

# Precast pile falls from piling rig while being pitched

Last updated 17-06-2020

 **WorkSafe is issuing a reminder about the importance of managing risks associated with precast piling operations.**

## Background

A 4.5 tonne precast concrete pile recently struck a piling rig's leader (mast) when the lifting chain failed. The way in which the lifting chain was rigged to the pile resulted in the chain being stressed beyond its lifting capacity. The pile was lifted using a single leg chain sling, with a master link at each end, wrapped in a choke hitch around the pile. The incident occurred as the pile was being lifted from the ground into a vertical position, before securing it into the hammer helmet of the piling rig.

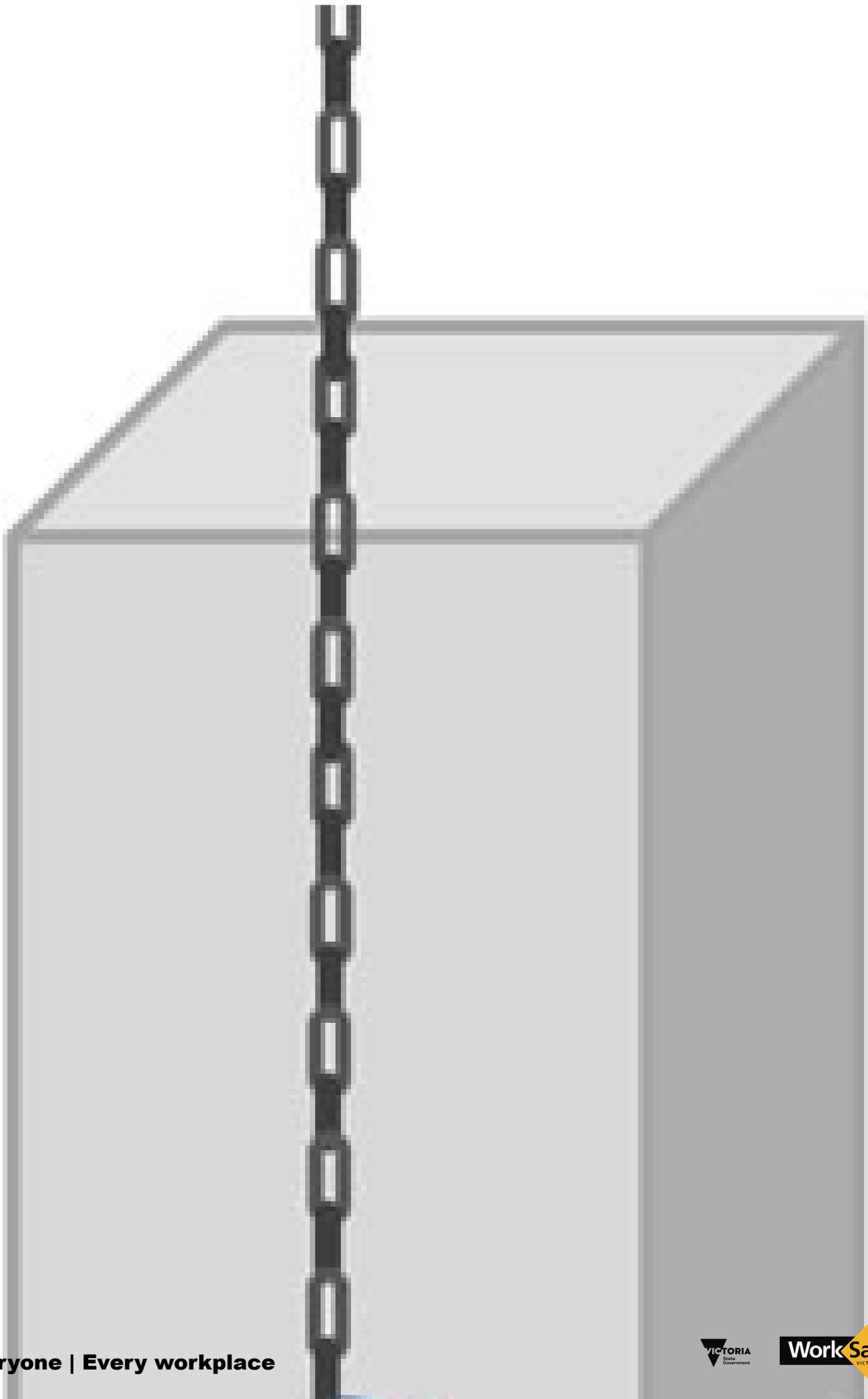
No injuries were sustained.

## Safety Issues

Poor planning and inappropriate lifting techniques in piling foundation work, can lead to loads being dropped from height, colliding with plant or people and causing serious injuries and even fatalities.

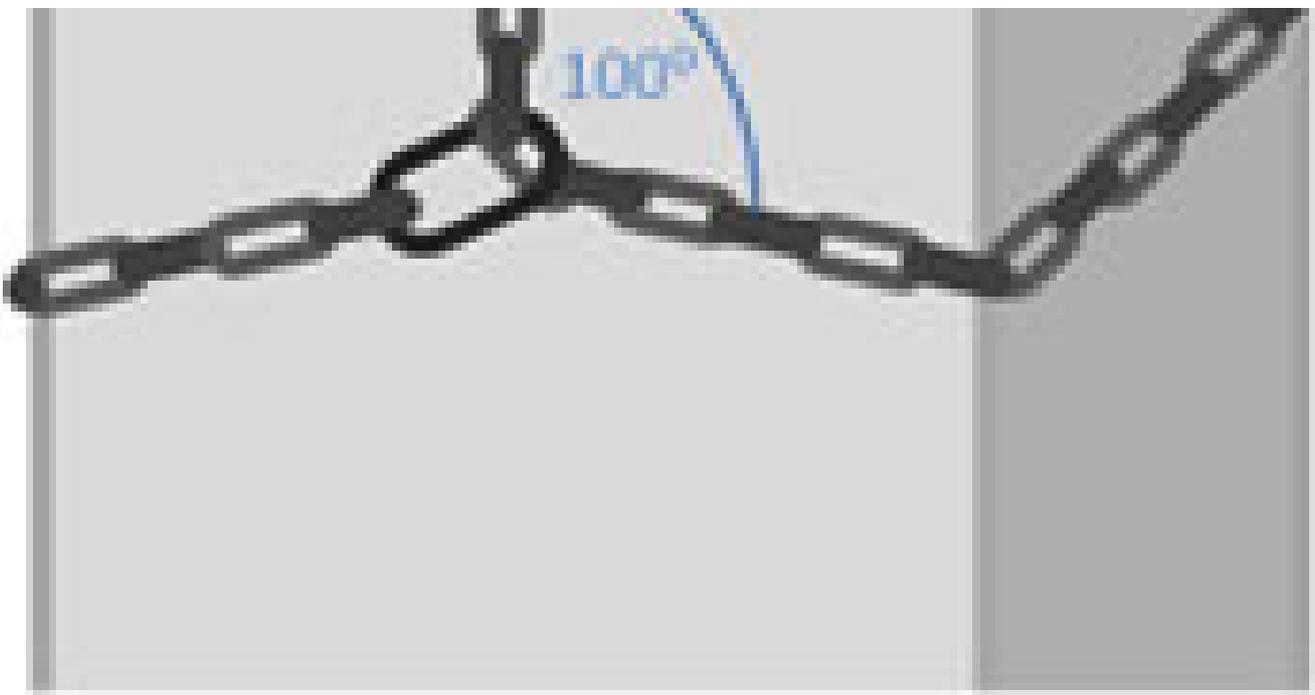
Some common examples of safety issues when lifting and pitching a pile are:

- When using a choke hitch, the angle of the lifting chain at the legs of the choke hitch can become very shallow. As the angle between the vertical leg of the chain and the leg of the choke hitch decreases below  $120^\circ$ , the tension in the chain increases. This may lead to an overstressing of the lifting chain beyond its capacity, causing it to break suddenly. For example, when the angle between the vertical leg and the choke hitch leg is  $100^\circ$  (as shown below) the tension in the chain is almost three times the weight of the load being lifted.



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- When using a single leg choke hitch, the master link of the lifting chain exerts high stresses onto the chain link that passes through it. If the piles being lifted are all of similar size, this link in the chain is repeatedly placed under high stress, which can cause the chain to suddenly fail.
- If the base of the pile is dragged along the ground towards the piling rig, additional forces are introduced on the load which can cause the lifting chain to be stressed beyond its capacity.

### **Recommended ways to control risks**

#### **Rigging arrangements**

- Ensure the rigging arrangement is carefully planned by a person with suitable training, experience and knowledge.
- Ensure the necessary load factors and rigging capacity derations have been taken into consideration and that the chains rated capacity is not exceeded.

#### **Cast in lift points**

- Wherever possible, include a cast in lift point in the design of the precast piles, instead of relying on a choke hitch to lift the pile.
- Ensure the lift point has been designed by a suitably competent engineer.
- Ensure the lift point is adequately rated to lift the entire weight of the pile, while taking into consideration the dynamic forces.
- Ensure the lifting equipment has been verified as compatible with the cast in lift point.

#### **Inspect**

- Regularly inspect lifting equipment and remove any damaged or worn equipment from service.

**Note:** Chain slings need to be inspected in accordance with the criteria set out in AS 3775.2 and lifting clutches need to be inspected and tested in accordance with AS 3850

### **Exclusion zones**

- Ensure that exclusion zones are always setup around the piling operations.

### **If using a choke hitch**

Where it has been determined that it is not reasonably practicable to have cast in lift points, then a choke hitch may be used to lift and pitch the pile.

If using a choke hitch to lift and pitch the pile:

- Ensure a detailed rigging plan has been developed that clearly identifies the capacity of the lifting equipment (including any derations) and the tension in the lifting equipment.
- Use an endless chain rather than a single leg chain, wherever possible. The endless chain will distribute the load more evenly between the chain links, avoiding repeated stressing of the individual chain links during lifting cycles.
- Before each lifting cycle, inspect the chain for any linkage damage and ensure that the inspection is documented.
- Attach a secondary choked hitch as a safety precaution. This secondary chain provides added protection in the event that the primary lifting chain fails. The secondary chain should only come under tension in the case of a failure of the primary chain.

### **Legal duties**

Under the Occupational Health and Safety Act 2004, employers must, so far as is reasonably practicable, provide and maintain a working environment that is safe and without risks to the health of employees and independent contractors. This means employers must eliminate so far as is reasonably practicable the risk associated with operating plant in the workplace. Where the risk cannot be eliminated, it must be reduced so far as is reasonably practicable.

Employers must provide or maintain plant or systems of work that are safe and without risks to health, so far as is reasonably practicable.

Employers must, so far as reasonably practicable, identify all hazards associated with plant at the workplace and eliminate any risk involved. If it is not reasonably practicable to eliminate the risk, employers must reduce the risk, as far as reasonably practicable in accordance with the plant hierarchy of control set out in Part 3.5 of the OHS Regulations. The OHS Regulations also set out specific duties about plant used to lift or suspend loads. For more detail, see the Plant compliance code.

Employers must provide employees with the necessary information, instruction, training or supervision to enable them to do their work in a way that is safe and without risks to health.

### **Further Information**

#### **Australian Standards**

- AS3850.1 – Prefabricated concrete elements – General requirements

- AS3775.2 – Chain slings for lifting purposes – Grade T(80) and V(100) – Care and use

### **Related information**

- **Piling work and foundation engineering sites: A guide to managing safety**

<https://www.worksafe.vic.gov.au/resources/piling-work-and-foundation-engineering-sites-guide-managing-safety>

- **Precast and tilt-up concrete for buildings: Industry standard**

<https://www.worksafe.vic.gov.au/resources/precast-and-tilt-concrete-buildings-industry-standard>

- **Compliance code: Plant**

<https://www.worksafe.vic.gov.au/resources/compliance-code-plant>