

Safe use of quick hitch devices on excavators

SIM 02/2007/01 Version 2

Target Audience:

**Construction Division Staff
Construction Inspectors**

Date issued: 2007-06-27	OG Status: Fully open
Review date: 2011-06-27	Author Unit/Section: Construction Sector

Introduction
Issues
Action by inspectors
Recommended enforcement action

Introduction

1 This SIM aims to describe what a quick hitch is and discusses common failure modes in particular with semi-automatic hitches. It will address key issues that inspectors may wish to consider during inspection and gives guidance on instances where enforcement may be appropriate. Version 2 has been updated at paragraphs 11 and 12.

2 A quick hitch (QH) on an excavator is a latching device that enables attachments to be connected to the dipper arm of the plant and interchanged quickly. An excavator operator may change the bucket on his excavator up to 30 times a day in order to maximise the machine productivity.

3 Approximately 13% of all accidents investigated on excavators are attributed to the bucket detaching from a quick hitch and injuring a ground worker. These are mostly fatal and major injuries. However, there may be many more dangerous occurrences that occur when a bucket detaches unintentionally from the hitch, but without injury because no one is underneath at the time. This means that quick hitch failures are relatively common, although injuries are less so.

4 Typically, the QHs are not made by the excavator manufacturer, although some QHs are “badged” with the excavator manufacturer’s name and are supplied by them. There are a large number of QH systems on the market – HSE some time ago identified 20 different manufacturers, most of whom had several different designs of QH.

5 A standard bucket is secured to the dipper arm with two pins. QHs may pick up a standard bucket using the original pins, or the QH may have a dedicated attachment system that only fits buckets with matching engagement lugs. The advantage of dedicated systems is that the original radius of bucket movement can be maintained by compensating for the thickness of the QH, thus keeping the same break out force as the manufacturer intended. The disadvantage is less flexibility because only dedicated buckets can be used. In addition, a significant investment in dedicated buckets and attachments is required. For this reason most systems are “pin” type rather than dedicated type.

6 The QH systems on the market can be manual, automatic or semi-automatic:

- a) A manual system requires the operator to change the bucket by, for example, winding a screw thread to open and close a latch, or using a bar to open a spring actuated latch. Although faster than the conventional method of bucket change, this method is relatively slow and cannot be done from the excavator cab.
- b) Non-manual systems use a hydraulic ram to move the latch to retain the bucket.
 - Semi-automatic systems (photo 1) require the operator to leave his cab after he has operated the QH latch to insert a retaining pin in the hitch as additional security. This pin usually works by locking the latch in its closed

position; this is often referred to as the “safety bar” and it is not a load bearing part of the hitch. The safety pin cannot be inserted unless the latch is in its fully closed position.

- Automatic systems (photo 2) can be operated entirely from the cab and usually have an independent locking system which functions automatically and which does not rely on hydraulic pressure to hold the latch in its closed position. Automatic systems should have a method where the operator can verify that the hitch is locked from the cab – for example, locking pins may protrude from the side of the hitch when the latch is in its unlocked state. Large attachments such as rammers may prevent the locked condition being verified from the cab, in which case, the driver needs to get out of his cab to check the locked condition.

7 In the past 10 years, QH systems have become increasingly common and now many large excavators and some mini-excavators are fitted with QHs. QHs need to be maintained and may well be replaced during the life of an excavator. If they are replaced, then it is important that the controls are compatible with the new hitch, or are replaced at the same time.

Issues

8 Although incidents have occurred with automatic QHs, accident statistics suggest that the majority of incidents occur on semi-automatic systems where a manual safety pin should be inserted, but where the operator failed to do so.

This may be because:

- a) The bucket is changed frequently and the operator may on occasion fail to fit the safety pin in order to reduce the changeover time.
- b) The excavator is working in poor conditions (e.g. mud, heavy rain) and the operator is reluctant to leave the cab to fit the safety pin.
- c) The operator may not have been adequately trained in the use of QHs, and is unaware of the need to insert the safety pin. (The excavator may be hired, and the operator may be familiar with the excavator, but not with the particular type of QH).
- d) A pin may not be available, having been lost or misplaced.
- e) Some hitches have two holes for the safety pin (in order to pick up different bucket sizes) and the pin may have been inserted into the incorrect hole by mistake.

9 There is a management issue in ensuring that the safety pin on semi-automatic hitches is always fitted. In some cases, supervisors may not be aware of whether a pin is required or not, or how to check whether it is in the correct position.

10 In addition to precautions relating to the way the QH is operated, the basic precaution of ensuring ground workers are not required to work close to, or under the bucket (for example, within an excavation) should be strictly maintained.

11 If the QH is used for lifting (many QH's have a lifting eye for this purpose) the weight of the QH has to be deducted from the SWL of the excavator. Quick hitches are subject to the requirements of LOLER. If the quick hitch is permanently attached to the excavator, then it can be treated as though it is part of the machine and should be thoroughly examined at least every twelve months, unless either there is an examination scheme

which determines otherwise, or a competent person has set a different period, for example, due to its condition, or to particularly harsh operation (e.g. use with a hammer).

If the quick hitch **is not** permanently attached to the excavator, then it should be treated as a lifting accessory and have a thorough examination every six months, or in accordance with an examination scheme.

New quick hitches should be CE marked and provided with a Declaration of Conformity (D of C), and this declaration is sufficient for the 12 months following the date on the D of C. After this date thorough examination of the quick hitch is required. For quick hitches supplied by the excavator manufacturer as part of the original equipment, the D of C for the excavator is sufficient.

Action by inspectors

12 Inspectors are requested to:

- a) Ask site supervision if the QHs on the excavators under their control require a manual safety pin (they should know!)
- b) Is the risk of bucket detachment covered by their risk assessment?
- c) In addition to evidence of training in operating the excavator, have excavator operators been trained in the use of their QHs, and in the use of the excavator as a crane? (NB: the CITB course does not cover quick hitches, or use of the excavator as a crane, so a **CPCS card does not demonstrate competence** in either of these).
- d) Is there a checklist in the cab of daily and weekly inspection and maintenance carried out on the excavator, and does this checklist include a check of the QH and lubrication as appropriate? Is there a record of the inspection and maintenance actually carried out?
- e) What are their management systems for checking whether manual safety pins are always in place?
- f) Inspectors should check whether the safety pins are inserted where appropriate. (If the pin is missing, try looking behind the driver's seat!)
- g) Can the operator explain the type of QH system he has (does he know whether it needs a safety pin or not?) and is a manual or instruction card available in the cab?
- h) Does the operator know how to visually check that the QH is locked?
- i) Does the operator know that, for all types of QH, he should test the security of the bucket after changing it? [Some manufacturers advise "shake, rattle and roll", others suggest placing the bucket flat on the ground then trying to uncrowd the bucket so that the bucket tries to disengage from the QH].
- j) If inspectors suspect that the QH is malfunctioning or has parts missing evidenced by:

- The latch on hydraulic types moving in a jerky action
- Any obvious missing or broken parts
- Hydraulic pipes close to the hitch badly damaged.

then inspectors should request involvement of their local SG mechanical specialist.

k) Advice to duty holders may include:

- Where there are loose pins or clips which may be easily lost, they should be retained or attached to the quick hitch.
- The area around safety pin insertion holes can be painted to make it clear to operators and site supervision that the pin should be inserted here.
- Some duty holders have modified the safety pin so that it cannot be fully removed from the hitch. (Duty holders should check with the manufacturer before modifying the hitch).
- **Safe systems of work should ensure that ground workers are not exposed to risk by working below the bucket, for example, in excavations.**

l) Inspectors should establish whether the hitch is permanently attached to the excavator and ensure that the hitch is part of the thorough examination as part of the machine or as an accessory depending on the response given.

“Helpful” ground workers have been injured by offering to remove and insert the safety pin but have been injured when the excavator operator intentionally detached the bucket, which then dropped or fell over on to the ground worker’s foot/leg.

Recommended enforcement action

No SSW: (Management are not aware whether safety pins are required, or do not carry out routine checks).	Consider IN (MHSW 5(1))
No SSW: Ground workers are required to work below excavator buckets fitted with QHs	PN and possible prosecution
No pin fitted when it should be	Consider PN (PUWER 5(1)). If more than one instance on the same site consider prosecution
Evidence that operator does not know how to use hitch.	PN (PUWER 7(2)) on hitch (Work can continue if hitch is removed and bucket replaced directly on the dipper).
Evidence of poor maintenance	IN or PN (PUWER 5(1)) if hitch appears likely to cause bucket detachment. Involve SG if necessary
No risk assessment covering bucket detachment	Letter or IN (MHSW 3(1) or 3(2))

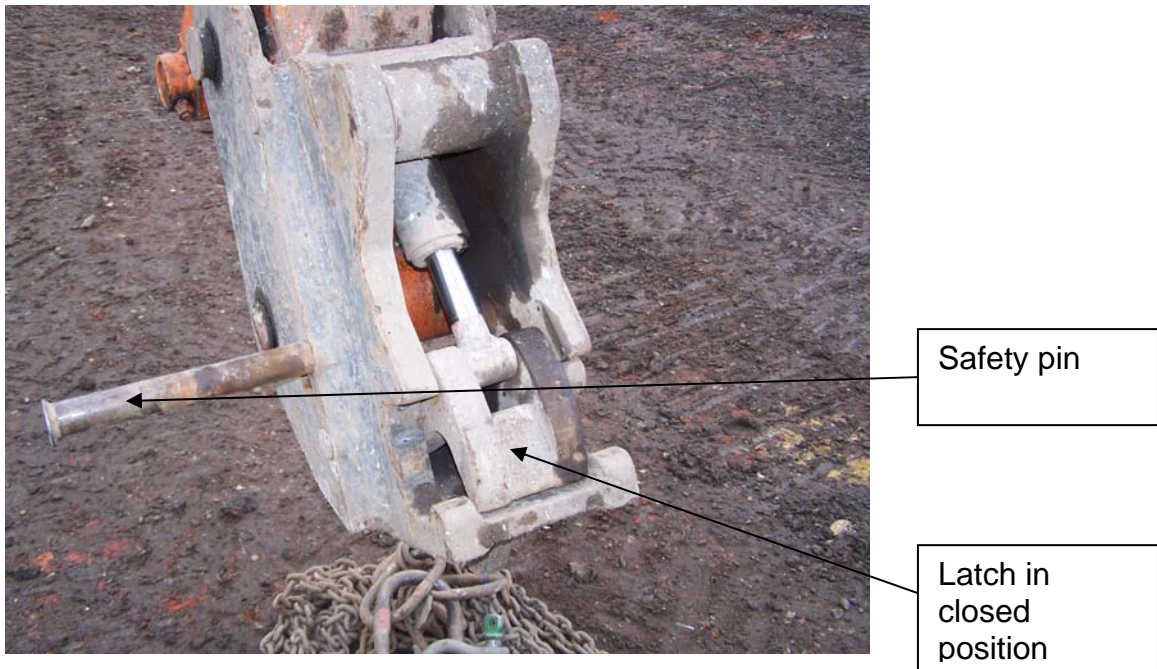


Photo 1: Semi-automatic type of QH (Safety pin about to be inserted)



Latch in closed position

Photo 2: Automatic type (Closed position)