



## **Concrete pumping safety**

In order to understand the workplace health and safety requirements for concrete pumping safety, and your obligations under the law you must consider and understand relevant legislation and codes of practice.

### What law applies

Legal obligations, legislation, code of practice

### Preparation of the site

Planning by builders, hirers, principal contractors and concrete pumpers

### Controlling the risks of concrete pumping

Concrete placement booms, pump gauges

### Avoiding pipeline failure

Concrete pipelines, pipe clamps, anchor brackets and pipe movement

### Placement of plant and equipment

Setting up the concrete pump, stable ground, outriggers, sole plates, exclusion zones, safe access for concrete delivery trucks, traffic control and safety near powerlines

### Safe concrete pumping

Concrete delivery, safe access and exit, pump hoppers, pump and boom operators, concrete pouring, delivery hose, line, pump and pipe cleaning, road transport

### Controlling noise and fumes

Reducing the effects of noise and fumes

### Compliance, inspections and maintenance

Compliance plates, booms, outriggers, repairs, replacements, registered professional engineers, defects, log books, records, testing pipes and other equipment

### Safety, training and supervision

Safety equipment, personal protective equipment, work methods, knowledge levels, tools and equipment, monitoring safe work practices

## What law applies

In order to understand the workplace health and safety requirements for concrete pumping safety, and your obligations under the law you must consider and understand relevant legislation and codes of practice.

### **General health and safety obligations**

To understand your obligations and safety requirements you must be familiar with the:

*Workplace Health and Safety Act 1995* which imposes obligations on people at workplaces to ensure workplace health and safety. The *Workplace Health and Safety Act 1995* also helps you to meet your workplace health and safety obligations through:

- The *Workplace Health and Safety Regulation 2008* which describes what must be done to prevent or control certain hazards which cause injury, illness or death
- codes of practice, which are designed to give practical advice about ways to manage exposure to common risks. In particular, the *Risk Management Code of Practice 2007* should be read in conjunction with information on PPE.

Every Queensland employer must have **workers' compensation** insurance. Most employers insure with WorkCover Queensland, while a small number of large organisations have their own insurance. This insurance coverage ensures that employees injured at work receive financial support.

### **What you must do**

It is a requirement of the *Workplace Health and Safety Act 1995* that risks must be assessed and control measures then implemented and reviewed to prevent or minimise exposure to the risks.

If the *Workplace Health and Safety Regulation 2008* describes how to prevent or minimise a risk at your workplace you **must** do what the regulation says. If there is a code of practice that describes how to prevent or minimise a risk at your workplace you **must** do what the code says or adopt and follow another way that gives the same level of protection against the risk.

If there is no regulation or code of practice about a risk at your workplace you **must** choose an appropriate way to manage exposure to the risk. People must, where there is no regulation or code of practice about a risk, take reasonable precautions and exercise proper diligence against the risk.

See the *Risk Management Code of Practice 2007* for further information.

## ***Specific regulations for concrete pumping***

Under the *Workplace Health and Safety Act 1995*, those responsible for concrete pumping must protect workers and the public from risks death, injury or illness caused by concrete pumping activities.

Legal responsibilities are covered in:

Part 3 of the *Workplace Health and Safety Act 1995*

People considered responsible for plant and equipment such as concrete pumping include:

- Employers, self-employed persons and/or business owners, principal contractors, owners of high risk plant and those in control of fixtures, fittings and plant such as concrete pumping and workers who operate concrete pumps; and
- Designers, manufacturers, suppliers and those who install or erect plant and equipment such as concrete pumps.

Under the Act, you must follow any regulation or code of practice which have been developed to help you meet your workplace health and safety obligations.

If there is a regulation about a risk, you must do what the regulation says.

## ***Specific codes of practice for concrete pumping***

The Practical advice about reducing risks is provided by the:

- *Concrete Pumping Code of Practice 2005*
- *Plant Code of Practice 2005*

The *Concrete Pumping Code of Practice 2005* explains how you can meet your obligations under the Act. However you may adopt another way if you think it is more suited to your business or work activity. If you adopt another way, it must give the same level of protection against risk as if you followed the Code.

It is very important to reduce the risks of injury when pumping concrete.

The Code has identified factors which need to be considered with care by employers, contractors and workers when concrete is pumped.

The Code also provides good advice about what to do in situations and the best way of avoiding problems.

Practical advice is provided in the *Risk Management Code of Practice 2007* about how to develop ways of controlling the hazards of concrete pumping.

Section 3 of the *Concrete Pumping Code of Practice 2005* looks at the important steps of planning and preparing the site before concrete pumping begins; and then outlines the particular risks from:

- plant and equipment – such as concrete placement booms, pipelines, delivery hose, gauges, clamps, brackets, pipe movements, receiving hopper and other parts
- the placement of concrete pumping plant and equipment close to traffic, members of the public, powerlines, trenches and ground stability
- major tasks such as concrete delivery line cleaning, pump and boom operation, concrete pouring, pump cleaning and road travel
- by-products of concrete pumping including fumes and noise

Check the dictionary of terms in Appendix 1 of the *Concrete Pumping Code of Practice 2005*.

To find out about and carry out your legal obligations, you must refer to the full text of the *Concrete Pumping Code of Practice 2005*.

## Preparation of the site

Planning by the builder, hirer or principal contractor

Planning by the concrete pumper

### ***Planning by the builder, hirer or principal contractor***

Planning by the builder, hirer or principal contractor should ensure that the site provides a clear, level area of ground with firm base to support the pump unit, clear access to the pump unit for concrete trucks and safe, unobstructed access for the general public if the pump unit is in the street.

It is important to have a clearly defined pump washout area which provides a method for collecting concrete residue to avoid stormwater drains and complies with Environmental Protection Authority requirements.

Additional planning includes the following points:

- the concrete pump is in the best position to pump concrete which allows the pump operator an unobstructed view of the pump and the pour area
- a time schedule for a major concrete pour and planning for weather, volume of concrete, site limitations, equipment back up and capacity
- if compressed air and water lines are supplied, they are placed on site in a way that avoids damage and complies with Australian Standards

For more detailed information on planning requirements, check Section 3.1 of the *Concrete Pumping Code of Practice 2005*.

### ***Planning by the concrete pumper***

**The concrete pumper** should consult with the principal contractor or responsible person about the plan for pumping concrete on site.

In addition, the following points are important:

- Providing enough workers to pump concrete safely, including a competent worker to operate the emergency shut down system if necessary.
- The best method for pumping concrete to the pour site.
- The capacity and type of pump to be used and where to place the pump for best access by concrete delivery trucks.
- Ensuring electrical safety including safeguards from nearby powerlines.
- Removing risks to health and safety from manual handling, trip, slip and fall hazards.
- Providing safety equipment including personal protective equipment.
- Keeping maintenance and repair manuals safely on registered premises.

- The pump operator should be trained and competent to use operational manuals and equipment.
- Instruction manuals and maintenance log books should accompany the pump unit and/or boom.

Before starting pumping, the concrete pumper should consult:

- the concrete delivery company – to discuss the measures in place for preventing line blow-outs and for handling multiple truck reversals to the concrete pump
- the truck driver – to discuss the importance of:
  - following the directions from traffic controllers or spotters
  - the arrangements for multiple trucks reversing to the concrete pump
  - standing in a safe place during concrete pumping

For more detailed information, the concrete pumper should check section 3.2 of the *Concrete Pumping Code of Practice 2005*.

## Controlling the risks of concrete pumping

### Concrete placement booms

#### Pump gauges

There are important steps you must take to control the risks of concrete pumping.

### ***Concrete placement booms***

Regular maintenance should be performed to prevent the structural or mechanical failure of the concrete placing boom according to manufacturer's instructions.

Guidance on inspections is provided by the AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.

Inspections should check:

- all functions and their controls for speed, smoothness of operation and the limits of motion
- all emergency and safety devices
- lubrication of all moving parts, filter elements, hydraulic oil and coolant
- structural components and other critical components
- correct erection and dismantling procedures

### ***Pump gauges***

- Gauges fitted to concrete pump should be accurate, correctly sized and visible style to prevent gauge damage or malfunction.
- Instruments should be visually checked and tested and recorded in log book.

More detailed information on the risks of failure of concrete pumping equipment is provided in section 4 of the *Concrete Pumping Code of Practice 2005*.

## **Avoiding pipeline failure**

Concrete pipelines

Pipe clamps

Anchor brackets

Pipe movement

### ***Concrete pipelines***

When laying a pipeline, avoid concrete pipeline failure by:

- eliminating bends, supporting horizontal and vertical pipelines to avoid extra loads on pipe clamp, securing 90° bends in pipes with leg clamped to ground
- securing vertical lines to the building and not to cranes, hoist towers, scaffolding and formwork
- checking all metal pipes and components with AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*
- flexible hoses must not be at risk of being run over by other plant and equipment on site

More detailed information on the concrete pipeline failure is outlined in section 4.1.3 of the *Concrete Pumping Code of Practice 2005*.

### ***Pipe clamps***

When using quick release pipe clamps on fixed lines, make sure that:

- the pipe clamps used are able to maintain the maximum concrete pressure in the pipeline from the pump
- the locking pins are used and engaged
- pipe clamps with no provision for locking pins should not be used
- all pipe clamps are regularly inspected and replaced if deformed or damaged
- clamps are locked according to manufacturer's instructions and not by hammering the quick released clamp lever or other methods causing metal fatigue

For more detailed information on avoiding concrete pipe clamp failure, check section 4.1.3 of the *Concrete Pumping Code of Practice 2005*.

### ***Anchor brackets***

When inserting anchor brackets on the concrete delivery pipe, the concrete pumper should:

- anchor brackets and tie downs should be used at no more than 3 metre intervals on the concrete delivery pipe
- the number of bolts to secure an anchor bracket should be in accordance with  
*AS 2550.1 - Cranes - Safe use - General requirements*
- when using friction type 'drill-in' anchors, these should be high-load slip, torque controlled type with a safety factor of 3 to 1
- chemical anchors are pull out load tested to 125% of their working load with a safety factor of 3 to 1 based on their failure load
- securing pipes overhead (i.e. so that the bracket anchors are loaded in pure tension) with 'through bolts' that extend through the concrete slab rather than drill-in type anchors
- if drill-in type anchors are used overhead they should all be pull out load tested to 125% of their working load

### ***Pipe movement***

Where excessive pipe movement occurs in temporary laid lines due to surging action of the pump, use:

- extra anchorage methods to restrict line movement, especially at bends and elbows; or
- install a short wire-braided high pressure rubber hose between concrete pump and pipelines.

For more detailed information on anchor brackets and pipe movements, check section 4.1.3 of the *Concrete Pumping Code of Practice 2005*.

## **Placement of plant and equipment**

Where to place plant and equipment

Risks with setting-up concrete pumping equipment

Operating near powerlines

Working near powerlines is restricted

Setting up in a public place

Before you start, traffic control

## Where to place plant and equipment

Risks with setting-up concrete pumping equipment include concrete pumping booms tipping over and workers being crushed or run over by the mobile pump or concrete truck.

When setting up a concrete pump, the area should be level, capable of supporting the load and free of obstructions by:

- not placing the pump over or near back-filled ground, holes, excavations or trenches, cellars, basements or pits or soft ground
- setting the pump up as level as possible and checking the manufacturer's instructions if the pump is placed on an angle or incline

### If outriggers are required

- supply adequate sole plates to pack the outrigger pads
- outriggers pads must be clear of excavations, soft ground or other obstacles which could prevent the safe operation of the machine
- the sole plate material must be of sufficient bearing area to support the machine and the outriggers must be regularly checked to prevent subsiding

**If the ground is not firm** or is close to an excavation the principal contractor should consider a more stable location:

- care should be taken if the concrete pump is used near an excavation since the weight of the pump and load can cause slippage and accidents
- the concrete pumping exclusion zone should be clearly signed, require people working in the area to wear high visibility vests and prevent access to unauthorised people

For additional information on placement of plant on site, check section 4.2.1 of the *Concrete Pumping Code of Practice 2005*.

Once the site has been selected and set-up, basic safety requirements are:

- clearly defined entry and exit points and good lighting at the site if night operations are required
- post a sign stating "Danger – Concrete Pump Area – Authorised persons only" and keep other traffic from the site

# Operating near powerlines

## ***Setting-up near powerlines or electrical equipment***

Working near powerlines is restricted under:

- the *Electrical Safety Regulation 2002* which regulates work around overhead power lines.
- practical advice is provided in the *Code of Practice - Working Near Exposed Live Parts*.

One of the requirements is that workers and plant should maintain an 'exclusion zone' of 3 metres around live overhead power lines of up to 132kV.

Greater 'exclusion zones' apply to high voltage lines (6 and 8 metres depending on the voltage).

In certain limited situations, exceptions may apply – refer to Appendix B of the *Code of Practice - Working Near Exposed Live Parts* for further details.

When operating plant near power lines, you must have an 'exclusion zone' around overhead power lines:

- The minimum clearance distance from the closest part of the concrete placement boom to the power line is the 'exclusion zone'.
- Allowing for sway and sag of the overhead lines. Sway is usually caused by wind and sag occurs when the temperature of the line fluctuates.
- Making sure that persons, plant and vehicles stay outside the 'exclusion zone' at all times.
- Nominating a 'safety observer' when the crane or plant could enter into the 'exclusion zone'.

There are a number of devices available to prevent contact with power lines, or reduce the degree of risk in the event of contact including:

- The use of 'tiger tails' on power lines act as a visual aid to prevent contact by highlighting the location of the power line. **Note:** tiger tails do not insulate the wires and therefore the 'exclusion zone' must be maintained.
- Limiting or warning devices to prevent the pump boom from entering the exclusion zone and the system should be designed to 'fail safe' or should at least meet category 4 reliability in accordance with AS 4024.1 - *Safeguarding of machinery - General principles* or EN 954 -1 European Norm – Safety Related Parts of Control Systems.
- Earthing of concrete placing booms should be in accordance with the *Code of Practice - Working Near Exposed Live Parts*.

Irrespective of whether safety devices are being used, the 'exclusion zone' must not to be encroached.

More information on working near exposed live parts.

## Setting up in a public place

Before you start  
Traffic control

### ***Before you start***

Before setting up in a public place, consultation needs to take place between the concrete pumper and principal contractor or person responsible about risks including:

- if approvals are required from local councils, these should be checked by the concrete pumper
- the public should be directed to an alternative footpath, and protective screens erected or fitted around the pump area to prevent concrete being splashed on the public
- lane closures and the erection of appropriate barricades and signs should comply with the requirements of the Department of Main Roads, Local Government Authorities and any relevant Building or Local Acts

### ***Traffic control***

Traffic control will be arranged by the contractor in consultation with the concrete pumper.

For more detailed information on the responsibilities about setting-up in a public place, check section 4.2.3 of the *Concrete Pumping Code of Practice 2005*.

## **Safe concrete pumping**

### Concrete delivery risks

Risks when delivering concrete from the delivery truck to the concrete pump hopper

### Concrete delivery trucks

Delivery trucks should have clear and safe access to approach and leave the receiving hopper

### Pump and boom operation

Safe use and training of the pump and boom equipment, concrete pouring, delivery hose

### Cleaning pipelines and pumps

Line cleaning, pump cleaning

### Road travel

Equipment is to be fastened securely while in transit

## Concrete delivery risks

Concrete delivery involves the delivery of concrete from the delivery truck to the concrete pump hopper. In this operation one or more concrete trucks are reversed up to the concrete hopper to deliver concrete. This activity poses risks to the concrete delivery truck driver, the concrete pump operator, the allocated traffic spotter, other workers working in and around the concrete pumping exclusion zone and members of the public

When concrete trucks deliver concrete (see section 4.3.1 of the *Concrete Pumping Code of Practice 2005*) to a concrete pump, remove the risk of:

- reversing trucks hitting or entrapping people between truck and concrete hopper
- being struck by concrete when delivering concrete to the hopper due to equipment failure such as burst lines
- being struck by ejected pipes from the concrete pump due to clamp failures, while discharging concrete into the hopper
- entanglement, crushing and amputation from the concrete hopper.

For important information on the risks of concrete delivery, check section 4.3.1 of the *Concrete Pumping Code of Practice 2005*.

## Concrete delivery trucks

Concrete delivery trucks  
Working around pump hoppers

### **Concrete delivery trucks**

When delivering concrete the following should be ensured:

- Concrete delivery trucks should have clear and safe access to approach and leave the receiving hopper of the pump.
- Where more than one concrete delivery truck is required, the person in control of the workplace should ensure that a spotter or traffic controller is on site to direct the movement of trucks.
- The concrete delivery truck driver should have adequate room to operate the concrete truck safely and, in an emergency, be able to operate the concrete pump emergency shutdown device.
- No person should stand between the reversing concrete delivery truck and the hopper.
- Any vehicle reversing into the exclusion zone must stop immediately if the spotter or traffic controller is not visible to the driver.
- The concrete chute on concrete trucks should only be moved when the truck is stationary and undertaken by the driver or with the agreement of the driver.
- The concrete receiving hopper should be at a height that allows a gravity flow of concrete into the hopper.
- Additional ramping may be required for the concrete delivery truck where low slump concrete is to be used.
- Where ramps are used they should be designed so that the truck cannot back off the ramps, it remains stable and has a non-slip surface.
- All concrete delivery trucks should be fitted with reversing hazard lights such as an amber flashing light mounted at the rear of the truck.
- All concrete delivery trucks should be fitted with audible reversing devices.

For important information on the safe concrete delivery, check section 4.3.1 of the *Concrete Pumping Code of Practice 2005*.

### **Working around pump hoppers**

When delivering concrete to the pump hopper you must protect workers and the public from risk of contact with moving parts by:

- Positioning hopper safely to receive concrete flow directly from discharge chute of concrete delivery truck.

- Provision of a grill to prevent access to dangerous moving parts such as feed or agitator mechanisms and valve gear.
- Bolting down the grill to prevent lifting or using a cut out switch designed to isolate the agitator shaft if the grill can be lifted.
- The emergency stop button must be able to be reached by the concrete pump operator and the concrete delivery truck driver.
- Constructing parallel bars on the grill spaced at or below 75mm to reduce the risk of a person's hand being trapped.
- Ensuring that the distance from the top of the grill to any moving parts be at least 100mm.

## **Pump and boom operation**

Using the pump and boom

Concrete pouring

Delivery hose

### ***Using the pump and boom***

Concrete pump and boom operators should be trained, supervised and competent to safely operate the equipment.

Plant operators should:

- be familiar with and operate the plant and equipment in line with advice and information from the manufacturer
- undertake daily inspection and maintenance before pumping starts
- always attend to the equipment or make sure that a competent person is in attendance if working away from the equipment
- pump concrete only when the grill is in the closed position
- make sure that pump flow rates match discharge rates of concrete delivery trucks
- be based at the pump and have a clear view of both the hose-hand and the hopper, if using remote control
- if a clear view is not possible, then another competent person, other than the delivery truck driver, should be based at the hopper to be responsible for stopping the pump
- follow the directions of and maintain communications with the hose-hand

More information on safe pump and boom operation is provided in the section 4.3.2 of the *Concrete Pumping Code of Practice 2005*.

### ***Concrete pouring***

The concrete pour involves the pouring of concrete through the delivery hose connected to the concrete pump to the concrete pump area. In doing this there are a number of risks including:

- concrete lines bursting;
- lines becoming unrestrained; and
- pipe clamps being dislodged.

Damage to the delivery hose may cause discharge of concrete under pressure.

### ***Delivery hose***

Ensure good quality of hose and avoid damage by:

- checking hose for damage before being fitted
- fitting a suitable stop device at the outlet end of the hose, where it is located above a working or public area
- fixing the delivery hose fitting on a boom pump by a safety chain, sling or other retaining device in line with AS 1418.15 - *Cranes (including hoists and winches) concrete placing equipment*
- using a delivery hose able to handle the pumping concrete pressure
- steel re-enforced hoses should be used with high pressure pumps on high-rise 'satellite' booms. Non re-enforced hoses should not be used on piston type pumps unless specified by the manufacturer
- avoiding structural failure of the boom caused when additional hose is added to the end of a concrete placement boom for pumping concrete
- using reducers to avoid overload of the hose or other parts of the unit
- the hose-hand should wear eye protection in line with AS/NZS 1336 - *Recommended practices for occupational eye protection*

Check in detail the responsibilities for concrete pouring safety in section 4.3.3 of the *Concrete Pumping Code of Practice 2005*.

## Cleaning pipelines and pumps

### Line cleaning

### Pump cleaning

Major tasks such as line cleaning and pump cleaning need to be handled with care:

#### ***Line cleaning***

Line cleaning is undertaken with either high pressure water or air, to remove residual concrete in the pipeline. The sudden release of waste concrete under pressure can harm workers and the public.

Check in detail the responsibilities for line cleaning on site in section 4.3.4 of the *Concrete Pumping Code of Practice 2005* and follow the manufacturer's instructions and employer's procedures.

The following safety precautions should be followed:

- Water rather than air should be used for cleaning and only experienced and trained workers should carry out line cleaning.
- The pipeline must not be dismantled for cleaning or other purposes until pressure is relieved. An air relief valve as well as the air entry point to the pipeline is needed to relieve pressure from the system.
- The pipeline must be free of internal pressure before disconnecting a pipeline connection or fitting and must not be left unattended until then.
- Remove rubber hose at the end of the pipeline and secure all parts of the pipeline to prevent uncontrolled movement during purging.
- A device should be attached to the discharge end of the pipeline to catch the cleaning device while the concrete is still flowing.
- If a concrete truck bowl is used, concrete lines should be prevented from moving. It is not safe to attach concrete lines to the concrete truck's ladder.
- Workers should be removed from the discharge end while the concrete is under pressure and any workers involved should wear protective clothing.

#### ***Pump cleaning***

Entanglement, crushing or amputation injuries can occur to workers working with a concrete hopper or pumping device. Workers should avoid placing any part of their body within the hopper. Safety precautions include:

- Providing a physical barrier at all times to protect people from the moving parts of a hopper.

- If cleaning or maintenance requires entry to the hopper, the equipment must be shut down and controls used to remove any hydraulic or air pressure to prevent movement or rotation of parts of the engine.
- Workers should receive instruction, training and supervision when concrete hoppers are cleaned and access to a support person in the immediate area.

Check in detail the responsibilities for pump cleaning on site in section 4.3.5 of the *Concrete Pumping Code of Practice 2005*.

## Road travel

Fasten equipment securely on journeys to prevent accidents:

- **Outriggers** (whether hydraulic or manual), must be secured with a locking device and stowed in a travelling position to prevent movement.
- **Loose components** (such as pipes, couplings and tools etc), must be stowed in appropriate storage areas outlined in standards on safe loads on road vehicles (e.g. Load Restraint Guide (2003) ISBN 0664 329319).
- Disengage all **drives to hydraulic pumps** (for operating the concrete pump), boom and/or outriggers, and, put the controls in the OFF position.
- **Boom restraint** should be placed according to manufacturer's instructions and should ensure there is no unintended movement of the boom.
- **Air operated devices** for 'Engage' and 'Disengage' of 'power takeoff' (PTO) drives must be of an approved type and brand, and must have a positive feel for the 'In' and 'Out' position with a warning light when engaged (if able to be operated independently).

Check in detail the responsibilities to prepare for road travel from section 4.3.6 of the *Concrete Pumping Code of Practice 2005*.

## Controlling noise and fumes

Controlling noise

Controlling fumes

### **Controlling noise**

Excessive noise in a workplace can cause industrial deafness. Operators of concrete pump and associated equipment should be provided with hearing protection if the noise is in excess of the noise exposure limits.

- Part 10 of the *Workplace Health and Safety Regulation 1997* prescribes maximum levels for excessive noise at the workplace
- Section 3 of the *Noise Advisory Standard 2004* (now known as a Code of Practice) provides an assessment of noise in the workplace.

### **Controlling fumes**

Exhaust gases from concrete delivery trucks, concrete pump and internal combustion engines can cause illness or death. If the concrete delivery truck is placed in an enclosed area, ventilation must be maintained or exhaust gases extracted.

- Section 5.3 of the *Hazardous Substances Advisory Standard 2003* (now known as a Code of Practice) provides an assessment of risk from fumes such as exhaust gases

For more detailed information on controlling the risks of excessive noise and fumes, check Section 4.4.2 of the *Concrete Pumping Code of Practice 2005*.

## **Compliance, inspections and maintenance**

### Compliance plates

Concrete pumping equipment must have fixed compliance plates or appropriate certification

### Maintenance inspections

Visual inspections, functional test, repairs and replacements, written records

### Reporting and recording defects

Owner of concrete pumping equipment should record all repairs in a log book

### Testing pipes

Pipe testing, identification and marking

## Compliance plates

All equipment associated with concrete pumping, must have fixed compliance plates, and/or appropriate certification for their use, for example:

- Cab and chassis - by the state transport authority in which the unit is registered, with a fixed motor vehicle modification plate showing the appropriate modification codes.
- Placing boom and outriggers:
  - by the manufacturer - with a fixed plate showing date of manufacture, serial number, maximum recommended working pressure, maximum recommended length of end (or drop hose), recommended maximum size of delivery pipe/hose, etc, in accordance with AS 1418.15 - *Cranes (including hoists and winches) concrete placing equipment*
  - by a registered professional engineer, whose area of competence includes the type of work being undertaken - with a fixed plate setting out the details of the annual inspection and the six year strip down and inspection dates, in accordance with AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*
- Concrete pump - by the manufacturer, with a fixed plate showing date of manufacture, serial number
- Maximum recommended working pressures for hydraulics and concrete, in accordance with AS 1418.15 - *Cranes (including hoists and winches) concrete placing equipment*
- Over length and over weight permits - must be obtained, kept current, and in the vehicle.

Any pump, boom, prime mover and/or associated equipment not having such a compliance plate or permit, should be removed from service immediately, until certification is gained.

For more detailed information on inspections and compliance check Section 5.2 of the *Concrete Pumping Code of Practice 2005*.

## **Maintenance inspections**

Inspections and preventative maintenance must be carried out on a regular basis to make sure that concrete pumps and booms are operating safely according to the manufacturer's recommendations and AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.

Before starting work each day

Routine maintenance inspections

Annual inspections

Assessment for service

### ***Before starting work each day:***

- All concrete pumping/placing equipment is to be given a visual inspection and functional test - in accordance with the manufacturer's instructions and recommendations, and AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.
- Any repairs or replacements should only be carried out by trained and competent personnel in accordance with the manufacturer's instructions.
- Written records of maintenance and repair work performed on concrete pumping/placing equipment should be kept.

### ***Routine maintenance inspections***

The owner should establish:

- A program of weekly, monthly and quarterly preventative maintenance inspections of all equipment in accordance with the manufacturers recommendations and AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*, which is based on the equipment's working environment and the severity of use of the equipment.
- Details of these inspections are to be kept in the appropriate log book, and a copy kept on the unit.

### ***Annual inspections***

All concrete placing booms, pumps and related equipment are to be inspected once a year by an assessor, to confirm that the equipment is suitable for continued service, in accordance with the manufacturer's specifications, and AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.

### ***Assessment for service***

All items of concrete placing equipment should undergo a major inspection to make sure the concrete placing equipment is in a safe working condition in accordance with

AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.

These inspections should include a strip down of all high stress areas, including the boom, slew ring and outriggers.

The inspection should be conducted by a registered professional engineer, whose area of competence includes the type of work being undertaken. All inspections should be noted in the appropriate log book.

All concrete placing equipment should be assessed for service and continued use when six years from the date of manufacture has elapsed and at each six year period thereafter.

For important information on maintenance responsibilities check sections 5.3 to 5.6 of the *Concrete Pumping Code of Practice 2005*.

## Reporting and recording defects

Inspection reports

Welding and other repairs

Reporting defects

Log books and inspection record sheets

Warning and safety signs

### ***Inspection reports***

If repairs/replacements are required under AS 2550.15 - *Cranes - Safe use - Concrete placing equipment* or the manufacturer's recommendations, then the owner of the plant or equipment should record it in the log book.

If no action is taken, or the equipment continues to fail to meet the assessment criteria, then the inspector may order that the equipment be removed from service immediately.

### ***Welding and other repairs***

Only a welder or service provider holding the appropriate qualifications, and where possible in possession of the manufacturer's current specifications may perform welding or repair work on:

- the concrete pump; or
- equipment such as the placing boom, the outrigger system or any other stressed structural component that is related to the overall equipment stability or structural integrity.

### ***Reporting defects***

A pump operator should report defects immediately:

- if a defect is considered to be a hazard to safety, pumping operations should be stopped until the defect is repaired
- the details of reported defects and subsequent action taken should be entered into a log book

### ***Log books and inspection record sheets***

- Instruction, maintenance and repair manuals should be kept in a safe place at the registered premises, and should include a parts catalogue.
- The operator should be familiar with the contents of the instruction manual which should be available at the site of operation.
- All log books and inspection record sheets must show complete details of all inspections, tests, repairs, replacements and modifications carried out on equipment, in accordance with AS 2550.15 - *Cranes - Safe use - Concrete placing equipment* and be

available for inspection by the principal contractor or person in control of the workplace.

- Evidence that the pump and other equipment has been inspected and certified to be 'suitable for continued service' (i.e. in a safe working condition), should be made available to the principal contractor or person in control of the workplace for inspection (on request), before the unit is allowed to operate on site.

### ***Warning and safety signs***

Ensure that all warning and safety signs/stickers are in good condition, legible and positioned on all equipment (after being inspected and found to be serviceable), in accordance with  
*AS 2550.15 - Cranes - Safe use - Concrete placing equipment.*

For more detailed information on reporting and recording defects check Section 5.9 of the  
*Concrete Pumping Code of Practice 2005.*

## Testing pipes

### Pipe testing, identification and marking

- Pipe wall thickness should be tested in accordance with AS 2550.15 - *Cranes - Safe use - Concrete placing equipment*.
- Ultrasonic testing may not be appropriate for twin wall pipeline. Other testing methods include the use of thickness testing callipers, increased inspection and increased monitoring of use, in terms of volume and type of concrete pumped.
- Piping which has a wall thickness less than the recommended thickness for the pumping design pressure should not be used.
- All pipeline segments shall be clearly identified with a permanently fixed unique identification mark or number, prior to being placed in service, showing the details required in accordance with AS 1418.15 - *Cranes (including hoists and winches) concrete placing equipment*.
- The pipe logbook shall record wall thickness and pressure details, in accordance with AS 1418.15 - *Cranes (including hoists and winches) concrete placing equipment*.

For more detailed information on pipe testing, identification and marking, check Section 5.12 of the *Concrete Pumping Code of Practice 2005*.

## **Safety, training and supervision**

Provision of personal protective equipment (PPE)

Training

Supervision

### ***Provision of personal protective equipment (PPE)***

The following items of PPE are likely to be required when pumping concrete:

- safety helmets
- eye protection
- hearing protection
- gloves
- reflective safety vest
- safety boots
- rubber boots
- waterproof clothing

PPE is the least effective method for controlling risks, however in many circumstances related to concrete pumping provides the most practical option.

### **Additional equipment**

Each pump unit should be equipped with the following items:

- first aid kit (must include eye wash)
- protective creams
- fire extinguishers (as appropriate)
- sufficient reflective traffic cones (minimum 450mm high)
- signs e.g. exclusion zone
- high visibility vests

For more detailed information on safety equipment, check section 6.1 and 6.2 *Concrete Pumping Code of Practice 2005*.

### ***Training***

Under the *Workplace Health and Safety Act 1995*, employers and business owners must provide information, instruction, training and supervision to workers and others at a workplace to ensure that work is performed in a safe manner and without risk to health. Information, training, and instruction should cover at least:

- the work methods to be used in the setting up and safe operation of concrete placing booms and pumps

- the method for inspection and maintenance of concrete pumping equipment
- a knowledge of the manufacturer's operation and service manuals
- the correct use, care and storage of personal protective equipment
- the correct use, care and storage of tools and equipment to be used, including electrical safety practices
- procedures to be adopted in the event of accident or injury.

## ***Supervision***

Supervisors must:

- ensure that only those workers who have received training and instruction are authorised to carry out that work
- monitor the work sufficiently to make sure that safe work practices are being carried out, including the use of all protection systems and personal protection equipment

For more detailed information on training and supervision, check Section 7 of the *Concrete Pumping Code of Practice 2005*.