



CMEIG Engineering Position Paper

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QUICKHITCHES

- **Terminology**

The term 'quickhitch' is used to describe a device used to easily change attachments on the end of the dipper arm of both hydraulic excavators and backhoe loaders. The term 'quickcoupler' is used in relation to a similar device used on other types of earthmoving machinery, such as wheel loaders, integrated tool carriers, telehandlers etc, and is not dealt with in this article.

- **General**

Quickhitches are used to improve the versatility of excavators and backhoes by allowing a large selection of different work tools to be easily changed on the host machine, enabling operators to perform a wide array of tasks with one machine. Traditionally, if an operator needed to change an attachment, the task would involve the removal of the pivot pins that secured the attachment to the machine. This is usually very laborious due to the nature of the fit between these pins and the associated bores, and often the environment is not ideal for this type of activity.

Quickhitches are basically an interface between the host machine and the numerous attachments that are likely to be used, thus allowing for the quick interchangeability of these attachments.

See - AS 4772-2008 Clause 2.1.4 for details.

- **Styles and Types**

- **Styles**

While the physical size of quickhitches varies considerably, there are two main styles of interface, namely dedicated, and non-dedicated.

Dedicated quickhitches, as the name suggests, will usually only allow the host machine to couple to attachments that are dedicated to that particular brand and, or model of host machine. Often the varying design of different manufacturers will restrict the interchangeability of numerous brands of attachment. The main advantage to this style of interface is its compact nature, which normally does not lead to a reduction in machine breakout forces when digging. The quickhitch is permanently pinned to the dipper arm in place of the original attachment, and the quickhitch then clamps to some form of location device on the attachment.

In contrast, non-dedicated quickhitches will often allow attachments from different manufacturers to be utilized. Initially the original attachment is removed and the quickhitch is permanently pinned to the dipper arm in the same manner as the original attachment, utilizing either the original pins, or a substitute set.

The quickhitch then acts as an interface that connects with an additional set of pins located in the original bores of the attachment. Each additional attachment will also need a set of pins to allow the quickhitch to utilize the attachment, without the need for physically changing pins.

Normally this style of interface will allow for minor variations in pin diameter and spacing. The downside to this style of interface is that it usually results in a minor reduction of machine breakout forces due to the increased spacing of the attachment from the host machine.

Irrespective of the style of interface used, (dedicated or non-dedicated) it is mandatory that all quickhitches be provided with a safety system. This is a system used to ensure that the attachment does not unintentionally disconnect from the quickhitch in the event of failure of the primary retention system.

See Clauses 1.4.7 and 2.1.4 of Australian Standard AS 4772-2008 for the definition and prescribed requirements of a 'Safety system'.

- **Types**

While dedicated quickhitches may vary in design slightly between manufacturers, generally their engagement methods are based on similar engineering principles.

Non-dedicated quickhitches, on the other hand, vary drastically in their engagement methods, and in the way that the 'Safety system' integrates with the design. There are

three main means of operation of quickhitches available on the Australian and New Zealand market, and these differing types relate to the level of interaction that is required of the operator.

The three main types are:

- **Manual,**
- **Semi-automatic, and**
- **Automatic.**

This article does not intend to extol the merits of any one design, but endeavors to highlight those issues that should be considered when purchasing a quickhitch that meets the requirements of the Australian Standard AS 4772-2008.

➤ **Manual**

Manual hitches require interaction at the attachment from either the operator, or a second person, to manually manipulate both the primary retention system, and the 'Safety system'. Common designs see the quickhitch hook on to one attachment pin, and the quickhitch is then rotated with the bucket crowd cylinder to allow location and clamping of the other attachment pin with some form of clamping device. This is known as the primary retention system.

In the majority of cases the primary clamping force is provided with the use of either spring force, or a screw thread. These are actuated with either a 'pinch bar' or a spanner, to ensure the attachment is firmly held, or to enable it to be released.

The primary clamping device may be in the form of a wedge, slide or claw, etc. The 'Safety system' must ensure, that in the event of spring failure, or the screw unwinding, that the primary engagement method is still effective.

➤ **Semi-automatic**

Semi-automatic hitches traditionally offer a wider variety of retention methods than manual quickhitches. Common designs see the quickhitch locate on to one attachment pin, and the quickhitch is then rotated with the bucket crowd cylinder to allow location and clamping of the other attachment pin. This system is known as the primary retention system. Clamping and locating methods vary significantly from design to design, but are generally all hydraulically actuated.

The primary retention system is controlled from inside the machine cabin, but the process is not yet complete, as a loss of hydraulic pressure at this stage may see the attachment release from the quickhitch.

As with all quickhitches it is imperative that there be a safety system to ensure that the attachment does not unintentionally disconnect from the quickhitch in the event of failure of the primary retention system.

Note: A check/lock valve mounted to the supply port of the hydraulic cylinder used to activate the primary retention system is not seen by regulators as an adequate safeguard that meets the intent of the 'Safety system'.

Semi-automatic quickhitches are so called because only part of the operation is carried out from the operators cabin, and normally these types of quickhitches require the operator, or a second person, to manually manipulate the 'Safety system'. There are a number of available quickhitches on the market that use a manually applied pin inserted behind the primary retention system, which will not allow it to fully retract in the event of loss of clamping pressure. This is not the only form of 'Safety system' available on the market for semi-automatic quickhitches. There are numerous designs that provide for similar levels of protection.

It is often inaccurately stated that the 'Safety system' must take the form of a manual pin inserted behind the primary retention system. This is not inline with the wording in either the current 2008 version of AS 4772, or the 2002 version of AS 1418.8 section 5 which prescribed the requirements for quickhitches prior to the release of AS 4772-2008. See below.

AS1418.8 - 2002, Section 5, Clause 5.10.1 (Superseded)

A quick-hitch that relies on positive hydraulic pressure to remain attached shall be fitted with an independent latching device that is both positively and mechanically locked in the engaged position and needs to be intentionally disengaged for the attachment to be uncoupled.

AS4772 – 2008 Section 2, Clause 2.1.4 - Safety system (Current)

All quickhitches shall be fitted with a safety system that ensures retention of the attachment to the quickhitch by mechanical and positive means in the event of failure of the primary retention system.

Means of verifying the engagement of the safety system shall be available from the operator's position. This means shall be stated in the operation and maintenance manual supplied by the manufacturer.

The safety system needs to be intentionally disengaged for the attachment to be disconnected from the quickhitch.

The safety system shall not be used as the primary retention system and must be in addition to the primary retention system.

In the event of failure of the primary system the operator should be able to detect that a failure has occurred.

The installation of the quickhitch shall not compromise the integrity of the safety systems of the host machine.

➤ **Automatic**

Automatic hitches offer an even wider variety of retention methods than manual quickhitches or semi-automatic quickhitches. All designs though see the quickhitch locate on to one attachment pin, and the quickhitch is then rotated with the bucket crowd cylinder to allow location and clamping of the other attachment pin. This system is known as the primary retention system. Clamping and locating methods vary significantly from design to design, but are generally all hydraulically actuated.

The primary retention system is controlled from inside the machine cabin.

As with all quickhitches, it is imperative that there be a safety system to ensure that the attachment does not unintentionally disconnect from the quickhitch in the event of failure of the primary retention system.

Note: A check/lock valve mounted to the supply port of the hydraulic cylinder used to activate the primary retention system is not seen by regulators as an adequate safeguard that meets the intent of the 'Safety system'.

Automatic quickhitches are so called because the function of both the primary retention system and the 'Safety system' are carried out from the operator's cabin, and these types of quickhitches do not require the operator, or a second person, to manually manipulate the 'Safety system'.

Designs of primary retention method, and safety systems vary drastically. It is imperative that you thoroughly understand the different systems available, and the levels of integrity provided by each design.

- **Precautions**

The Association considers that the safety of workers is being placed at risk by poor work practices. It has been found that 'Safety systems' on manual and semi-automatic quickhitches are not being used. These are purposely designed to prevent a bucket or attachments from uncontrolled release from the excavator.

Do not operate your machine without the 'Safety system' engaged.

Quickhitches are subject to arduous conditions, which can result in a build up of debris and increased wear rates from prolonged use. Operators must follow the maintenance instructions provided by the quickhitch manufacturers to ensure the systems are functional at all times. Operators and owners without maintenance guides should contact the quickhitch manufacturer for advice and instructions.

- **Selection**

While legislation varies significantly from region to region, they are all based around the same principles, namely:

Employers to assess the risks associated with their work, in order to identify workplace hazards and eliminate them through the application of adequate controls.

Employers to ensure that anyone who uses, supervises or manages work equipment has access to adequate information, instruction and training relating to the safe use of that equipment.

Equipment is designed and constructed to be 'fit for purpose'. It should be selected taking account of the working conditions that exist and any additional risk that might be posed by its use.

Equipment is maintained so that it works efficiently and safely.

From the above it can be seen that, as with all types of equipment procurement, it is imperative that a thorough risk assessment be carried out prior to purchase.

In this way an informed decision can be made as to what style and type of quickhitch should be purchased. This will also aid in the selection of an adequate primary retention system, and verification that the 'Safety system' provides an appropriate level of protection that ensures retention of the attachment to the quickhitch by mechanical and positive means in the event of failure of the primary retention system.

Other considerations may relate to the physical size and strength of the quickhitch, whether it is fitted with a suitably rated 'closed' lift eye, fitment of audible alarms if required, choice and location of controls to avoid unintentional operation, marking requirements for ratings, and adequate operation and maintenance information. This is not an exhaustive list and further details are contained in AS 4772:2008

- **Lifting freely suspended loads**

Nearly all quickhitches designed and manufactured in Australia are fitted with a dedicated lift eye to allow a freely suspended load to be lifted. Where a lift point is provided, a load chart must be fitted in the machine operator cab in accordance with AS1418.8-2008.

If it is not intended to lift off the quickhitch, then the lift eye should be removed or made unusable by some mechanical means.

Any lifting operation creates hazards for personnel in the vicinity. Under normal circumstances, personnel are kept away from the working area around the bucket of an excavator, as this is considered to be a hazardous area.

Where the excavator is used for object handling however, the slinger has to be in close vicinity in order to hook the load on to the lifting lug. This puts the slinger at risk of being struck by the load or excavator arm if the excavator moves without warning.

Excavator operators and slingers should be made aware of these dangers and effective communications must always be maintained between slinger and operator. The excavator operator should always make use of the safety lever (safety armrest) whenever the slinger is in the danger area.

It is imperative that persons are kept well away from the lifting area, and in particular that there is no one working below the lift, for example in a trench.

Personnel should wear hi-visibility clothing and other appropriate PPE.

Excavator operators must never move the machine or load until they have satisfied themselves that the slinger/signaler and any other persons associated with the lift have all moved away from the hazardous area.

The slinger or operator should check the lifting accessories, including the lifting point, before use to ensure they are not damaged or worn.

Any defective lifting accessories should be removed from service immediately. Chain slings should not have any distorted links or components and hooks should not be bent. Fibre slings should be rejected when damaged, and in any case when the outer covering is worn to the extent that the inner cores are visible.

The lifting lug should never be attached to part of the bucket, and the bucket should be removed in order to improve visibility and reduce the weight being lifted.

Operators and slingers should be adequately trained and assessed to undertake their roles in lifting operations. This training is additional to the training required for operating the machine as an excavator.

All machinery types require pre-use checks, inspections and maintenance to ensure that they do not deteriorate to an extent where the operator or other persons are put at significant risk.

- **Safe Use**

Where a quickhitch is fitted the following recommendations are made.

- Only use attachments that are designed for your specific quickhitch.
- Quickhitches shall be adequately maintained.
- Test the unit on a regular basis to ensure desired operation.
- Manufacturers should supply information for safe use, maintenance etc.
- Always ensure that operators are adequately trained for safe operation of the quickhitch, and not just the host machine. This includes knowledge on the primary retention and safety systems.
- Loads shall only be suspended from the designated lift point unless a dedicated lifting attachment is fitted.
- All other attachments should be removed while lifting.
- Never lift loads over personnel.
- See AS1418.8: 2008 Section 5 for further details on lifting with earthmoving machinery.

- **Bibliography**

AS 4772: 2008 - *Earthmoving machinery – Quickhitches for excavators and backhoe loaders*

AS 1418.8: 2002 - *Cranes, hoists and winches – Part 8 Special purpose appliances (Superseded)*

AS 1418.8:2008 - *Cranes, hoists and winches – Part 8 Special purpose appliances*

AS 2550.1 - *Cranes, hoists and winches – Safe Use Part 1 General requirements*

CMEIG *Fitment of lifting lugs to excavator / wheel loader buckets* Engineering Position Paper, Construction & Mining Equipment Industry Group Inc.

NOTE: There is currently an ISO Working Group developing an international standard for quickhitches.

NOTE: This Position Paper supersedes Engineering Position Paper No. 2 - 17 September 2008

Engineering Position Paper No. 10 – amended 14 August 2009
Construction and Mining Equipment Industry Group Inc.

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