



## CMEIG Engineering Position Paper

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Guidance document – Lifting with hydraulic excavators, and how Australian Standard ‘AS 1418.8:2008 Section 5’ applies.

This document was formulated to assist industry interpret the revised requirements of Section 5 of the Australian Standard AS1418.8: 2008 – ‘Cranes, hoists and winches – Special purpose appliances’.

This varies considerably to the requirements of AS1418.5: 2002 – ‘Cranes, hoists and winches – Mobile cranes’. It is unfortunate that the numbering of these two different standards is so similar, and thus easily confused.

The requirements of AS1418.8 Section 5 relate to all forms of earthmoving machinery when used to lift freely suspended loads, i.e. with a hook and/or sling. These requirements vary greatly to the previous 2002 version of this standard, and this document specifically deals with all sizes and forms of hydraulic excavators, including wheeled excavators.

If individual hydraulic excavators (HEX) are never intended to lift freely suspended loads, this standard does not apply, and all lifting points should be removed (if fitted), and warnings should be placed in both the ‘Operator’s Manual’, and in the machine cabin, warning that the machine should not be used to lift freely suspended loads.

It is also advisable that ‘ride on’/‘stand up’ machines not be used for lifting freely suspended loads as these style of machines may rely on the operator remaining in position to maintain stability, and thus if the operator dismounts, the machine may become unstable.

The scope of the 2008 edition of AS1418.8 section 5 differentiates between modes of lifting, and also machine ratings, and these determine whether the HEX should be used in this mode, and whether hose burst protection valves should be fitted. A copy of the scope for section 5 is shown below:

### **5.1 SCOPE OF SECTION**

*Together with Section 1, this Section shall apply when earthmoving equipment, including backhoes, front-end loaders, excavators, tool carriers and similar units are used for lifting freely suspended loads as secondary*

*function associated with the normal applications of the equipment, e.g., lifting and moving pipes, unloading construction equipment, maneuvering accessories associated with the equipment.*

*Where it is intended to use the earthmoving equipment for craneage operations other than those indicated above, or where variable rated capacities are specified, all requirements of AS1418.5 and this Section shall apply.*

From the above it can be seen that if earthmoving machinery is to be used for craneage operations, i.e. assembling roof trusses etc, or the machine retains variable load rating charts as per ISO10567: 2007, then the machine should be configured to meet the requirements of AS1418.5, with all the associated limiting and indicating devices.

Due to the onerous requirements listed in AS 1418.5, it would be advisable to either hire/purchase a dedicated crane, or a telehandler that meets the requirements of AS 1418.19: 2007 ‘Cranes, Hoists and Winches – Telescopic Handlers’.

See AS 2550.5:2002, and AS 2550.19:2007 for guidance on the ‘safe use’ of cranes, and telescopic handlers, respectively.

HEX used for lifting freely suspended loads as a secondary function associated with the normal applications of earthmoving, e.g., lifting and moving pipes, unloading construction equipment, maneuvering accessories associated with the equipment, should be assessed on an individual basis to determine the requirements for compliance to this standard.

This assessment is based on the lift capacity rating for the HEX in its least stable position, when the rating considers hydraulic capability, static tipping, dynamic tipping, and structural limitations.

The approach developed by the Standards Australia committee, of only providing a single position for load rating (static and mobile) the HEX is based on the goal of never exceeding the stability, hydraulic capacity, lifting capacity or physical strength of the machine.

As the configuration requested by a customer may vary considerably from the consist of a standard machine, it is imperative that an assessment be conducted by a competent person to determine what effect this may have on the load rating, and to ensure that the requirements of this standard have been considered. This should be done in consultation with the OEM.

## **Assessment Process**

There are a number of steps that should be followed in the assessment process, namely:

- Determine standard configuration machine rating
- Document limitations of above rating
- Ensure that position of rating is known
- Determine unique configuration rating due to changes to consist
- Ensure rating considers stability requirements of AS1418.8 section 5
- Document limitations of customer configuration ratings
- Ensure prescribed limiting and indicating devices fitted
- Ensure machine-marking requirements are met

It is imperative that a thorough understanding of the initial rating is attained. ISO10567 allows for rating calculations either with or without a bucket fitted. It also allows for the bucket to be in any number of orientations, as it does not prescribe that the bucket cylinder be fully extended for rating purposes.

Some manufacturers supply load charts where the rating is based at the bucket pivot point. ISO10567 also rates machines with a lug fitted to the back of the excavator bucket, which is unacceptable in Australia. It is imperative that, unless an OEM, or their authorised representative supplies the new rating, then a competent person to validate the ratings conduct thorough testing.

It would also be advisable to obtain a copy of the test report, or a statement of compliance to the standard. This applies to both the machine rating, and any limiting or indicating devices, and the performance of hose burst protection valves, if fitted.

The calculations for rating the HEX based on stability also varies between ISO10567 and AS1418.8 section 5. The difference between the two standards relates to stability ratios, as AS1418.8 allows for a different stability ratio for static mode compared to dynamic (travelling).

Both the AS & the ISO allow for the static rating to be the lesser of 87% of hydraulic capability, and 75% of tipping, in the least stable position. AS1418.8 Section 5 also stipulates that the dynamic rating that should be used for the 'pick and carry' mode (travelling) be the lesser of 87% of the hydraulic capability and 66% of tipping.

Therefore, it is expected that the majority of machines will be rated with both static and mobile ratings.

If HEX is fitted with a quickhitch, ensure that the rating for the strength of the quickhitch lift point is equal to, or greater than the machine load rating, otherwise the machine may need to be de-rated to the lesser value.

### **Machine modifications needed to meet the requirements of AS 1418.8 Section 5.**

All hydraulic excavators used for lifting freely suspended loads, irrespective of load rating should be fitted with:

- 1) Warning device (machine horn)
- 2) Machine level indicator
- 3) Machine slope indicator (inclinometer) if OEM ratings allow for sloping ground
- 4) Load Indicator (Optional, not Mandatory)



Fig 1 – Typical 'Level Indicator'



Fig 2 – Typical 'Inclinometer'

Machines that are rated per the Australian Standard at greater than 1000 kg (either static stability, dynamic stability, or hydraulic capability limited) should also be fitted with boom lowering control valves, and stick lowering control valves, that allow the machine to meet the requirements of ISO8643.

ISO8643 prescribes a procedure for testing the load holding capability of the HEX when boom lowering control valves are fitted and a hose burst is simulated. It states that the load should not drop more than 100mm for at least 10 seconds after the hose burst is simulated, while the HEX is holding, raising, or lowering a load.



Fig 3 - Typical HEX Boom Lowering Control Valve Installation.

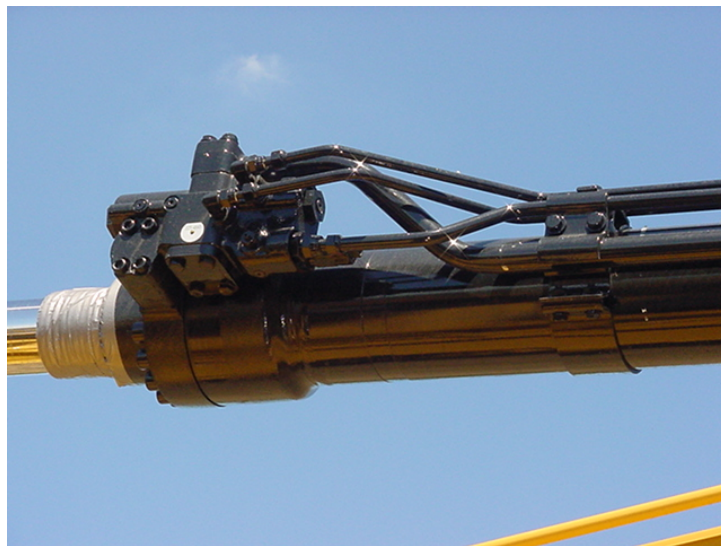


Fig 4 – Typical HEX Stick Lowering Control Valve Installation.

It is not possible to determine compliance to ISO8643 without thorough type testing of the machine configuration. Some OEM's will have kits available to retrofit machines, and due to prior testing can determine compliance. Ask your supplier to provide a statement of compliance.

If valves for retrofit are sourced from an after market supplier, or the configuration varies from a factory available configuration, ensure that testing is conducted to determine compliance with both ISO8643 and the stability requirements of the Australian Standard. Ask the testing company to provide a statement of compliance.

Be aware that poor selection of after market valves may induce overheating, poor hydraulic flow problems, or a lack of sensitivity with controls. Ensure that adequate testing has been conducted.

## **Machine Marking**

Ensure that the variable rating chart as per ISO10567 is removed from HEX.

Irrespective of the machine load ratings ensure that warning information is provided ensuring that loads are never lifted over, or in the vicinity of people. (Use tag lines)

Irrespective of the machine load ratings, ensure that the static and mobile rated capacity is permanently displayed in a prominent position near the lifting point.

For machines fitted with a quickhitch it would be advisable to warn under this rating that this is with the bucket removed.

If HEX is fitted with a quickhitch, ensure that the rating for the strength of the quickhitch lift point is equal to, or greater than the machine load rating, otherwise the machine may need to be de-rated to the lesser value.

Ensure the rating of the lift point on the quickhitch is clearly marked near the lift point.

Irrespective of the HEX load rating, ensure that a rated capacity chart is mounted inside the operator's cabin that also lists any conditions that may affect the rating.

If hose burst protection valves are fitted, ensure that a notice to that effect is displayed.

If hose burst protection valves are not fitted, ensure that a notice to that effect is displayed.

Ensure that the above information is also shown in the Operator's manual.

## **Testing**

Whenever a load rating is calculated by a third party, other than OEM or authorized dealer, testing by a competent person in accordance with AS1418.8-2008, paragraph 5.7, must be carried out.

Non-generic load charts must be tested by a competent person in accordance with 5.7.1(a) of AS1418.8 and a test certificate or statement of compliance provided.

Whenever hose burst protection valves are sourced from a third party, other than an OEM or authorised dealer, ensure that adequate testing has been performed by a competent person to maintain machine performance, and that the requirements of ISO 8643 have been met.

Whenever a third party quickhitch is installed, ensure that the quickhitch meets the requirements of AS4772. This will ensure the lift point has been tested by a competent person and marked with the appropriate maximum load rating.

## **References**

AS 1418.5: 2002 – Cranes, hoists and winches – Mobile cranes

AS 1418.8: 2008 – Cranes, hoists and winches – Special purpose appliances

AS 2550.5: 2002 - Cranes, hoists and winches - Safe use - Mobile cranes  
AS 2550.19: 2007 - Cranes, hoists and winches - Safe use - Telescopic handlers  
ISO 8643:1997 - Earth-moving machinery - Hydraulic excavator and backhoe loader boom-lowering control device -Requirements and tests  
ISO 10567: 2007 - Earth-moving machinery - Hydraulic excavators - Lift capacity

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