



CICA Position Paper

Excavators Used as Cranes

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1. Background

Excavators are heavy construction equipment consisting of a boom, stick, bucket and cab on a rotating platform. Excavators are used in many ways on site including digging of trenches, holes or foundations and material handling. With the development of technology and machine design, capabilities of hydraulic excavators fitted with hydraulic-powered attachments such as a breaker, a grapple or an auger have expanded beyond excavation tasks. Many excavators feature a quick coupler for simplified attachment mounting which increases the machine's utilization on the jobsite.

At some of the construction sites, excavators are used for lifting freely suspended loads as a secondary function associated with the normal applications of the equipment (e.g., lifting and moving pipes, unloading construction equipment, manoeuvring accessories associated with the equipment). In their standard form, excavators are not presently equipped with crane-type instrumentation, and are therefore limited in their lifting capacities. Using excavators as cranes is a high risk activity because lifting is not the primary design function of these machines.

Excavator operators are often not familiar with operation outside their primary design function. The lack of relevant skills and knowledge in setting up the machine for lifting activities and not understanding the proper use of lifting gear can cause serious safety issues. An independent plant and equipment research centre published a safety alert on excavators used as cranes [1], it states that "A number of dangerous occurrences have recently occurred where chains, shackles or master links have either deformed or broken whilst loaded or excavators rolled over while lifting weights. Such incidents occur primarily because the load is not freely suspended from the lifting point. Instead, lifting equipment is wrapped over the lift point therefore creating rotational forces that multiply the load many times over". If excavator operators have knowledge of differences between various lifting equipment or machine attachments and slinging techniques, these incidents may have been avoided.

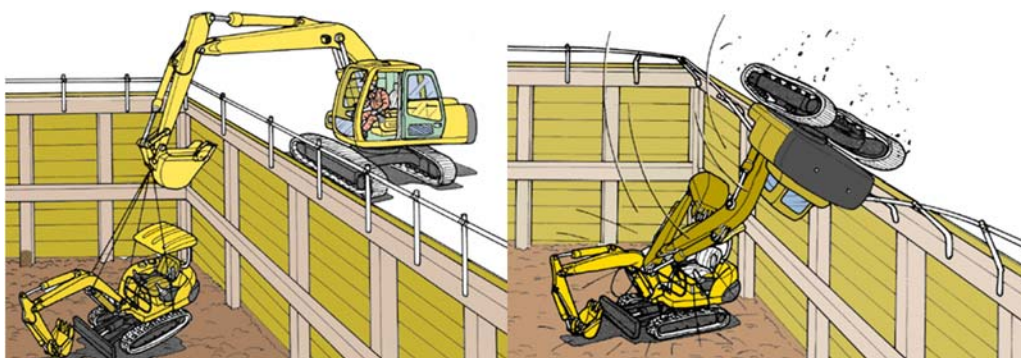


Figure 1. Example of an Excavator Accident

2. Comparison of Lifting Safety between Cranes and Excavators

2.1 Cranes

Cranes are purposely designed for load lifting and load placement applications. When perform lifting tasks, cranes must be designed in accordance with acceptable engineering principles and relevant technical standards, to ensure the crane is without risk to health and

safety. Every crane carries a detailed crane load chart at all times. The load chart is the most important resource for ensuring crane safety and for determining the lifting capacity of a particular crane. The load chart includes all notes and warnings, and how to calculate or determine the crane's actual net capacity in each configuration. The load chart provides guidance to crane operators on any deductions that may need to be made.

Cranes also have limiting and indicating devices. The purpose of limiting devices is to stop a specific crane motion before the operation moves out of the crane's design limits. Indicating devices are used to visually and/or audibly warn the crane operator that the crane may be approaching its set limits. These devices indicate load, working radius and other pertinent operational factors. Motion indicators and limiters display the operational conditions of the crane relative to its rated capacity limitations. They assist the crane operator to stay within the load chart and rated capacity limit of the crane. All safety devices are checked and verified by competent inspectors periodically through the prescribed crane maintenance and inspection program.

Crane operators are competent personnel who are trained to safely operate a crane to perform lifting activities. A person who operates a crane must hold a high risk work license for the type of crane they are operating. Key competencies of crane operators include [2]:

- Carry out all necessary pre-operational checks;
- Prepare a safe operational plan to deal with typical hazards and control the risks arising from those hazards;
- Set-up the crane or hoist ;
- Understand and interpret load charts and data plates;
- Operate the crane or hoist under actual or simulated working conditions
- Shut down and secure the crane or hoist
- Respond to hand and whistle signals for load movement;
- Calculate the safe working loads of slings in various configurations;
- Inspect lifting gear for defects;
- Assess the weight of loads;
- Understand the use of various items of lifting gear;

The certification system operating in Australia provides employers, employees and the community with an assurance that crane licence holders have been assessed as having the necessary knowledge and are competent to carry out lifting works in a safe manner.

2.2 Excavators

The majority of excavators are specifically designed and manufactured for excavation works. As a general rule, excavators are less suitable than most common types of cranes for precision lifting and placement applications due to their inherent 'hydraulic drift' characteristics. The erection of structural steel or tilt-up concrete panels, multi-crane lifting (dual lifts) and lifting of persons are examples of applications where earthmoving equipment should not be used.

Excavators could be used to perform crane type of jobs only when the excavator has been originally designed and manufactured to also function as a lifting machine. A load capacity chart identifying the lift point location(s) and the corresponding rated capacity at that position shall be provided by the excavator manufacturer and shall be available for access at all times. The excavator shall be equipped with audible warning device, level indicator, slope indicator and any other indicators required by AS1418.8. All displays shall be clearly legible from the operator's position.

An excavator used for lifting activities requires maintenance and inspection by a competent person at a similar standard and interval as crane maintenance and inspection (i.e. pre-use daily checks and periodical inspections).

Excavator operators who perform crane works need specific training and instruction in the use of the equipment. In all instances, the operator must have knowledge of assess weight of load and the capacity of the equipment, manufacturer's instructions for site conditions and lifting conditions shall be followed. The operator of the mobile plant must be able to see the load at all times during the lift. If the load is out of the operator's view at any time, the lifting process must be directed by a worker with a dogging or rigging HRW licence [4]. The operator shall also be able to understand and interpret excavator load chart, and respond to hand and whistle signals for load movement. One method of improving excavator operators' competent of performing lifting jobs is to have the operator undertake non-slewing mobile crane training [3].

3. Conclusion

CICA recommends that for safety and risk control reasons, all lifting activities on site shall be performed by cranes (operate by licensed crane drivers) that have suitable lifting capacity for the task. If excavators are to be used in a similar manner to a crane, to control and prevent accidents, lifting activities and procedures shall be planned before the work started, and a safe work method statement shall be prepared. Relevant Australian Standards and industrial work safe guidance notes shall be followed.

4. Reference

1. Off-highway Plant and Equipment Research Centre (OPERC) Safety Alert ALT-017, Excavators Used as Cranes.
2. Crane and Hoist Operators, What you need to know about certificates of competency, WorkCover VIC.
3. Guidance Note Earthmoving equipment used as a crane, WorkSafe Victoria, May 2010
4. Mobile Crane Code of Practice, 2006, Workplace Health and Safety Queensland.
5. AS1418.5 (2013) – Cranes, hoists and winches Part 5: Mobile Cranes.
6. AS1418.8 (2008) – Cranes, hoists and winches Part 8: Special purpose applications

5. Further Information

This Position Paper contains summary information only and further information and a listing of CICA recognised Crane Engineers is available by contacting The Crane Industry Council of Australia:

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