

CODE OF PRACTICE Pumping Concrete

gazetted 3 December 1993, commenced 1 March 1994

1. Introduction

1.1 Citation

This Code of Practice may be cited as, Code of Practice, Pumping concrete.

1.2 Purpose

This Code of Practice sets out guidelines for the safe operation of concrete pumps and ancillary equipment used for pumping concrete.

1.3 Scope

This Code applies to pump units that are skid mounted, trailer mounted or vehicle (prime mover) mounted.

1.4 Commencement date

This Code commences on 1 March 1994

1.5 Authority

This Code of Practice is approved as an Industry Code of Practice pursuant to section 44A of the Occupational Health and Safety Act, 1983, by the Minister for Industrial Relations and Employment on the recommendation of the WorkCover Authority of NSW.

2. Planning and preparation

Planning and preparation is the first step in ensuring that work is done safely. Planning and preparation should involve consultation with all those engaged in the work including *employee representatives*.

2.1 Planning by builder

When planning for pumping concrete to be on site the builder or principle contractor should consider such factors as:

- a. Location of the concrete pump in the most favourable position to pump concrete.
- b. A clear, level area of ground with a firm base that is capable of supporting the pump unit.
- c. Clear access to the pump unit for concrete trucks.
- d. Safe and unobstructed access for the general public if the pump unit is set up in the street.
- e. Formwork certificate. The formwork must be inspected and have a certificate issued by a qualified *engineer* in accordance with Construction Safety Regulation 86(1B).
- f. Time schedule. Prior to a major pour commencing there should be a realistic assessment of the time of completion made in consultation with the workers' representative which allows for:
 - (i) weather
 - (ii) accessibility
 - (iii) volume of concrete
 - (iv) slab limitations
 - (v) kibble back up
 - (vi)

- (vi) restricted work times (local council rules).

2.2 Planning by concrete pumping contractor

In addition to collaboration with the builder or *principal contractor* in the overall planning for pumping concrete on site, the concrete pumping contractor should consider:

- a. The most suitable method of pumping concrete to the pour area.
- b. The capacity and type of pump to be used to complete the job satisfactorily.
- c. The location of the pump and access for concrete delivery trucks.
- d. Assessment of manual handling tasks which could cause muscle and ligament strains and other injuries.
- e. Provision of personal protective equipment and other safety equipment.
- f. Provision of safe access including elimination of trip and slip hazards.
- g. Electrical safety, including the location of nearby powerlines and systems of work which comply with the recommendations in the *Code of Practice, Electrical Practices for construction work*.
- h. Instruction manuals should be supplied with the pump unit and boom, giving comprehensive instructions for operation, maintenance and repair and should include a parts catalogue.
 - (i) The operator should be familiar with the contents of the manual which should be available at the site of operation.
 - (ii) Manuals should be kept up to date with any additional information from the manufacturer.
- i. Log books should be kept up to date and be made available on request at the workplace.

3. Work practices and protective measures

3.1 Setting-up on site

When setting-up a concrete pump the area should be level, solid and free of obstructions. Careful attention should be paid to the following:

- a. Make sure the pump is not being positioned over or adjacent to:
 - (i) previously disturbed ground that has been back-filled.
 - (ii) excavations, trenches or holes in the ground.
 - (iii) cellars, basements or pits.
 - (iv) inadequately compacted or soft ground.
- b. Make sure the pump unit is set up level and:
 - (i) if this cannot be achieved make sure the incline or angle of the machine does not exceed the manufacturer's recommendations (refer to operating instruction manual).
 - (ii) if outriggers are used, supply adequate timbers for the purpose of packing the base plate. To ensure the outriggers do not subside, the timbers should be pigstayed and be of sufficient bearing area to support the machine. Make regular checks to ensure stability.
 - (iii) the outriggers pads are clear of excavations, soft or filled ground, or other obstacles liable to interfere with the safe operation of the machine. If the ground is not firm or is near an excavation the operator should make sure that the bearing pressure of the ground is not exceeded by the pressure on the foot of any outrigger. For calculations and checking of bearing pressure refer to *Appendix I*.
- c. Particular care and precautions should be taken when a concrete pump is used in the vicinity of an excavation. The weight of the concrete pump and the load can effect the stability of the excavation wall and cause a slip to occur which may lead to the concrete pump overturning.
- d. Unauthorised persons should be kept away from the immediate area of the machine.
- e. The area should be made safe from other traffic.

- f. Concrete delivery trucks should have clear and safe access to approach and leave the receiving hopper of the pump.
- g. If more than one truck is required to approach the receiving hopper at any one time, a spotter or traffic controller should be on hand to safely direct the movement of the trucks.
- h. No person should stand between the reversing truck and the hopper.
- i. The concrete receiving hopper should be at a height that allows a gravity flow of concrete into the hopper.

3.2 Location

Where a permanent or semi-permanent set-up area is designated for the positioning of the concrete pump it should be identified with painted lines or other method to clearly define the area. Clear access and adequate lighting should be provided around the unit at all times. Post a sign clearly stating "Concrete Pump Area".

3.3 Setting-up near powerlines or electrical equipment

The precautions listed below should be strictly observed when setting up near powerlines.

- a. Minimum distances. Under the Construction Safety Act, 1912, Section 133(a) boom pumps must observe the following minimum distance requirement from powerlines:
 - 3m up to 132,000 volts
 - 6m from 132,000 to 333,000 volts
 - 8m over 330,000 volts
 - 8m where the voltage is not identified(Refer to *Appendix 2*)
- b. Wind conditions. Swinging of the overhead powerlines and of the placing boom in the wind should also be taken into account when setting distances from powerlines.
- c. All powerlines or electrical conductors must be considered **LIVE** unless they are positively identified to be isolated from all sources of power supply. A certificate should be issued indicating that all power lines and electrical conductors have been de-energised.

3.4 Setting-up in a public place

When setting-up a concrete pump in a street, roadway or other public place careful attention should be given to the following.

- a. Protective screens should be erected or fitted around the pump area to prevent concrete being splashed on the public.
- b. A close fitting mesh or shade cloth screen should be fitted to the pump reservoir to prevent concrete splash.
- c. Post a sign stating "concrete pump being used" or "concrete pump in operation".
- d. Provide an access ramp for the public when a concrete line crosses over the footpath. The ramp should:
 - (i) be stable and of solid construction and capable of performing the purpose it was designed for.
 - (ii) not create a trip hazard at the leading edge of the ramp.
 - (iii) have a height to length ratio of no more than 1:12 from the highest point to the end of the ramp.
 - (iv) be easily negotiable by wheelchair.
 - (v) be provided with a non-slip surface even when wet.
 - (vi) extend across the width of the footpath.
 - (vii) be fitted with handrails and toeboards at a suitable height for both adults and small children and follow the contour of the ramp.
 - (viii) have adequate lighting to ensure the area is sufficiently illuminated at all times.
 - (ix) have pump pipes that are removable for inspection and cleaning.

3.5 Traffic control

Ensure that pedestrians on or off the site are not at risk from trucks delivering concrete to the pump by nominating a person whose duties will be to control the traffic. This person should wear the appropriate personal protective equipment.

3.6 Fumes

Ensure that an adequate level of ventilation is maintained to prevent the build-up of exhaust gases.

If a concrete pump is located in a enclosed or confined area where there is a likelihood of build-up of gases from internal combustion engines, precautions should be taken to direct the gases to the open air.

The build-up of gases can also be prevented by fitting a catalytic converter (scrubber) to the exhaust system of each internal combustion engine.

3.7 Noise

Noise levels from machinery or equipment during pumping operations should not be a risk to hearing or health.

Suitable hearing protection equipment should be provided to all workers in the vicinity of the concrete pump and other associated equipment if the noise is in excess of the noise exposure limits.

The risk of causing permanent hearing damage is related to both loudness of the noise and the length of exposure. For example two minutes working in noise levels of 144 decibels (dB(A)) may cause the same amount of damage as eight hours working in 85 dB(A).

3.8 Water and air lines

Where compressed air and water lines are supplied on site for use with the concrete pump they should be positioned to avoid damage to the lines and be kept well clear of any public place.

3.9 Residue collection

Where a permanent or semi-permanent set-up has been established on site or where a pump is set-up in a roadway or public place a method to collect concrete residue should be put in place and all necessary precautions taken to prevent washdown residue from the clean-up of pumping operations finding its way into stormwater drains, this also includes concrete delivery trucks.

The residue collection method should comply with Environment Protection Authority requirements.

3.10 Vibration

To minimise vibration caused by the pump motor and hydraulics the pump frame should be anchored to the concrete deck where this is practicable.

3.11 Pump gauges

Gauges fitted to the concrete pump should be accurate and of a size and style that are easy to read. The instruments should be checked on a regular basis and the results recorded in the pump's log book.

3.12 Concrete pipelines

- a. When laying a pipeline avoid using unnecessary bends.
- b. Horizontal pipelines should be adequately supported.
- c. Each section of pipe in a vertical pipeline should be supported to avoid extra load on the pipe clamp.
- d. The 90 (degree) bend at the base altering the direction of the concrete line from horizontal to vertical should be equipped with a leg sitting firmly on the ground. Otherwise any movement in the vertical line may snap off the first clamp.
- e. Vertical lines should be positively secured to the building.

Do not use crane or hoist towers, scaffolding or formwork to secure the line. This type of equipment may not be capable of taking the impact load when pumping concrete through the line.

3.13 Pipe clamps

When using quick release pipe clamps engage the locking pin to avoid accidental release.

3.14 Anchor brackets

Use enough anchor brackets and tie-downs to adequately secure the system.

On a vertical (riser) line, brackets should be securely fixed to the wall or to the edge of each floor slab no more than three metres apart.

Do not use friction fasteners as brackets to hold down bolts where a change of direction in the line occurs.

3.15 Pipe movement

Where excessive pipe movement occurs in temporary laid lines due to the surging action of the pump use extra anchorage methods to restrict the line movement, especially at bends and elbows.

3.16 Delivery hose

The rubber delivery hose should be checked for damage prior to being fitted.

If it is used where the full hose is passed above workers or public areas fit the hose with a suitable stop cap at the outlet end.

Care should be taken to avoid damage to the hose during use. Ensure the delivery hose on a boom pump is secured in position by a safety chain, sling or other retaining device.

3.17 Receiving hopper

The receiving hopper should be positioned on the mounting so that it can receive concrete flow readily from the discharge chute of a concrete delivery truck.

A hinged grill should be provided to prevent access to dangerous moving parts such as feed or agitator mechanisms and valve gear. The grill should be constructed of parallel bars, spaced so that it is not possible for a person's hand to become trapped. Spacing should not exceed 70mm and the distance from the grating to moving parts should be at least 150mm.

Keep hands, arms, legs and feet away from the hopper grate whenever the pump is running. Never remove the hopper grate while the pump is running and never stand or walk on the hopper grate regardless of whether the pump is running or not.

3.18 Line cleaning safety

Line cleaning should only be carried out by experienced and trained pumping personnel. Extreme care should be taken when using compressed air to clean the pipeline. Air pressure will cause anything inside the pipeline to act as a high-velocity projectile.

The following safety precautions should be followed:

- a. There should always be a connection to atmosphere (air relief valve) as well as the air entry point to the pipeline. This connection is to allow the system to be depressurised before removing any pipeline.
- b. Remove the rubber delivery hose at the end of the pipeline. If left on, the hose can whip around dangerously as the line is blown out.
- c. A positive catchment device should be attached to the discharge end of the pipeline to safely catch the cleaning device but at the same time allow the concrete to flow.
- d. Keep all workers away from the discharge end while the concrete is under pressure.
- e. Never attempt to take a line apart to clean out a blockage or to dismantle it until after the pressure has been relieved.

3.19 Pump cleaning safety

Before a person places any part of their body into a pump opening the engine should be shut down and the controls actuated to exhaust any hydraulic accumulators which can allow the elements to move or rotate with the engine stopped. When cleaning make sure that another person is in the immediate vicinity to provide assistance if required.

3.20 Safety precautions for deck area concreting

The following safety precautions should be used for deck area concreting:

- a. Edge protection. All perimeter guard railing or safety screens should be securely in place. If guard railing is used it should be of a two level design with the top rail being set at one metre above the finished concrete slab.
- b.

enable proper access for those carrying equipment to the pour area. These walkways can consist of scaffold planks placed at least two planks wide which can be moved back as the pour progresses.

- c. Vibrating machine. A confined area such as slipform or jumpform can present a fume or fire hazard during a pour. Electric powered vibrating machines should be used rather than petrol driven machines. Fire extinguishers should be on hand in the immediate work area where petrol machines are in use.
- d. Lighting. All workplaces and access to workplaces where a concrete pour is being carried out should be well lit.

3.21 Preparation for road travel

The manufacturer's instruction should be followed. In particular:

- a. Lock hydraulic operated booms and outriggers in the stowed or travelling position.
- b. Stow all loose components, such as pipes, couplings and tools.
- c. Disengage all drives to hydraulic pumps for operating the concrete pump, boom and outriggers and put the controls in the OFF position.

4. Inspection and maintenance

4.1 General

Planned inspection and maintenance are essential for safety and efficiency in the operation of concrete pumps and booms.

4.2 Daily

Manufacturer's instruction manuals recommend that specific tasks should be carried out daily. Any repairs or replacements should be in accordance with the manufacturer's recommendations. Only trained and *competent* personnel should carry out inspections, repair or replacement.

4.3 Monthly

All pipeline, including reducers, bends, hose and couplings should be inspected monthly using ultrasonic testing for metal parts and areas likely to be subjected to wear. Rubber hose and couplings should be visually inspected. Records of the pipeline inspection should be kept in the log book or on site in the case of fixed pipeline installation.

4.4 Yearly

Concrete placing booms and pumps and all other associated equipment, except pipelines, should be inspected once a year by a *competent* person and the results entered in the log book. This is in addition to the daily visual checks and inspection by the operator prior to the commencement of the equipment being used.

4.5 Six year maintenance program

After six years of operation there should be a thorough check of all areas of potential wear or fatigue. This inspection should include but not be limited to:

- a. The complete stripping and inspection of the slew ring or king post assembly.
- b. The replacement of the slew ring bolts
- c. Magnetic particle, dye penetration or radiographic checking of all critical areas for cracking.
- d. Ultrasonic thickness testing of any wear areas or corroded sections.
- e. Detailed inspection of all arm joints including bearings, bushes, pins, links.

4.6 Repairs

All inspection schedules should be based on the manufacturer's recommendation. Where it is not practicable to obtain or follow these recommendations the inspection schedule should be drawn up by an *engineer*.

If the manufacturer's recommendations are not followed the reasons should be recorded in the log book.

4.7 Welding

Only persons authorised by the boom manufacturers or a welder holding the necessary qualifications may perform welding work on the placing boom, the outrigger system or other stressed structural components that are related to the placing boom's stability or structural integrity.

4.8 Reporting defects

A pump operator should report defects without delay. If a defect is considered to be a hazard to safety, pumping operations should be stopped until the defect is repaired. The repairs should be recorded in the log book.

4.9 Log books and inspection check sheets

The log book should set out complete details of all inspections, tests, repair and modifications carried out on equipment. See Appendix 4, Sample check sheets.

Evidence that the plant has been *competently* inspected and is in a safe working condition can be demanded before the plant is allowed on site.

No machine should operate without having up-to-date log books available for inspection at the workplace.

4.10 Safety stickers

Ensure that all safety stickers are in good condition and legible.

4.11 Pipe identification

Pipes, bends and reducers should be identified with a permanently fixed metal tag with numbers not less than 10mm in height.

4.12 Pipe ends and hose tails

All pipes ends and hose tails should be regularly inspected by a *competent* person. The end or tail should be replaced if it differs from the manufacturers's specifications.

4.13 Couplings

All couplings should be regularly inspected by a *competent* person for signs of wear and fatigue. Couplings showing deformation or damage that affect the efficiency of the coupling action should be replaced.

5. Safety equipment

5.1 Provision of personal protective clothing

Before starting any pumping operations, the employer must assess conditions likely to affect the health and safety of employees and arrange for the provision and use of appropriate personal protective equipment. The following are likely to be required:

- Safety helmets
- Eye protection
- Hearing protection
- Reflective safety vest
- Gloves
- Safety boots
- Rubber boots
- Waterproof clothing
- Mesh type face protection (for concrete spraying operations).

5.2 Additional equipment

Each pump unit should be equipped with the following items:

- First aid kit
- Barrier cream
- Adequate portable lighting for night time operations
- Eight reflective traffic cones minimum 450mm high
- A portable orange rotating safety light capable of being fitted to the outrigger nearest to approaching traffic (boom pumps only).

6. Training and supervision

Section 15 (2)(c) of the *Occupational Health and Safety Act 1983*, requires employers to provide information, instruction, training and supervision to employees necessary to enable them to perform their work in a manner that is safe and without risk to health.

a. The training and instruction given should cover at least:

- (i) The work method to be used in the setting-up and safe operation of concrete placing booms and pumps.
- (ii) The method for inspection and maintenance and a knowledge of the manufacturer's operation and service manuals.
- (iii) The correct use, care and storage of personal protective equipment.
- (iv) The correct use, care and storage of tools and equipment to be used, including electrical safety practices.
- (v) The procedure to be adopted in the event of accident or injury.

b. Supervision must:

- (i) Ensure that only those employees who have received training and instruction are authorised to carry out the work.
- (ii) Include sufficient monitoring of the work to ensure that agreed safe work practices are being adhered to, including the use of all protection systems and personal protection equipment

7. Legal requirements

7.1 Employer responsibilities

The pumping of concrete requires compliance with Acts and Regulations relating to occupational health and safety. Compliance applies to work practices, equipment and qualifications of workers.

If any uncertainty exists, enquiries should be made at the planning stage to the WorkCover Authority. Standard and Codes which offer practical guidance on health and safety in pumping concrete, appropriate Acts and Regulations are listed in Section 7.4. However, these are subject to change and checks should be made with the WorkCover Authority.

7.2 Employee responsibilities

The Occupational Health and Safety Act 1983, requires employees to take care of their own health and safety and to co-operate with their employer in the interests of health, safety and welfare.

The Construction Safety Act 1912, requires:

- every person to use the safeguards provided and not to interfere with the use of these safeguards.
- any person who operates a concrete placing boom to be in possession of a Certificate of Competency or a permit to learn under supervision.

7.3 Self-employed persons

The Occupational Health and Safety Act 1983 requires self-employed persons to ensure that persons not in their employment are not exposed to risks to their health and safety arising from the conduct of their undertaking at a place or work.

7.4 Acts, Regulations, Standards and Codes

The following Acts, Regulations Standards and Codes of Practice apply to the pumping of concrete.

Act and Regulations

- Occupational Health and Safety Act 1983 and Regulations
- Construction Safety Act 1912 and Regulations
- Code of Practice, Electrical Safety for Construction Work.

Definitions

"Clean out adaptor"

A short length of pipe with one end blanked off and connections for a water or air hose coupled to the pipeline for cleaning purposes. It should have a separate air relief valve vented to atmosphere and a pressure gauge when used with compressed air.

"Competent person"

Means a person who an employer ensures has acquired through either retraining, qualification, or experience or a combination of those, the knowledge and skill enabling that person to correctly perform the task required.

"Concrete pumping pressure"

The pressure that is exerted by the pump on the concrete at the piston head.

"Condition of tipping"

A pump should be considered to be in the condition of tipping when the stability moment equals the overturning moment.

"Coupling system"

The means of joining sections of delivery pipeline.

"Delivery hose"

A flexible hose used in or at the end of the pipeline.

"Delivery pipeline"

Portable rigid or flexible piping supplied in sections with the provision for joining together with a coupling system.

"Employee representative"

Includes an employee member of a health and safety committee or a person elected by the employees at a place of work to represent them on health and safety matters.

"Engineer"

A person eligible for membership of the Australian Institute of Engineers, who has a knowledge of the relevant regulations, and a knowledge of concrete pumps and placing booms.

"Outriggers"

Extendible structural members on the pump unit to increase the dimensions of the stability base.

"Placing boom"

A device to support and position the delivery pipeline. It can incorporate folding, luffing, extending and slewing motions.

"Principal contractor"

A person or company contracted by the owner to carry out the work.

"Pump unit"

The concrete pump and the mounting.

"Reducer"

A pipe that changes the internal diameter of the pipeline.

Appendix 1 - Outrigger bearing pressure calculations

The concrete pump operator is responsible for the safe and stable set up of their machine. The operator should check the intended site of installation and refuse to set up the machine if safety is in doubt.

The operator should make sure of the following.

- The boom pump chassis is set up either perfectly level or at no greater angle permitted by the manufacturer as described in the Boom Pump Operating Instructions Manual.
- When setting up, all locking pins are correctly inserted in the chassis and outriggers.
- The base timbers of any packings (timbers resting on the ground) are closely packed and cover an area large enough to safely transmit their load to the ground.

To estimate the area necessary to provide a safe base, use the formula below.

Use the BEARING PRESSURE indicated on each outrigger and the MAXIMUM PERMISSIBLE GROUND PRESSURE as specified by the construction site supervisor. When this information is not available use the tabulated values set out below.

To find the minimum area for each outrigger base:

W = Bearing pressure of the outrigger (in kN)

V = Permissible ground pressure (in kN/m²)

Area of each base (in square metres) A = W/V

MAXIMUM ALLOWABLE BEARING PRESSURE

KINDS OF MATERIAL	PERMISSIBLE GROUND PRESSURE kN/m ₂ (V)
Soft clay or loam	100
Virgin ground	150
Ordinary clay and dry sand mixed with clay or asphalt (min thickness 200mm).	200
Dry sand and dry clay, clay/silt soil, firm	300
Hard clay and firm coarse sand	400
Firm coarse sand and gravel	600
Shale rock and sandstone	800

Hard rock

2000

MAXIMUM ALLOWABLE BEARING PRESSURE

Note: $1\text{kN/m} = 102\text{kg/m}^2$ eg. $100\text{kN/m}^2 = 10.2$ Tonnes per square metre

Example: Ground type = Ordinary clay 200kN/m^2 (V)

Boom pump outrigger bearing pressure 150kN (W)

$A(\text{m}^2) = W/V = 150/200 = 0.75\text{m}^2$ (or 7500cm^2)

To achieve this you should have a square base of at least 0.75m under the particular outrigger.

i.e. $87\text{cm} \times 87\text{cm} = 7569\text{cm}^2$ or 0.756m^2

Alternatively a rectangular base $60\text{cm} \times 125\text{cm} = 7500\text{cm}^2$ or 0.750m^2

If any doubt exists, increase the base area.

- The base layer of packing should be of sufficient length and width to cover the square metres required for the base. They must be closely laid over an area of ground that has been levelled and hard packed.
- All packing timbers should be free from defects and be of ample heavy size. It is recommended that the base layer timbers be of hardwood $50\text{mm} \times 150\text{mm}$ of a length to suit the base size require. Where oregon is used for succeeding layers of packing beware of cracks. Under compression from the load longitudinal cracks in the timber may be widen causing failure due to the collapse or rolling of the timber.
- Successive layers should consist of at least two equal or larger sized timbers, long enough to cover the width of the base layers and crossed or pigstyed.
- The final layer should cross under the outrigger at right angles to and be at least 200mm wide. Some manufacturers supply glued laminated support blocks $60\text{cm} \times 60\text{cm}$ which are suitable for this (see illustration).
- All outriggers should be inspected at frequent intervals. Where looseness is evident, operations should be suspended until all packing is tightened again. The initial tightness of the outriggers can be lost due to settlement of the ground or the packing compressing.
- An adequate supply of the various sizes and lengths of packing should be carried on the boom pump unit preferably in suitable boxes attached to the chassis. The practice of using pieces of timber of odd sizes and lengths laying about on the job, leads to faulty and haphazard packing that can fail and collapse possibly overturning the entire boom pump.

Appendix 2 - Caution with overhead powerlines

Direct contact with a live line is **ALWAYS DANGEROUS**.

Even when close to high-voltage lines, a spark can are over and make the machine as well as the surrounding area live.

CAUTION: Power substations are equipped with an automatic circuit breaker which means that after a fuse has reacted the power is switched off. This may falsely indicate a 'safe situation'. However after a brief period of time the current will be automatically switched on without warning.

Whenever there is a crossing over of current, there is **DANGER** for **ALL** persons connected to or close to the machine.

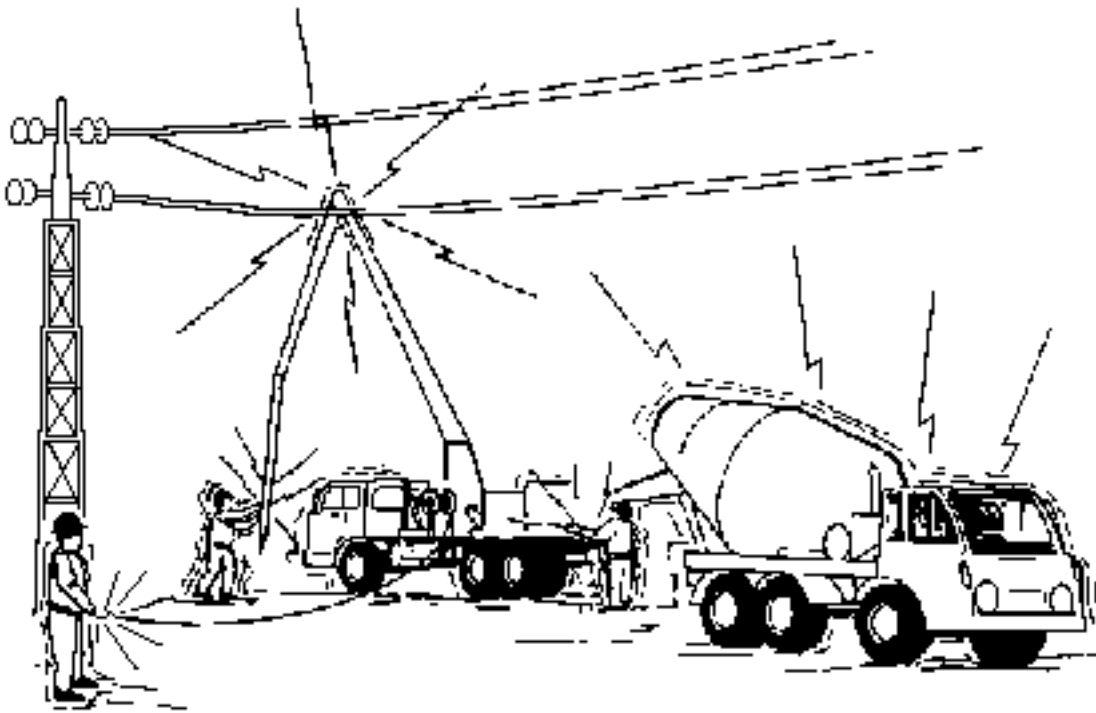


Figure 1 - Overhead power lines

When there is a crossing over of current, a so-called "voltage funnel" forms under and around the unit. The voltage decreases as the distance from the unit increases (example, Fig. 2).

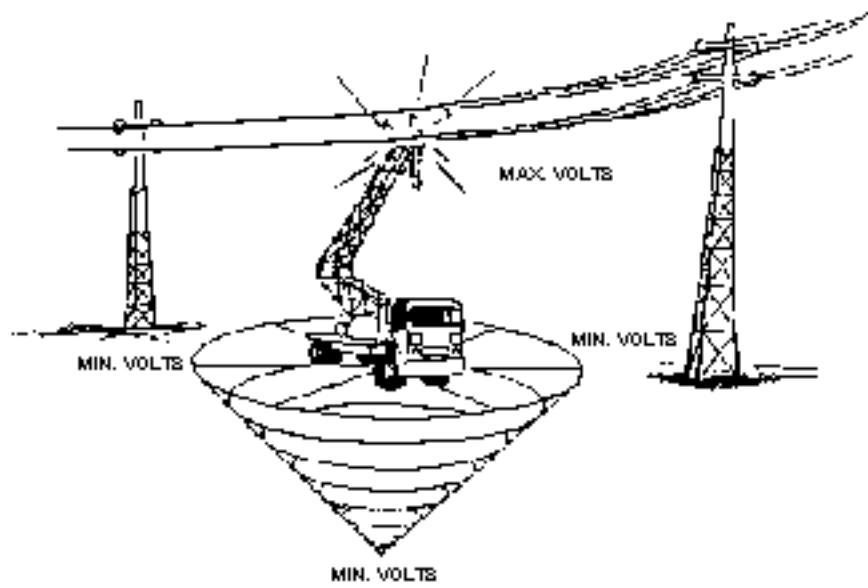


Figure 2 - Voltage Funnel 1

EVERY STEP WITHIN THIS VOLTAGE FUNNEL IS DANGEROUS!

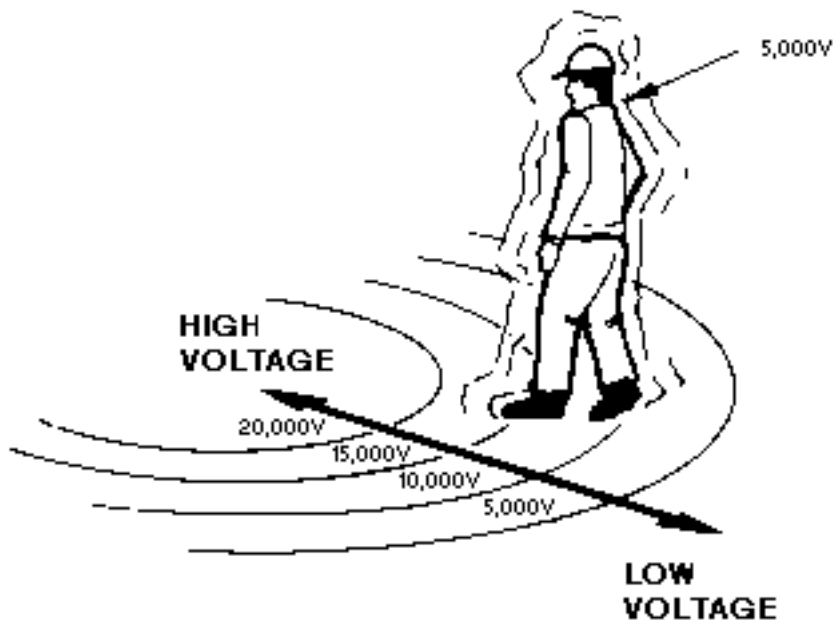


Figure 3 - Voltage Funnel 2

When working near overhead lines have the overhead line switched off by the responsible electric supply authority.

Voltage minimum approach distance

Up to 132,000V 3m

Above 132,000V up to 330,000V 6m

Above 330,000V 8m

It is important to take into account the swinging of the overhead line and of the placing boom in the wind.

If this minimum clearance cannot be complied with **IN ALL POSSIBLE WORKING POSITIONS, ALWAYS** consult the local

If this minimum clearance cannot be complied with **IN ALL POSSIBLE WORKING POSITIONS, ALWAYS** consult the local electric supply authority.

Appendix 3 - Pipeline thickness

Graph to determine the necessary minimum wall thickness against deformation (without considering fatigue) of concrete steel pipes ST55 Seamless Steel Pipes to DIN Specification 2448.

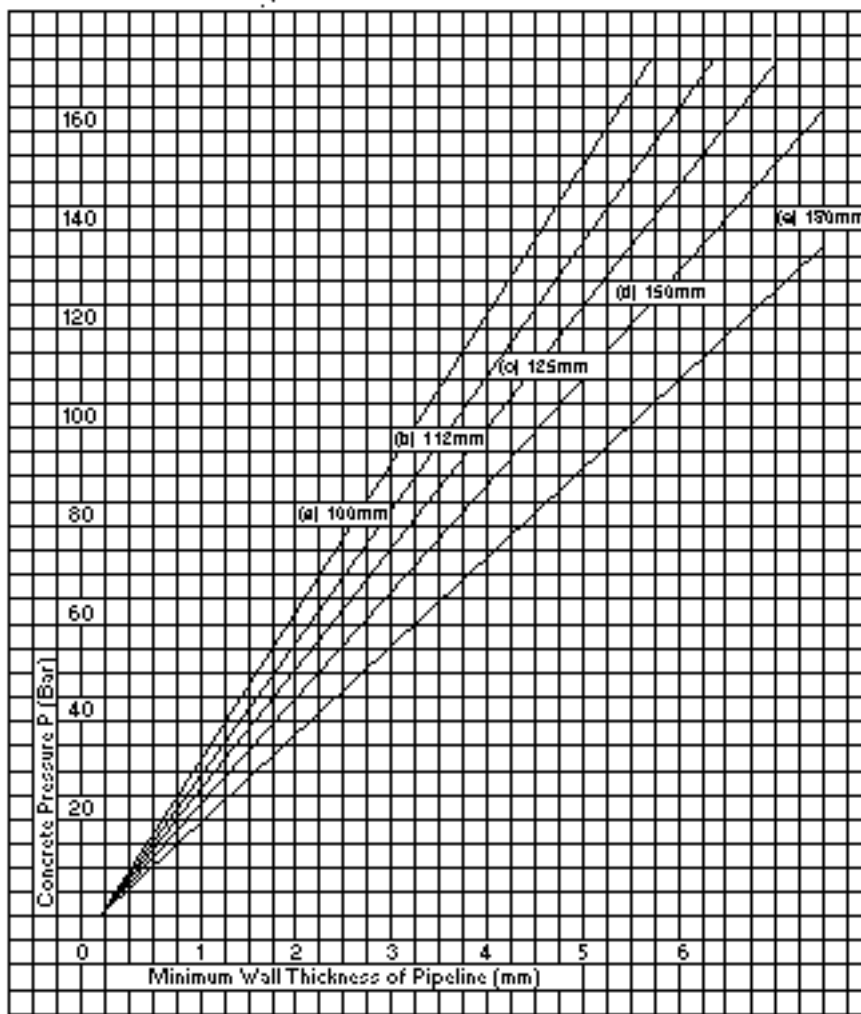


Figure 4 - Pipeline Thickness

Appendix 4 - Sample check sheets

CONCRETE PUMP & PLACING BOOM CHECK BOOK

Master Record Sheet

Concrete pump manufacturer:

Type/Model: _____ Serial No: _____ Year of Construction: _____

Permissible max. operating gauge pressure in the hydraulic system: bar

Max. delivery pressure: 200 bar

Placing boom manufacturer: _____

Type/Model: 2004 MAZDA 626 Serial No: 2004000000000000 Year of Construction: 2004

Max. reach (horizontally from centre of slewing head): _____ m

Max. permissible diameter of the concrete delivery line: 444.44 mm

End placing hose: dia. _____ mm, length: _____ max.

Permissible max. operating gauge pressure in the hydraulic system: bar

Support width front: m, rear: m

Maximum corner support force: _____ kN

Chassis manufacturer: _____

Type/Model: _____ Chassis No: _____

Superstructure manufacturer: *****

Serial No: _____ Year of Construction: _____

Remarks (modifications, special features etc.):

Manufacturer: _____

(Place)

{Date}

(Stamp/Signature)

Figure 1 - Master Record Sheet

CONCRETE PUMP & PLACING BOOM CHECK BOOK	
* Concrete Pump	
Manufacturer:
Type/Model: Serial No:
* Placing Boom	
Manufacturer:
Type/Model: Serial No:
* Chassis	
Manufacturer:
Type/Model: Chassis No:
Company (operator):
* Delete where not applicable.	

Figure 2

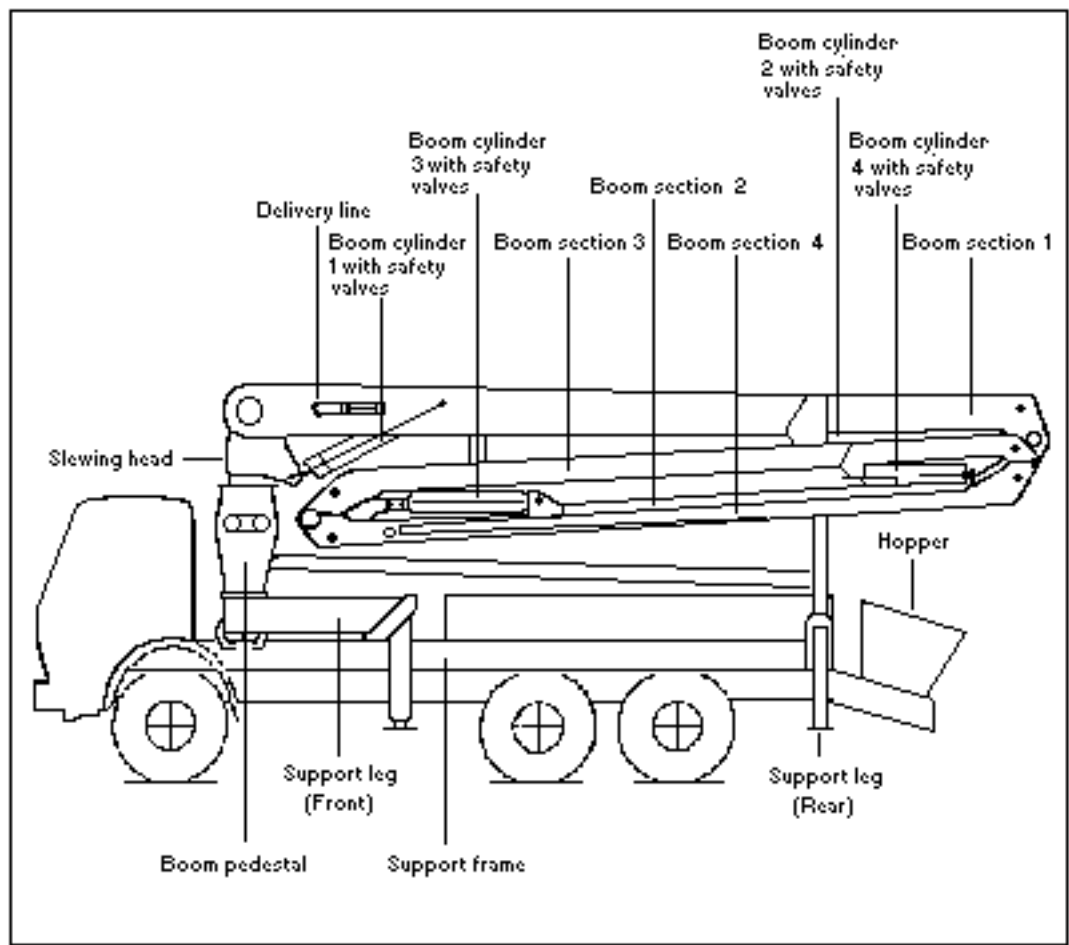


Figure 3

CONCRETE PUMP & PLACING BOOM		CHECK BOOK
Type/Model:	Inspection record sheet for inspection of placing boom prior to	
Serial No:	Initial operation (Initial inspection) by the authorised manufacturer's	
	Inspector.	
Preliminary inspection		
The preliminary inspection has been duly Authorised inspector:		
conducted:		
.....
(Place, date)	(Name)	(Signature)
Design inspection		
The preliminary inspection has been duly Authorised inspector:		
conducted.		
.....
(Place, date)	(Name)	(Signature)
Acceptance inspection		
An acceptance inspection was conducted on the placing boom on		
No/the following) defects were established:		
<div style="border: 1px solid black; min-height: 140px;"></div>		
There are and no reasons why the machine should not be operated.*)		
A reinspection is		
- not - "required,"		
.....	Authorised inspector:	
(Place, date)	(Name)	
	(Signature)	

*] Defects where not applicable.

*). Delete where not applicable.

Figure 5 - Reinspection

[illegible]

Figure 6 - Supplement to Master Record Sheet

CONCRETE PUMP & PLACING BOOM		CHECK BOOK
Record sheet for regular inspections by the qualified inspection personnel		
Inspection report No: dated Repeat inspection/reinspection*) There are - are no - reasons why the machine should not continue to be operated.*) Reinspection is - is not - *) required for		
		Qualified Inspector:
.....	
(Place, date)	(Name)	
	
	(Signature)	
Inspection report No: dated Repeat inspection/reinspection*) There are - are no - reasons why the machine should not continue to be operated.*) Reinspection is - is not - *) required for		
		Qualified Inspector:
.....	
(Place, date)	(Name)	
	
	(Signature)	
Inspection report No: dated Repeat inspection/reinspection*) There are - are no - reasons why the machine should not continue to be operated.*) Reinspection is - is not - *) required for		
		Qualified Inspector:
.....	
(Place, date)	(Name)	
	
	(Signature)	
) Delete where not applicable.		

Figure 7 - Inspection Report

CONCRETE PUMP & PLACING BOOM										CHECK BOOK
Inspection Report No..... Sheet 1 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:										
		Objections								
		No Objections	Corrosion	Cracks	Deformation	Bearing/flank clearance	Lubrication	Missing Components		
Support frame										
Support frame mounting										
Support system										
Transport Safety										
Support arms										
Extension box										
Slewing bearing										
Support Safeguard										
Boom pedestal										
Boom pedestal mounting										
Slewing head with ball pivot connection										
Slewing head										
Ball pivot ring										
Mounting bolts										
Toothed ring										
Drive Pinion										
Slewing drive mounting										
Slewing limiting system										
Slewing head with Slewing column										
Slewing head										
Slewing column bearing										
Slewing drive (tooth backlash)										
*) If necessary, the objections must be stated precisely here (eg. no support safety devices on the rear right support arm). **) Delete where not applicable										

Figure 8 - Inspection Report Sheet 1

CONCRETE PUMP & PLACING BOOM										CHECK BOOK
Inspection Report No..... Sheet 2 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:										
		Objections							Reinspection required	
		No Objections	Corrosion	Cracks	Deformation	Bearing/flank clearance	Lubrication	Missing Components		
Boom sections										
Section 1										
Section 2										
Section 3										
Section 4										
Transport safeguard										
Joints										
Reversing lever										
Support cylinders										
Leakproof										
Pressure setting										
Slewing drive										
Brake function										
Leakproof										
Speed										
Pressure setting										
Boom cylinders										
Sections 1 to 4										
Leakproof										
Speed										
Pressure setting										
Hydraulic lines										
Damage										
Leakproof										
*) If necessary, the objections must be stated precisely here (eg. no support safety devices on the rear right support arm). **) Delete where not applicable										

Figure 9 - Inspection Report Sheet 2

CONCRETE PUMP & PLACING BOOM										CHECK BOOK									
Inspection Report No..... Sheet 2 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:																			
Controls and valves																			
Leakproof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure setting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pressure limiting valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical manual operation (switching functions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remote control (switching functions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Concrete delivery line																			
Attached delivery line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End placing hose	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retaining fixtures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boom pipes, hose size OK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div>..... (Place)</div> <div>..... (Date)</div> <div>..... (Name)</div> </div> <div style="text-align: right; margin-top: 20px;"> (Signature) </div> <p style="margin-top: 20px;">This inspection report (Sheets 1 - 3) must be filed in the inspection logbook. The person responsible for rectifying the defects must receive a copy.</p> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div>Other copies must be submitted to:</div> <div>Acknowledged by the plant manager.</div> </div> <div style="text-align: right; margin-top: 20px;"> (Date/Signature) </div>																			
*) If necessary, the objections must be stated precisely here (eg. no support safety devices on the rear right support arm). **) Delete where not applicable																			

Figure 10 - Inspection Report Sheet 3

CONCRETE PUMP & PLACING BOOM		CHECK BOOK
Inspection Report No..... Sheet 4 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:		
Objections		
	Yes	No
Model plate***		
Fixing		
Legibility		
Completeness		
Short-form operating instructions		
Fixing		
Legibility		
Completeness		
Control platform, steps		
Safe condition of steps and standing areas		
Protective railing		
Damage		
.....		
Grid covering, feed hopper		
Firmly bolted**)		
Shut-down of the agitator**)		
(in the case of hinged grids)		
Securing of the grid against falling down**)		
Distance between grid bars		
Spacing between grid and danger points		
Damage		
.....		
Other safety devices		
eg. water tank cover		
Rotor housing covers		
Drives		
Sliding cylinder		
Drive chain guards		
Safety stickers - complete and legible***		
*) If necessary, the objections must be stated precisely here (eg. mesh size, grid covering greater than 70mm) **) Delete where not applicable ***) Both on pump and boom		

Figure 11 - Inspection Report Sheet 4

CONCRETE PUMP & PLACING BOOM		CHECK BOOK		
Inspection Report No..... Sheet 5 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:				
Objections				
	Yes	No	Remarks*)	
Pressure accumulator				
Record of the required inspections in accordance with applicable pressure vessel legislation				
Pressure gauge for accumulator				
Protection against unintentional movements of the slides when the slide housing is open				
.....				
Hydraulic Lines				
Damage				
Leakproof				
.....				
Control and valves				
Leakproof				
Pressure Gauge for main hyd, pump				
Pressure setting				
Pressure limiting valve				
Mechanical manual operation (Switching function)				
Remote control (Switching function)				
Identification				
.....				
Electrical equipment				
Damage (eg. cable sheathing, stain-relief)				
Non-fused earth conductor connection				
.....				
*) If necessary, the objections must be stated precisely here (eg. mesh size, grid covering greater than 70mm) **) Delete where not applicable				

Figure 12 - Inspection Report Sheet 5

CONCRETE PUMP & PLACING BOOM		CHECK BOOK	
Inspection Report No..... Sheet 6 for concrete placing boom -repeat inspection**) Type/Model: -reinspection**) Serial No:			
Objections			
	Yes	No	Remarks*)
Supporting device/cylinders			
.....			
.....			
Additional attachments and modifications by the operator			
.....			
Miscellaneous			
.....			
.....			
.....			
.....			
<div style="display: flex; justify-content: space-between; margin-bottom: 20px;"> (Place) (Date) (Name) </div> <div style="text-align: center; margin-bottom: 20px;"> (Signature) </div> <p>This inspection report (Sheets 4-6) must be filed in the inspection logbook. The person responsible for rectifying the defects must receive a copy.</p> <div style="display: flex; justify-content: space-between;"> Other copies must be submitted to: Acknowledged by the plant manager. </div> <div style="text-align: right; margin-top: 20px;"> (Date/Signature) </div>			
<p>*) If necessary, the objections must be stated precisely here (eg. no support safety devices on the rear right support arm).</p> <p>**) Delete where not applicable</p>			

Figure 13 - Inspection Report Sheet 6

PIPELINE LOG SHEET

	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Remarks
Pipe	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	
No.	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	Thknr	
Signed													

Figure 14 - Pipeline Log Sheet