

## Workplace Health and Safety Queensland

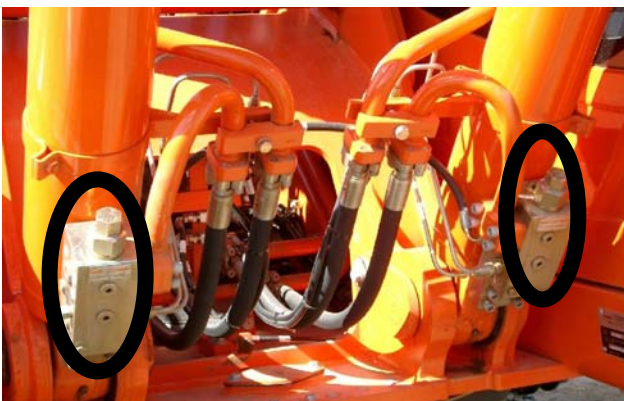
*Technical guidance note***Earthmoving equipment — Burst protection on earthmoving equipment used as cranes**

This technical guidance note clarifies the requirements for burst protection to be fitted to earthmoving equipment, when used in the crane mode.

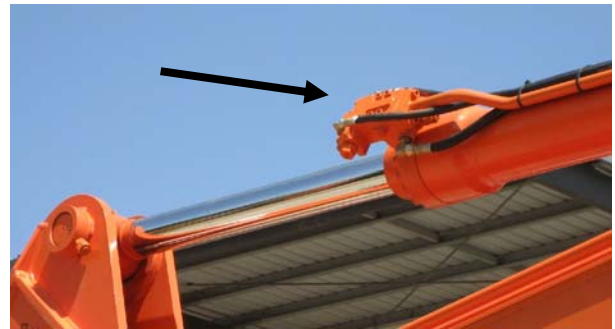
**Background**

A catastrophic failure of a hydraulic hose supplying the oil flow to raise or maintain a lifting boom at a specific height will cause a sudden collapse of the lifting system and injury to a person if struck by a falling boom or load. The risk of hose failure increases significantly as hydraulic operating pressures increase when the mass of the load increases.

For many years mobile cranes have been fitted with burst protection on critical hydraulic cylinders to prevent crane or boom collapse. These devices lock cylinders in the event of sudden loss of hydraulic fluid pressure (i.e. when a flexible hydraulic hose ruptures). One type of burst protection device is shown in photographs 1 and 2.



**Photograph 1:** Burst protection fitted to boom cylinders.



**Photograph 2:** Burst protection fitted to dipper arm cylinder.

The *Mobile Crane Code of Practice 2006* discusses the need for burst protection to be fitted to the boom and dipper arm of earthmoving equipment used as a crane (i.e. with a freely suspended load).

Section 5.4 of International Standard ISO 8643 describes the distance a test load is allowed to fall from a stationary position will not exceed 100 mm during the first 10 seconds after a hose burst.

**Determination**

Burst protection is to be fitted on all earthmoving equipment used as a crane, where the rated capacity exceeds 1 tonne. The burst protection is to be fitted to both the boom and dipper arm of the equipment. Burst protection is to comply with the performance requirements of *ISO 8643: Earthmoving machinery – Hydraulic excavator and backhoe loader boom-lowering control device – Requirements and tests*.

The following additional conditions are to be applied:

- The maximum rated capacity is to be in accordance with the manufacturer's specifications for the equipment. Equipment must not be de-rated to avoid fitting burst protection.
- **Single rated capacity** – Where the decision is made to rate the lifting capacity of the equipment at its maximum lifting radius, this becomes the rated capacity<sup>1</sup> and is to be marked on the boom or dipper arm. The rated capacity must then be strictly observed at all times, irrespective of the radius of the load. Information should be available on site to confirm that the rated capacity marked on the unit is the same as that specified by the manufacturer.
- **Variable rated capacities** – Where the equipment has variable lifting capacities, the manufacturer's rated capacity chart (i.e. load chart) is to be fixed to the inside of the operator's cabin. For equipment with variable rated capacity, the lifting capacity at minimum radius is to be used to decide whether burst protection is required.
- The burst protection device should not be provided with the ability for the operator to switch the device on and off (in case the operator forgets to switch the burst protection on when the equipment is operated as a crane).
- Where the rated capacity of the equipment is 1 tonne or less, and the decision is made not to fit burst protection, the equipment must not be used to lift loads in close vicinity to workers.

Earthmoving equipment owners should seek advice on fitting of burst protection from original equipment manufacturers, to help avoid fitting faulty or unsafe systems.

## Implementation

The following scenarios provide guidance on typical enforcement action that can be expected from WHSQ:

<sup>1</sup>Safe working load abbreviated to "SWL" can also be used to indicate the rated capacity.

<sup>2</sup> Earthmoving equipment is usually described by its operating weight and not its rated lifting capacity, as is the case with a mobile crane.

- **Scenario 1** – An inspector observes a 40 tonne excavator<sup>2</sup>, with a rated capacity of 7.1 tonnes at maximum radius, being used in crane mode to lift a storm water pipe with a worker partially underneath one end of the pipe. The excavator is not fitted with burst protection. The inspector will issue a Prohibition Notice that totally prohibits the excavator from lifting any suspended load until it is fitted with burst protection on both the boom and dipper arm hydraulic cylinders.
- **Scenario 2** – An inspector observes a 20 tonne excavator lifting loads in crane mode and the load is approximately 2.5 tonnes. The excavator was manufactured in 2008 and is not fitted with burst protection. The dipper arm is marked with the letters "SWL 1 Tonne". The operator claims that because the excavator is rated at 1 tonne it does not require burst protection. The inspector checks the manufacturer's specifications and notes the excavator has a rated capacity of 3.6 tonnes at maximum radius. The inspector will issue a Prohibition Notice that totally prohibits the excavator from lifting any suspended load until it is fitted with burst protection on both the boom and dipper arm hydraulic cylinders.
- **Scenario 3** – An inspector observes a 5 tonne excavator lifting a storm water pipe that weighs approximately 500 kg. The dipper arm is marked with the letters "SWL 700 kg" in accordance with the manufacturer's rated capacity at its maximum radius. The inspector observes workers walking under the load. The operator claims that it is okay to lift loads over workers and the excavator doesn't require burst protection because the excavator's maximum rating doesn't exceed 1 tonne. **Enforcement action** – The inspector will issue a Prohibition Notice that totally prohibits the excavator from lifting any suspended load over workers. The inspector tells the operator that the excavator can only be used to lift suspended loads if workers are excluded from the lifting zone.

## For more information

For more information about mobile plant, visit [www.worksafe.qld.gov.au](http://www.worksafe.qld.gov.au) or call the Workplace Health and Safety Infoline on 1300 369 915.