian standards that cover rated loads for wheel loaders fitted with forks.

A comparison of the standards used to determine rated loads for the front portion of wheeled backhoe loaders fitted with forks is given in Table 2.

Log Handling Applications

Rated loads for the front portion of wheeled backhoe loaders fitted with log grabs are covered by the following standards;

- **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*
- **EN474-4:2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*

PLEASE NOTE: There are currently no Australian standards that cover rated loads for wheel loaders fitted with log grabs.

A comparison of the standards used to determine rated loads for the front portion of wheeled backhoe loaders fitted with log grabs is given in Table 3.

Lifting Applications

Rated loads for the front portion of wheeled backhoe loaders fitted with attachments used to lift suspended loads are covered by the following standards;

- **AS 1418.8-2008** *Cranes, hoists and winches – Special purpose appliances*
- **EN474-4-2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*

PLEASE NOTE: **ISO 20474-3:2008** also refers to **ISO 20474-14:2008** for mandatory national and/or regional provisions. The specific provision for Australia in relation to wheeled backhoe loaders used to lift suspended loads is compliance to Section 5 of **AS 1418.8-2008**.

A comparison of the standards used to determine rated loads for wheeled backhoe loaders used to lift suspended loads is given in Table 4.

IMPORTANT: The use of wheeled backhoe loaders to lift suspended loads is highly regulated within Australia. Please refer to the Occupational Health and Safety legislation applicable to your state or territory for further guidance.

BACKHOE PORTION OF A WHEELED BACKHOE LOADER

All rated loads for the backhoe portion of wheeled backhoe loaders are determined with the loader bucket and outriggers placed on the ground.

Bucket Applications

Rated loads for the backhoe portion of wheeled backhoe loaders fitted with buckets are covered by the following standards;

- **EN474-4-2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*

PLEASE NOTE: There are currently no Australian standards that cover rated loads for the backhoe portion of wheeled backhoe loaders fitted with buckets.

A comparison of the standards used to determine rated loads for the front portion of wheeled backhoe loaders fitted with buckets is given in Table 5.

Lifting Applications

Rated loads for the backhoe portion of wheeled backhoe loaders fitted with attachments used to lift suspended loads are covered by the following standards;

- **AS 1418.8-2008** *Cranes, hoists and winches – Special purpose appliances*
- **EN474-4-2006** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **ISO 20474-4:2008** *Earth-moving machinery – Safety – Part 4: Requirements for backhoe loaders.*
- **SAE J31 – 1986** *Hydraulic Backhoe Lift Capacity*

PLEASE NOTE: **ISO 20474-4:2008** refers to **ISO 20474-14:2008** for mandatory national and/or regional provisions. The specific provision for Australia in relation to wheeled backhoe loaders used to lift suspended loads is compliance to Section 5 of **AS 1418.8-2008**.

A comparison of the standards used to determine rated loads for wheeled backhoe loaders used to lift suspended loads is given in Table 6.

IMPORTANT: The use of wheeled backhoe loaders to lift suspended loads is highly regulated within Australia. Please refer to the Occupational Health and Safety legislation applicable to your state or territory for further guidance.

Standard	Terminology	Description	Max Travel Speed	Operating Surface	Load Centre of Gravity (C.O.G) Location
ISO 14397-1:2007	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	Centroid of ISO rated bucket volume
EN474-4-2006	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	Centroid of ISO rated bucket volume
ISO 20474-4:2006	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	Centroid of ISO rated bucket volume

Table 1 – Rated Loads for Bucket Applications – Front Portion

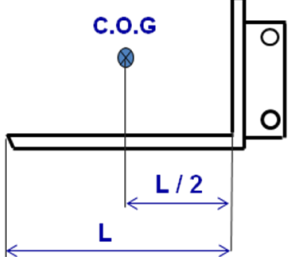
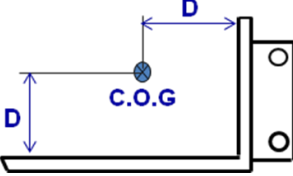
Standard	Terminology	Description	Max Travel Speed	Operating Surface	Load Centre of Gravity (C.O.G) Location								
ISO 14397-1:2007	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	 <p>where L = fork tyne length</p> <p>PLEASE NOTE: Fork tyres must be in horizontal position.</p>								
EN474-4-2006	Rated Operating Capacity	60% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Rough terrain	 <table border="1" data-bbox="1527 970 1966 1104"> <thead> <tr> <th>Load (N)</th> <th>D (mm)</th> </tr> </thead> <tbody> <tr> <td><10,000</td> <td>400</td> </tr> <tr> <td>10,000 – 50,000</td> <td>500</td> </tr> <tr> <td>50,000 – 100,000</td> <td>600</td> </tr> </tbody> </table> <p>PLEASE NOTE: Fork tyres must be in horizontal position.</p>	Load (N)	D (mm)	<10,000	400	10,000 – 50,000	500	50,000 – 100,000	600
		Load (N)	D (mm)										
<10,000	400												
10,000 – 50,000	500												
50,000 – 100,000	600												
80% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Firm and level ground											

Table 2 – Rated Loads for Fork Applications – Front Portion

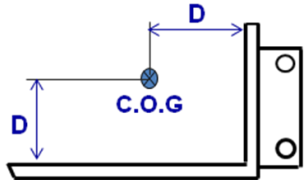
Standard	Terminology	Description	Max Travel Speed	Operating Surface	Load Centre of Gravity (C.O.G) Location								
ISO 20474-4:2006	Rated Operating Capacity	60% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Rough terrain	 <table border="1" data-bbox="1523 566 1960 702"> <thead> <tr> <th>Load (N)</th> <th>D (mm)</th> </tr> </thead> <tbody> <tr> <td><10,000</td> <td>400</td> </tr> <tr> <td>10,000 – 50,000</td> <td>500</td> </tr> <tr> <td>50,000 – 100,000</td> <td>600</td> </tr> </tbody> </table> <p data-bbox="1444 734 2027 798">PLEASE NOTE: Fork tynes must be in horizontal position.</p>	Load (N)	D (mm)	<10,000	400	10,000 – 50,000	500	50,000 – 100,000	600
		Load (N)	D (mm)										
<10,000	400												
10,000 – 50,000	500												
50,000 – 100,000	600												
80% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Firm and level ground											

Table 2 – Rated Loads for Fork Applications – Front Portion (continued)

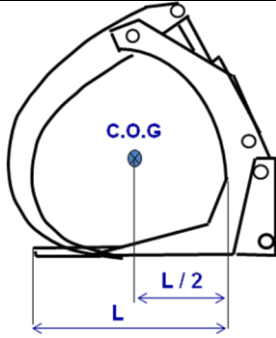
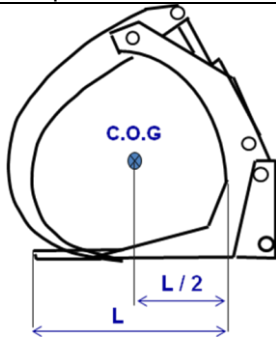
Standard	Terminology	Description	Max Travel Speed	Operating Surface	Load Centre of Gravity (C.O.G) Location
ISO 14397-1:2007	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	 <p>where L = grab tyne length</p> <p>PLEASE NOTE: Grab tyne must be in horizontal position with clamp closed.</p>
EN474-4-2006	Rated Operating Capacity	75% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Rough terrain	 <p>where L = grab tyne length</p> <p>PLEASE NOTE: Grab tyne must be in horizontal position with clamp closed.</p>
		85% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Firm and level ground	

Table 3 – Rated Loads for Log Handling Applications – Front Portion

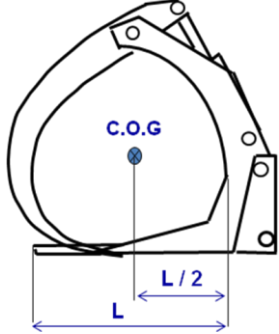
Standard	Terminology	Description	Max Travel Speed	Operating Surface	Load Centre of Gravity (C.O.G) Location
ISO 20474-4:2006	Rated Operating Capacity	75% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Rough terrain	 <p data-bbox="1585 705 1908 737">where L = grab tyne length</p> <p data-bbox="1447 756 2033 810">PLEASE NOTE: Grab tyne must be in horizontal position with clamp closed.</p>
		85% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Firm and level ground	

Table 3 – Rated Loads for Log Handling Applications – Front Portion (continued)

Standard	Terminology	Description	Max Travel Speed	Operating Surface	Permissible Lift Point Locations	Load Centre of Gravity (C.O.G) Location
AS 1418.8-2008	Rated Capacity	50% of the tipping load OR 100% ¹ of the hydraulic lift capacity (whichever gives the lesser result)	As specified by the manufacturer on the load chart	As specified by the manufacturer on the load chart	Lifting lug located on the boom, bucket or coupler as specified by the manufacturer	Through lifting lug at maximum achievable reach
EN474-3-2006	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	As specified by the manufacturer	Through load hooking point at reaches as specified by the manufacturer
ISO 20474-4:2006	Rated Operating Capacity	50% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	15 km/hr	Hard, substantially smooth and level	As specified by the manufacturer	Through load hooking point at reaches as specified by the manufacturer

Table 4 – Rated Loads for Lifting Applications – Front Portion

¹ AS 1418.8 Section 5 Clause 5.6 and 5.7.6 relate to hydraulic excavators and the backhoe portion of backhoe loaders, whereby one of the limiting factors is 87% of hydraulic lift capacity. This only relates to slewing machines, and the standard will be amended to reflect this applicability.

Standard	Terminology	Description	Operating Surface	Load Centre of Gravity (C.O.G) Location	Other Conditions
EN474-4-2006	Rated Lift Capacity	75% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	Hard, level surface	Through the bucket hinge pin at least stable position (eg. fully side-shifted, fully extended telescopic arm, etc)	Attachment bracket may be fitted to the machine but all attachments must be removed.
ISO 20474-4:2006	Rated Lift Capacity	75% of the tipping load OR 100% of the hydraulic lift capacity (whichever gives the lesser result)	Hard, level surface	Through the bucket hinge pin at least stable position (eg. fully side-shifted, fully extended telescopic arm, etc)	Attachment bracket may be fitted to the machine but all attachments must be removed.

Table 5 – Rated Loads for Bucket Applications – Backhoe Portion

Standard	Terminology	Description	Operating Surface	Permissible Lift Point Locations	Load Centre of Gravity (C.O.G) Location	Other Conditions
AS 1418.8-2008	Rated Capacity	75% of the tipping load or 87% of the hydraulic lift capacity (whichever gives the lesser result)	As specified by the manufacturer on the lift chart	Lifting lug located on the boom, arm, linkage or quick hitch as specified by the manufacturer ²	Through the lifting lug at least stable position (eg. fully side-shifted, fully extended telescopic arm, etc)	N/A
EN 474-4-2006	Rated Lift Capacity	75% of the tipping load or 87% of the hydraulic lift capacity (whichever gives the lesser result)	Hard, level surface	As specified by the manufacturer on the lift chart	Through the bucket hinge pin at least stable position (eg. fully side-shifted, fully extended telescopic arm, etc)	Attachment bracket may be fitted to the machine but all attachments must be removed.
ISO 20474-4:2006	Rated Lift Capacity	75% of the tipping load or 87% of the hydraulic lift capacity (whichever gives the lesser result)	Hard, level surface	As specified by the manufacturer on the lift chart	Through the bucket hinge pin in the least stable position (eg. fully side-shifted, fully extended telescopic arm, etc)	Attachment bracket may be fitted to the machine but all attachments must be removed.

Table 6 – Rated Loads for Lifting Applications – Backhoe Portion

² AS 1418.8-2008 states that lift points must not be attached to buckets designated for hydraulic excavators or backhoes.

Standard	Terminology	Description	Operating Surface	Permissible Lift Point Locations	Load Centre of Gravity (C.O.G) Location	Other Conditions
SAE J31-1986³	Rated Boom Lift Capacity (over end)	75% of the tipping load or 87% of the boom hydraulic lift capacity (whichever gives the lesser result)	Hard, level surface	As specified by the manufacturer on the lift chart	Through the bucket hinge pin at reaches and heights as specified by the manufacturer and within a 45 degree angle either side of the swing pivot centre line.	Bucket fitted to machine. Arm fully rotated out and bucket fully dumped.
	Rated Dipperstick Lift Capacity (over end)					Bucket fitted to machine. Boom in transport position and bucket fully dumped.
	Rated Boom Lift Capacity (swing arc)				Through the bucket hinge pin at reaches and heights as specified by the manufacturer and anywhere within the full swing arc.	Bucket fitted to machine. Arm fully rotated out and bucket fully dumped.
	Rated Dipperstick Lift Capacity (swing arc)				Bucket fitted to machine. Boom in transport position and bucket fully dumped.	

Table 6 – Rated Loads for Lifting Applications – Backhoe Portion (continued)

NOTE: Rated boom lift capacity (swing arc) in the least stable position most closely represents the rated lift capacities as defined in AS 1418.8:2008, EN474-4:2006 and ISO 20474-4:2006.

³ Rated lift capacities in accordance with SAE J31-1986 should be rated in both fully retracted and fully extended positions for machines with telescopic arms and with both swing pivot on the centreline of the machine and also in the least stable offset position.