Safety Manual

Concrete delivery and placing machines

06/2026 Rev21 en



in cooperation with

VDMA
Baumaschinen und
Baustoffanlagen

Putzmeister

SCHWING Stetter

LIEBHERR

Imprint

Published by

VDMA e.V.
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D-60528 Frankfurt

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vdma.eu/bub

Cover image
© Putzmeister

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Changes in this revision

As part of revision 21, the Safety Manual was completely revised.

- Reorganisation
- Compliance with current guidelines:
  - Processes and terms from EU legislation
  - Accident insurance regulations
  - New technology
- Insights from practical experience incorporated



Foreword

This Safety Manual contains important safety instructions and sets out the responsibilities for operating concrete delivery and placing machines safely, properly and economically. Observing these safety instructions helps to avoid danger, to reduce repair costs and down-times and to increase the reliability and service life of the machine.

This Safety Manual has been compiled by the companies listed (see cover page) with the aim of defining the basic safety instructions for the use of concrete delivery and placing machines across all manufacturers.

This Safety Manual is revised periodically. The current version can be obtained at any time from the publisher.

To improve readability, plural pronouns are used in this Safety Manual to refer to a singular subject of any gender.



1 Application area

This Safety Manual applies to concrete delivery and placing machines (hereinafter referred to as “machines”) as defined in the chapter entitled “Machines”. *(Machines P. 18)*

This Safety Manual is intended for anyone who is tasked with working with/on the machine, and with the following in particular:

- Scheduling
- Transport
- Operation, including preparation
- Fault rectification in the course of work
- Cleaning
- Maintenance (inspection, service, repair)

This Safety Manual has been developed in accordance with the regulations listed in Chapter 2 “References” for use within the scope of the EU Machinery Directive. It is also applicable in other contexts, provided that there are no regulations in the country of use that preclude this.

This Safety Manual should not be regarded as a replacement for knowledge of the relevant legal regulations. Compliance with this Safety Manual does not replace site planning. The manufacturer’s Operating Instructions that may be supplemented by this Safety Manual must also be observed. The manufacturer’s Operating Instructions contain additional machine-specific safety instructions.



2 References

European regulations:

- Directive **2006/42/EC** of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) **(Machinery Directive)**
- Council Directive **92/57/EEC** on the implementation of minimum safety and health requirements at temporary or mobile construction sites (eighth individual Directive under 89/391/EEC)
- Council Directive **89/391/EEC** on the introduction of measures to encourage improvements in the safety and health of workers at work (**Framework Directive for occupational safety and health**)
- Directive **2009/104/EC** of the European Parliament and of the Council of 16 September 2009 concerning the minimum safety and health requirements for the use of work equipment by workers at work (**minimum requirements for tools**, second individual Directive under 89/391/EEC)
- **EN 12001:2012** - Conveying, spraying and placing machines for concrete and mortar - Safety requirements
- Machine-specific Operating Instructions *(Operating Instructions P. 35)*

German regulations:

- **DGUV Rule 113-604**, concrete industry, part 3: Operation of concrete pumps and truck mixers
- **DGUV Information 213-020** “Selection and qualification of personnel for operating truck-mounted concrete pumps”



3 Definitions

3.1 Groups of people

3.1.1 Manufacturer

Any natural or legal person who markets a machine covered by this Safety Manual.

3.1.2 Operating company

The owner of the machine or an authorised representative of the owner.

3.1.3 Machine operator

The person operating the machine.

3.1.4 Hoseman

The person holding the end hose.

3.1.5 Signaller

A person who assists the machine operator in their work when the machine operator cannot see all work areas and danger zones.

3.1.6 Auxiliary personnel

A person who assists the machine operator in their work, following their instructions.

3.1.7 Truck mixer driver

A person who supplies concrete to the machine using a truck mixer and operates the operating element provided for them on the machine.

3.1.8 Subject expert

A person who, through their professional training, their professional experience and their recent professional activity, possesses the necessary expertise and is authorised, in accordance with the relevant national legislation or practice, to carry out inspections on the machine (*(References P. 15)*, 2009/104/EC).

3.1.9 Qualified personnel

A person who has completed specialist training for a particular activity which qualifies them to carry out their role.

3.1.10 After Sales Service personnel

Qualified personnel employed by the manufacturer who are responsible in particular for maintenance of the machine.

3.1.11 Health and Safety Coordinator (HSC)

Any natural or legal person entrusted by the client and/or the site management with the coordination of the construction site and with health and safety tasks during the preparatory phase and/or the construction of the structure (*(References P. 15)*, 92/57/EEC Art. 3).

3.1.12 Client

Any natural or legal person on whose behalf a structure is constructed.

3.1.13 Site management

Any natural or legal person entrusted by the client with the coordination of the construction site. The site management appoints the health and safety coordinator (HSC).

3.2 Machines

- Stationary concrete pumps
- Truck-mounted stationary concrete pumps
- Stationary placing systems (an ensemble of placing boom or rotary distributor and base structure)



3.2.1 Truck-mounted concrete pump

An ensemble of truck and concrete pump with and without placing boom. The safety regulations issued by the chassis manufacturer also apply to the truck.

3.2.2 Truck mixer concrete pump

An ensemble of truck mixer, concrete pump and placing boom. The safety regulations issued by the truck mixer manufacturer and by the chassis manufacturer also apply to truck mixer concrete pumps.

3.2.3 Stationary concrete pumps

A concrete pump that does not have its own drive. To move around the construction site, it is usually equipped with a chassis, which may also be roadworthy.

3.2.4 Truck-mounted stationary concrete pump

A concrete pump that has its own drive, although this is generally intended only for moving the pump around the construction site. In addition to the hazards associated with a stationary concrete pump, there are further hazards associated with moving the pump.

3.2.5 Stationary placing system

An ensemble of placing boom or rotary distributor and base structure.

3.3 Components/assemblies

3.3.1 Concrete pump

A component designed to convey concrete to the sites of concrete placement through a system of pipe and hose lines.

3.3.2 Placing boom

A piece of power-driven slewable equipment consisting of one or more extendible, slewable or folding parts for guiding delivery lines.

3.3.3 Arm assembly

Synonym for placing boom.

3.3.4 Rotary distributor

Placing boom without its own drive.

3.3.5 Base structure

A device for supporting a stationary placing boom in order to provide it with the necessary stability.

3.3.6 Truck mixer

Vehicle with mixing equipment for transporting concrete.

3.3.7 Delivery line system

A closed pipe or hose line through which concrete is pumped from the concrete pump to the site of concrete placement. The delivery line system may include devices for shutting off, diverting or cleaning delivery lines.

3.3.8 End hose

A hose fitted to the placing boom at the end of the delivery line to distribute the concrete.

To improve readability, the term “end hose” is also used to refer to end hose combinations *(End hose combination P. 20)* in this Safety Manual, unless specific components of an end hose combination need to be described in detail.

3.3.9 End hose combination

End hose with additional components (e.g. reducer or end hose shut-off valve) after the final delivery line elbow.

3.4 Responsibilities/roles

3.4.1 Maintenance

All measures required to inspect, maintain and repair a machine.



3.4.2 Starting to pump

The phase at the start of the pumping process until the delivery line including the end hose has filled with conveyed material and this conveyed material emerges evenly from the end hose.

3.5 Construction site

A construction site is the location where a building project is being carried out at the instruction of a client, involving the construction, alteration or demolition of one or more structures as well as the associated preparations and finishing work. For the purposes of this Safety Manual, it is assumed that construction sites comply with the provisions of Directive 92/57/EEC, in particular Annex VI, which sets out minimum safety and health requirements for construction sites.

3.6 Workspace

3.6.1 Place of work

The area in which people must remain in order to carry out the work.

3.6.1.1 Place of work of the machine operator

The machine operator’s place of work is with the remote control when the pump is in operation.

When operating the support, the machine operator’s place of work is directly next to the machine.

3.6.1.2 Place of work – hoseman

The hoseman’s place of work is located within the end hose’s danger zone.

3.6.1.3 Place of work – truck mixer driver

The place of work of the truck mixer driver is located in the danger zone of the hopper and the truck mixer.

3.6.2 Working area

The working area is the area in which work is carried out with and at the machine. Parts of the working area can become danger zones depending on the operation being carried out and the position of the placing boom.

3.6.3 Impermissible working area

An area into which the placing boom can be moved, but for which it is not designed. The area outside the construction site is also off-limits.

3.6.4 Danger zone

The danger zone is the machine itself and the area surrounding the machine, in which people may be endangered by the machine.

The danger zone varies within the working area and depends on the activity being carried out and the position of the placing boom, if one is present.

3.6.4.1 Placing boom

The danger zone when working with the placing boom is the zone over which the placing boom is slewed.

3.6.4.2 End hose

As a general rule, the end hose and the area surrounding the end hose are always danger zones as the end hose may swing out unexpectedly. The danger zone has a diameter which is twice the length of the end hose/end hose combination.

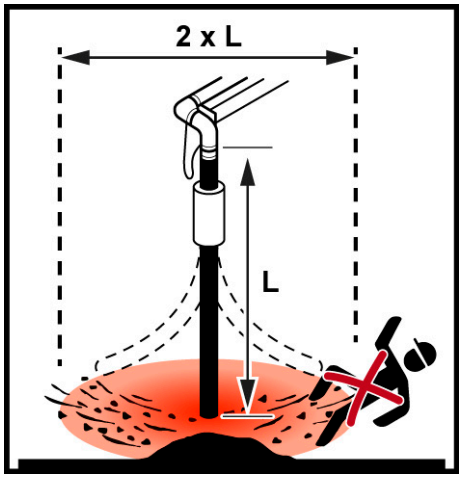


Figure 1: Danger zone at the end hose

Item	Designation
L	Length of the end hose/end hose combination



4 Designated use

The machine must only be operated as intended and in technically perfect condition. All protective devices and safety functions, as well as EMERGENCY STOP devices, must be available and fully functional.

The machine must only be used for pumping operations on construction sites.

The machine is only intended for pumping and distributing concrete up to a bulk density of 2400 kg/m^3. If a manufacturer permits higher densities (high-density concrete), this is documented in the Operating Instructions. The maximum delivery pressure must not exceed the manufacturer’s specified limit.

You must also observe the Operating Instructions and comply with the intervals and conditions for recurring inspections and maintenance work in order to operate the machine within the limits of its designated use.

5 Foreseeable misuse

5.1 Definition

Misuse is defined as use which is not described in or goes beyond that described in the “Designated use” section *(Designated use P. 25)*. The manufacturer accepts no liability for damage resulting from such use.

Misuse may damage the machine and lead to accidents resulting in personal injury.

Some common examples of misuse are listed below.

5.2 Transporting goods

The machine must not be used for the transport of goods, except for carrying the accessories used for the machine, such as pipes, hoses, etc. Truck mixer concrete pumps may carry the intended load in accordance with their designated use. The maximum permissible gross weight must not be exceeded.

5.3 Lifting loads

The placing boom must not be used for lifting loads unless it is expressly designed for this purpose by the manufacturer.



Figure 2: Do not lift loads

5.4 Removing obstacles

The placing boom and the support system must not be used to clear obstacles.

5.5 Extending the placing boom and end hose

The placing boom must not be extended. The end hose must not be extended beyond the length specified by the manufacturer.

- Connections permitted for use with the end hose: *(End hose P. 71)*
- Other connections:
  - *(Drills and other distribution equipment on the placing boom P. 55)*
  - *(Continuation delivery lines on the placing boom P. 56)*

5.6 Impermissible end hose

There must be no couplings, spouts, discharge stops or other items fixed to the outlet end of the end hose unless they are approved by the manufacturer.

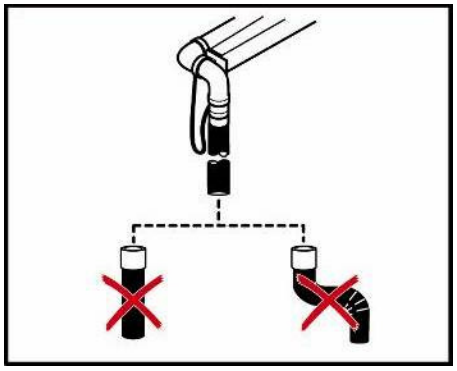


Figure 3: Modifications to the end hose

5.7 Impermissible working area

During pumping operations, the end hose must not be moved backwards beyond the vertical axis of rotation of the placing boom.

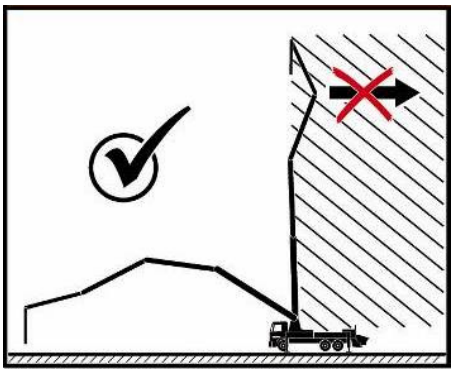


Figure 4: Impermissible working area

In addition to this, additional impermissible working areas exist, depending on the machine model and manufacturer, which are described in the Operating Instructions.

5.8 Climbing the placing boom

It is prohibited to climb the placing boom, to stand on top of it or to misuse it as a working platform or climbing aid.

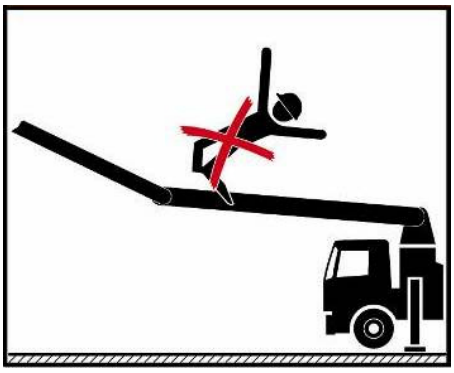


Figure 5: Do not climb onto the placing boom

5.9 Impermissible delivery pressure of the concrete pump

The delivery pressure must not exceed the maximum permitted operating pressure of the delivery line. Delivery line elements are marked with the maximum permitted operating pressure.

5.10 Accessories and attachments

It is prohibited to fit accessories and attachments to the machine if they have not been expressly approved for use on this machine by the manufacturer.

5.11 Changes to the machine

Unauthorised changes to the machine are prohibited. Changes must always be approved by the manufacturer.

Examples of changes to the machine:

- Use of non-equivalent replacement parts or accessory components
- Modifications and alterations to the machine
- Adjustment of the factory-set safety pressures, movement speeds, power ratings, speeds of rotation and other settings



6 Requirements for specific groups of people



6.1 Operating company

The operating company is responsible for the use of the machine.

The operating company must clearly define who is responsible for operation and maintenance of the machine. The operating company must also ensure that only persons commissioned to work on the machine do so, in particular qualified personnel for maintenance and maintenance. The operating company must provide the machine operator with the necessary personal protective equipment.

The operating company must define the responsibility of the operating and maintenance personnel (including in respect to national road traffic regulations) and empower them to reject instructions from third parties prejudicial to safety.

6.2 Machine operator

The machine operator must be instructed in accordance with the Operating Instructions and must be able to independently assess any dangerous situations that may arise on the machine and react according to the situation.

6.3 Hoseman

The hoseman must receive machine-specific instructions in line with their role and be able to independently assess dangerous situations that may arise at the end hose and react according to the situation.

6.4 Signaller

The signaller must receive machine-specific instructions in line with their role and be able to independently assess dangerous situations that may arise when working with the machine and react according to the situation.

6.5 Truck mixer driver

The truck mixer driver must receive machine-specific instructions in line with their role and be able to independently assess dangerous situations that may arise when working on the machine’s hopper and react according to the situation.



7 Safety-relevant documents and regulations

7.1 Operating Instructions

The Operating Instructions must always be available wherever the machine is in use.

As an operating company, machine operator or person responsible for the maintenance of the machine:

- Read the Operating Instructions and the Safety Manual before working with the machine.

As the operating company:

- Make the Operating Instructions available.
- Have personnel working on the machine confirm their knowledge, understanding and application of the Operating Instructions and Safety Regulations or Safety Manual.
- At regular intervals, check that personnel are conscious of safety and the hazards involved in their work and are taking account of the Operating Instructions.

7.2 Operating procedures

As the operating company:

- Draw up operating procedures for your personnel in accordance with the regulations in force in the country where the machine is being used.

7.3 Other regulations

In addition to the Operating Instructions and the Safety Manual, the relevant regulations governing the operation of concrete delivery and placing machines in the country of operation must be observed. These may include, for example, regulations issued by the accident insurance provider or the liability insurance company.

In addition: *(References P. 15)*

8 Personal protective equipment (PPE)

In order to reduce risks of injury or death to personnel, personnel must use personal protective equipment insofar as this is necessary or required by regulations.

The information provided here regarding personal protective equipment is based on the typical use of the machines. Operating companies may deviate from this on the basis of the risk assessment. Additional requirements may be set out in the site regulations.

Personal protective equipment must, as a minimum, comply with the requirements of the specified standards.

Symbol	Meaning	Specifications for use
	**Safety helmet** The safety helmet protects your head, e.g. from falling concrete or parts of delivery lines if lines burst. (DIN EN 397:2022; Industrial safety helmets)	Always
	**Safety footwear** Safety footwear protects your feet from falling objects and any protruding nails. (DIN EN ISO 20345:2022; Safety footwear for professional use; category S3)	Always
	**Hearing protectors** Hearing protectors protect your ears when in the vicinity of the machine against any noise that arises there. (DIN EN 352-1:2021; Hearing protectors - General requirements - Part 1: Earmuffs or DIN EN 352-3:2021; Hearing protectors - General requirements - Part 3: Earmuffs attached to an industrial safety helmet)	Near the machine
	**Protective gloves** Protective gloves protect your hands from aggressive or chemical substances, mechanical effects (e.g. impact) and from cuts. (DIN EN 388:2019; Protective gloves against mechanical risks; class 1111)	Always

Symbol	Meaning	Specifications for use
	**Protective goggles** Protective goggles protect your eyes from injuries associated with concrete spatter and other small particles. (DIN EN 166:2002; Personal eye protection - Specifications)	Near the hopper and the end hose, and always during cleaning
	**Safety harness** When working at height, use the climbing aids and working platforms provided for reasons of safety or wear a safety harness. The relevant national regulations must be complied with. (DIN EN 361:2002; Personal protective equipment against falls from a height - Full body harnesses; category III)	When working at a height with a risk of falling

9 Work area and danger zones

9.1 General

The construction site must be secured and marked out by the site management in accordance with regulations to ensure that the machine can be set up and operated safely.

The machine operator must be able to see the danger zones. If that is not possible, the machine operator must appoint one or more signallers. The danger zone around the hopper must be monitored by the truck mixer driver during the pumping process.

Depending on the working situation, places of work may occasionally fall within the danger zone, especially the place of work of the hoseman and the truck mixer driver. If a place of work is located in a danger zone, increased caution is required.

The machine operator, the truck mixer driver and, where applicable, the signaller are responsible for safety in the danger zone while working with the machine. If unauthorised persons approach the danger zone, they must be instructed to leave the danger zone.

The machine operator or the truck mixer driver must, if necessary, stop all hazardous machine functions.

Immediately press an EMERGENCY STOP button if there is a risk to the life and limb of persons!

9.2 Diagrams showing the work area

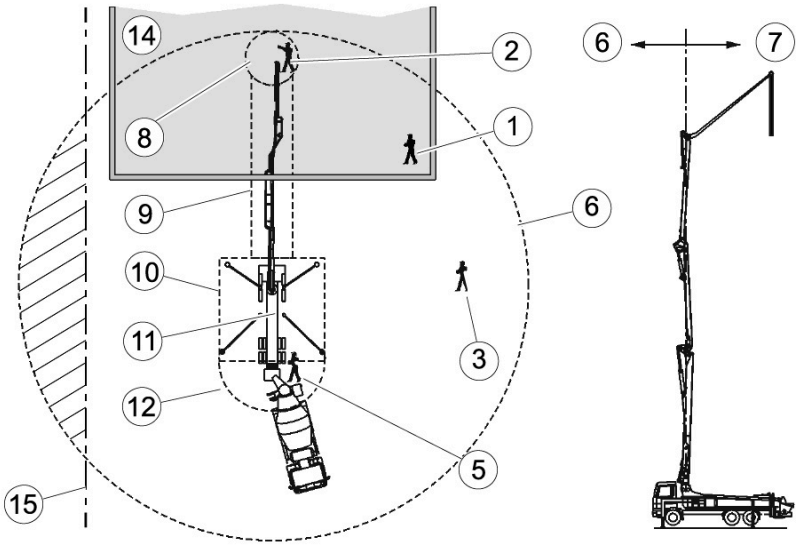


Figure 6: Work area – mobile machines with a placing boom

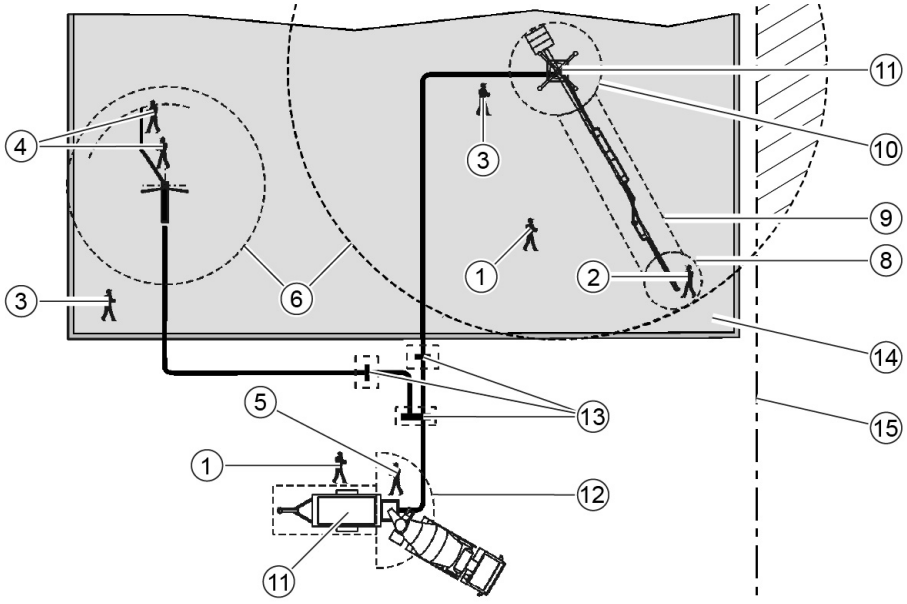


Figure 7: Work area – stationary machines with a placing boom

Pos.	Designation		Explanation Requirements/measures
1	Place of work (during pumping operations)	Machine operator	The place of work must be selected so as to allow visual contact with the placement site and so that the working area can be observed at the same time. A signaller must otherwise be used. There must be a means of communication with the truck mixer driver.
2		Hoseman	The hoseman and machine operator must have visual contact. If visual contact is not possible, there must be a means of communication.
3		Signaller	There must be a means of communication with the machine operator.
4		Auxiliary personnel	For example, as a machine operator of manual placing systems. There must be a means of communication with the machine operator.
5		Truck mixer driver	There must be a means of communication with the machine operator.
6	Working area	Permitted	Area with a radius of the reach of the placing boom + end hose length, but only the part of this area that is within the construction site
7	Working area	Impermissible	The end hose must not be moved backwards beyond the vertical of the placing boom.
8	Danger zone	End hose	Risk of injury when pumping is started, during pumping operations, when removing a blockage and during washing out procedures. The diameter of the danger zone is twice the length of the end hose/end hose combination *(End hose P. 23)*.



Pos.	Designation		Explanation Requirements/measures
9	Danger zone	Placing boom	Risk of injury from falling objects, concrete or ice when unfolding the placing boom, and risk of crushing and impact when moving the placing boom.
10	Danger zone	Support legs and feet, or base structures	Risk of crushing when setting up or dismantling the machine in the swing-out and extension zone.
11	Danger zone	Machine	All the time the vehicle is in operation, there is a risk of injury on and below the machine from moving parts and bursting delivery lines or hydraulic hoses, as well as a risk of falling on slippery surfaces or steps.
12	Danger zone	Hopper	At the hopper, there is a risk of becoming trapped between the truck mixer and the hopper, of being sprayed with concrete, and of coming into contact with moving parts in the hopper.
13	Danger zone	Delivery line system	Risk of injury from bursting delivery lines in the event of a sudden rise in pressure. There is a risk of crushing and injury by shearing with devices integrated in delivery line systems, e.g. gate valves.
14	Structure or area being concreted		Example
15	Construction site boundary		The placing boom must not be moved into areas outside the construction site.

Table 1: Place of work, working areas and danger zones



10 General hazards and measures to prevent them



10.1 Machine

Before switching on or restarting the machine or individual machine functions, you must ensure that doing so will not endanger anyone's safety.

You should be constantly observing the machine for any damage or faults while it is in use.

In the event of malfunctions or faults that compromise safety at work:

- Stop the machine immediately and secure it.
- Have the fault rectified immediately.

If it is not possible to rectify faults that jeopardise safety at work:

- Suspend operation to rectify the faults.

It is forbidden to climb onto the machine during operation.

10.1.1 Electrical power

10.1.1.1 General

Work on electrical systems or operating equipment must only be carried out by qualified personnel.

Machine components which are to undergo maintenance work must be deenergized. This also applies to vehicle electrical systems with voltages of 12–24 volts. Ensure that disconnected machine components cannot be restarted. First of all, you must check that deenergized parts are indeed deenergized, then earth and shortcircuit them and isolate adjacent live parts.

10.1.1.2 Battery-powered machines

The energy stored in the batteries used to power the drive or machine operation, combined with the high voltages, poses an additional potential hazard, particularly during service and maintenance work. Before carrying out maintenance work, find out the location and/or marking of high-voltage cables, as well as the procedures for disconnecting the battery and the discharge times.

These machines pose an increased risk of fire, particularly if the batteries are damaged. If a fire breaks out, immediately inform the fire brigade about the batteries fitted, as special fire-fighting measures are required for battery-electric vehicles.

10.1.1.3 Power at the construction site

On the construction site, current must be drawn from a dedicated feed point (site power distribution point).

Only qualified personnel are permitted to work on electrical installations.

An electric shock (possibly with fatal consequences) may be the result of touching machines with electric motors or contact with other electrical cables if the electrical connection has not been made properly or the supply cable is damaged.

10.1.2 Hydraulic systems

10.1.2.1 General

Work on hydraulic systems must only be carried out by qualified personnel.

Always wear your personal protective equipment when carrying out work on the hydraulic system.

Injection through the skin is a medical emergency. Seek medical attention immediately. This also applies for injuries which may seem only slight.

Before starting repair work, depressurise the system sections and pressure lines (hydraulic system, pneumatic system, delivery line) that are going to be opened in accordance with the information in the Operating Instructions. Pay particular attention to the instructions for dumping the pressure in accumulators.

Be aware that enclosed hydraulic fluid can remain pressurised for a certain length of time. Do not open any hydraulic systems if they are under load from an external force (particularly from a raised placing boom).

Thoroughly vent the hydraulic system after any maintenance work. Otherwise, there is a risk of injury due to uncontrolled movements of machine components. Open vent valves extremely carefully until the hydraulic fluid starts to escape.

Replace damaged hydraulic lines rather than repairing them. Hydraulic fluid spray escaping under pressure can cause fires.



10.1.2.2 Replacing hydraulic hoses

During recurring inspections, hydraulic hoses must be checked for external damage by a subject expert. The operating company must have hydraulic hoses replaced if they show signs of external damage or have reached the end of their permitted service life.

10.1.3 Noise emissions

A high sound level can cause permanent hearing damage. The place of work in normal operation is with the remote control. For this reason, it is not possible to specify a particular place of work for the machine operator. Take the values for the sound pressure level and sound power level from the machine Operating Instructions.

Wear suitable personal protective equipment in the vicinity of the machine.

Soundproofing equipment must be fitted, closed and in perfect condition.

10.1.4 Exhaust emissions

Vehicle exhaust gases contain constituents that can be deadly or carcinogenic. Only operate internal combustion engines in well-ventilated areas and ensure that exhaust gases are directed away from the place of work.

10.1.5 Functional fluids

Always wear your personal protective equipment when handling hazardous functional fluids and follow the manufacturer’s information.

When handling oils, greases and other functional fluids, observe the safety regulations applicable to the product concerned (see the safety data sheet).

Cleaning agents, concrete release agents, preserving agents, etc. propelled by compressed air can cause very serious damage to the respiratory passages if a respiratory protection mask is not worn. Spray mist enters the lungs very easily.

10.1.6 Remote control

The machine operator’s place of work is with the remote control while the placing boom is being moved and during pumping operations.

If you are operating the machine using the remote control:

- Secure all control and operating elements on the machine against unauthorised access, unless they are protected by the control console lock.

Always carry the remote control on your person while the machine is ready for operation. Only in this way can it be guaranteed that you can press the EMERGENCY STOP button in the event of an emergency situation.

As a general rule, carry the remote control in such a way that no control and operating elements can be operated unintentionally. Switch off the remote control as soon as you need to pay attention to something other than the machine.

Take steps to prevent unauthorised use of the remote control in the following situations:

- Breaks in pumping
- Interruptions
- Maintenance work
- When you move away from the machine

For technical reasons, the range of a radio remote control is long enough for the machine to receive control commands even without visual contact (e.g. from a great distance or from inside enclosed spaces). If visual contact is not possible, for example because the construction site is cluttered, it is essential to deploy signallers who are in appropriate communication with the machine operator and have a clear view of the site of concrete placement, the work area and danger zones, and the machine.

The radio link for the radio remote control may be disrupted in the vicinity of transmitters (radio transmitters, etc.). In this case, switch off the radio remote control and use a cable remote control instead.

10.1.7 Moving machine components

Keep all access covers, maintenance flaps, guards, etc. closed and locked during operation. This also applies in particular to the grille, water box cover and covers over cylinders. Otherwise, there is a risk of injury from moving machine components.

Keep clear of the danger zones around moving parts.



10.1.8 Hot surfaces, hot functional fluids and auxiliary materials

There is a risk of burning from hot surfaces – particularly the drive motor, its attachments and the exhaust.

When machine performance is high for extended periods, the surface temperatures of hydraulic components can approach the burn threshold.

When handling hot functional fluids and auxiliary materials, there is a risk of burning and/or risk of scalding.

10.1.9 Slipping, tripping, falling

There is a risk of injury at all points on the machine from slipping, tripping, falling, etc. Use the handles and steps to climb into and out of the machine. It is forbidden to stand on the hopper grille. Do not jump from the machine.

10.1.10 Information and warning notices on the machine

All warning and information plates on the machine must be complete and in a perfectly legible condition.

As a machine operator:

- Inform the operating company immediately if any warning or information plates are damaged or illegible.

As the operating company:

- Replace any damaged or illegible warning and information plates immediately.

10.2 Surroundings

10.2.1 High-voltage lines

10.2.1.1 General

Even simply approaching a high-voltage line can cause a life-threatening flashover and create a discharge voltage pattern. In this case, or if the machine comes into contact with a high-voltage line, there is a risk of death for all persons either on the machine or in its vicinity or who are connected to it (via the cable remote control, end hose, etc.).

10.2.1.2 Clearances from highvoltage lines

Always maintain a safe clearance between high-voltage lines and the machine. The safe clearance is determined by adding the maximum placing boom length to the minimum clearance specified in the table. The maximum placing boom length is measured in the horizontal when the placing boom is fully extended.

Rated voltage [V]	Minimum clearance [m]
Less than 1 kV	1,0
Between 1 kV and 110 kV	3,0
Between 110 kV and 220 kV	4,0
Between 220 kV and 380 kV	5,0
More than 380 kV or unknown rated voltage	5,0

Table 2: Minimum clearances to high-voltage lines

The specified clearances are minimum requirements. You must observe any greater clearances that may be specified in the country of use.

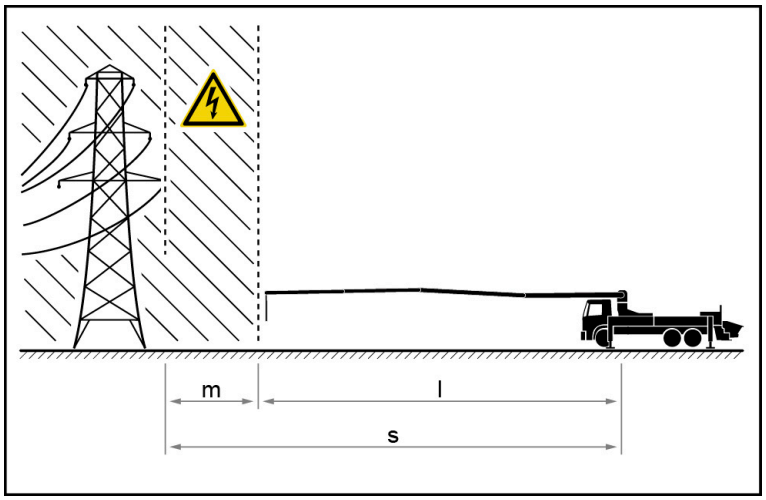


Figure 8: Clearances from highvoltage lines

Item	Designation
m	Minimum clearance
l	Max. placing boom length
s	Safe clearance



When maintaining the clearances (safe clearance or minimum clearance), the possibility of the high-voltage lines and the placing boom swaying must also be taken into consideration.

Position yourself so that you can monitor compliance with the minimum clearance, or ask a signaller to assist.

A clearance smaller than the safe clearance may be used if absolutely required by the conditions on the construction site. The clearance to high-voltage lines must not be smaller than the minimum clearance specified in the table.

In case of clearances smaller than the safe clearance, contact between the placing boom and the high-voltage line cannot be excluded and there is a risk of death. Suitable organisational measures to guarantee the minimum clearance in all working situations must be developed, observed and documented to prevent this risk of death.

If the minimum clearance between the placing boom and the high-voltage line cannot be maintained:

- Before the start of work, contact the relevant network operator and arrange for the high-voltage line to be switched off.

Should you have any doubts, it is better to forgo the use of the placing boom and to lay a separate delivery line.

The first priority must always be to set up the machine with the safe clearance (placing boom length plus minimum clearance).

10.2.1.3 Highvoltage warning devices

According to the current rules of engineering, highvoltage warning devices do not meet a safety standard which enables minimum clearances to highvoltage lines that are smaller than the required minimum clearances to be used. Previous experience has shown that highvoltage warning devices cannot make all situations in working procedures safe. Flash overs and fatal accidents can occur despite the use of a highvoltage warning device. Always maintain the minimum clearances mentioned above.

10.2.1.4 Procedure in the event of a flash over

In the event of a flash over, what is known as a “discharge voltage pattern” is formed in the vicinity of the machine. The voltage decreases from the inside to the outside in this discharge voltage pattern. If you step inside this discharge voltage pattern, you will bridge different

potentials. This will cause a voltage corresponding to the potential difference to flow through your body, which can result in an electric shock causing serious injury or death.

If a flashover has occurred:

- Remain calm.
- Stay exactly where you are (potential differential!).
- Do not touch anything.

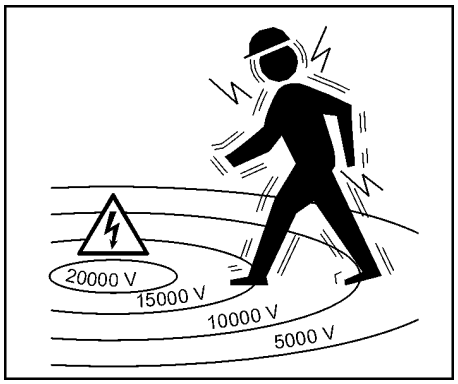


Figure 9: Potential differential/discharge voltage pattern

If your machine comes into contact with high-voltage lines:

- Warn people standing outside the area not to approach or touch the machine.
- Have the power switched off.
- Only leave the machine once you are sure that the line you have touched or damaged has been deenergised.

Electricity generator works are always equipped with automatic start-up systems. If a circuit breaker trips, the short-circuited line will be switched back on again after a brief interval. Brief intervals where the voltage is absent create a false sense of safety.

You must not move or rescue injured persons until a representative of the network operator has notified you that the line has been switched off.

Inside the discharge voltage pattern, the machine operator is at risk even when using a radio remote control.



10.2.2 Earthing in the event of electrostatic charging

Dangerous electrical charges may build up in the machine in the vicinity of transmitters (radio transmitters, etc.). Persons who bridge the charged parts to the earth suffer life-threatening electrification on contact.

Machines in use in the vicinity of transmitters must be earthed. Earthing measures must be specified by the health and safety coordinator. This earthing may only be carried out by trained personnel.

Even with an earthed machine, the safe clearances to high-voltage lines *(Clearances from highvoltage lines P. 52)* and the instructions relating to storms and bad weather *(Procedure in storms P. 56)* must be complied with.

10.2.3 Earthing on construction sites with special equipment

When carrying out work in the area of special installations (particularly overhead lines for railways or substations), it may be the case that the machine needs to be earthed upon request and in consultation with the health and safety coordinator. This earthing must only be carried out by qualified personnel.

Even with an earthed machine, the safe clearances to high-voltage lines *(Clearances from highvoltage lines P. 52)* and the instructions relating to storms and bad weather *(Procedure in storms P. 56)* must be complied with.

10.2.4 Obstacles

Choose your place of work so that you can identify any potential collision points between the placing boom and obstacles (e.g. buildings, other machines, etc.). If necessary, ask a signaller for assistance.

10.2.5 Drills and other distribution equipment on the placing boom

If a drill or distribution unit is connected to the delivery line for the placing boom, it must not place any further strain on the placing boom. The placing boom must be connected in such a way that it does not require adjustment. There should be 1–2 delivery hoses between the placing boom and the drill or distribution unit; these must be secured so that they cannot move in an uncontrolled manner. When the drill or distribution unit is moved on the construction site, the placing boom must not be connected.

10.2.6 Continuation delivery lines on the placing boom

Continuation delivery lines not described in the Operating Instructions must not put an additional strain on the placing boom.

Before installing, dismantling or using a continuation delivery line:

- Switch off the control system for the placing boom to prevent it from moving unintentionally.

There is a risk of accident posed by jerky movements of the boom tip.

10.2.7 Procedure in storms

There is a risk of lightning strike in a storm. Lightning strikes pose a risk of death. The machine and the surrounding area will be charged with electricity. Earthing the machine does not reduce this risk.

Move mobile placing booms into the driving position in the event of storms or bad weather.

Move stationary placing booms into the rest position in the event of storms or bad weather.

Observe the manufacturer specifications for the maximum wind speed during operation. The definitive wind speed is measured at the height of the boom tip.

Wind speeds in accordance with the Beaufort scale are average wind speeds measured over a period of 10 minutes. Higher speed gusts of wind may occur briefly during the measuring period.

Higher wind speeds jeopardise the stability and safety of structural elements.

Wind speed measuring equipment is usually installed on construction sites, so you can find out the wind speed from the site management.

If there is no wind speed measuring equipment:

- Request information about the current wind and weather situation from a reliable source.

10.2.8 Concreting in cold weather

Placing booms must not be used at temperatures of below minus 15 °C (+5 °F) except with the express approval of the manufacturer. There is a danger of damage to the steel (brittle fracture) and the seals throughout the system at such extreme minus temperatures.



11 Setting up and working with the machine



11.1 Before working with the machine

11.1.1 Preliminary coordination by the operating company

During the ordering process, provide the site management with the information required to ensure the work can be carried out safely.

Essential site-related information required for the safe operation of the machine includes:

- Condition of public access routes and traffic routes on the construction site (height, width, load-bearing capacity of the supporting ground, bridge loads, structure and purity of the supporting ground)
- Condition of the supporting ground at the set-up site
  - Sufficiently large, horizontal and level surface
  - Load-bearing capacity based on the maximum supporting forces encountered and the load-distribution devices used
  - There must be no voids or other ground irregularities under the support feet. Asphalt, concrete slabs, etc. may have been washed out underneath.
- Foundations and/or bottom plates, e.g. for stationary machines
- Distances from pits and shoring
- Existing exposed cables
- Forces transmitted to structures, e.g. via anchoring for stationary placing booms

Ensure that the site management team carries out the following tasks:

- Provide a signaller to direct the manoeuvres of vehicles on the construction site
- Provide a facility for cleaning and a disposal site for concrete residue

Check in advance whether set-up in a public space is required, and inform the site management that they must obtain the necessary approvals.

Inform the site management that all preparatory measures to ensure the safe operation of the concrete pump on the construction site are the responsibility of the construction site manager, and that the hoseman, the truck mixer driver and, where applicable, the signaller must be briefed on the machine.

Ensure that all necessary information is made available to the machine operator before working with the machine.

11.1.2 Checking that the machine is ready for operation

As a machine operator:

- Check the machine for any visible damage or defects.
- Report any changes to the operating company of the machine immediately. If necessary, shut the machine down immediately and secure it.

11.1.3 Rendering the machine ready for operation

As a machine operator:

- You are responsible for rendering the machine ready for operation. This also includes topping up the functional fluids.
- When the machine is ready for operation, ensure you use the remote control correctly *(Remote control P. 49)*.

11.2 Driving/transport

11.2.1 Mobile machines

11.2.1.1 Driving

In particular, the following requirements must be met for roadworthiness:

- The placing boom must be folded in fully and positioned on the provided placing boom cradle.
- The delivery line, pump and hopper must be empty.
- The support legs and support feet must be fully retracted and secured.
- Raised or locked axles must be lowered and released.
- Accessories and moving parts belonging to the machine must be safely stowed/secured.
- The maximum permissible gross weight must not be exceeded.

Concrete residue affects the centre of gravity of the machine. Observe the road traffic regulations and specifications of the machine manufacturer.

Maintain a distance of at least 1 m to the secured edges of the pit and a distance of at least 2 m to slopes.

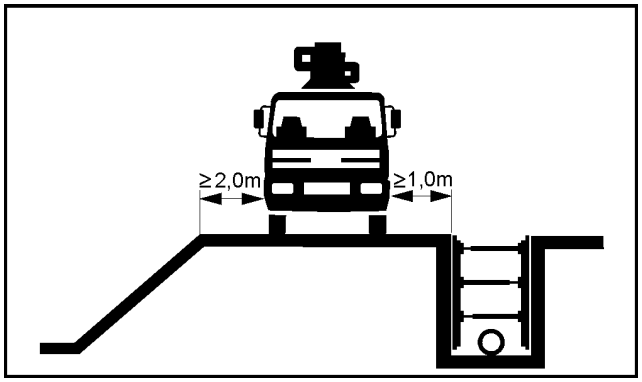


Figure 10: Distance to slopes and pits while driving

Always make sure that there is sufficient clearance when driving under underpasses, bridges and through tunnels or when passing under overhead cables. The same minimum clearances apply when driving under high-voltage lines as when working with the placing boom. Be aware of the height of the truck. Only drive on supporting grounds with sufficient load-bearing capacity – particularly arches and bridges.

Do not drive across uphill or downhill gradients. Be aware of the elevated position of the truck's centre of gravity when travelling on a slope and on ascending or descending routes. Adapt your driving speed to the prevailing conditions on sloping terrain.

Observe national road traffic regulations. If necessary, clean the tyres, lights and number plate. Before the start of a journey, check that the braking, steering, signalling and lighting equipment is fully functional.

Passengers must be seated on the proper passenger’s seats.

For truck mixer concrete pumps, only turn the mixer drum at the maximum specified speed of rotation whilst the truck is in motion. The truck is at risk of toppling over, particularly when travelling around corners.

11.2.1.2 Transporting

The machine must only be transported in accordance with the Operating Instructions. Many lifting points fitted to the machine are provided for assembly purposes only. They are not suitable for lifting the complete machine.

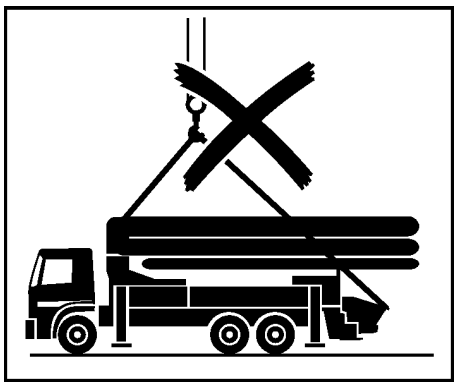


Figure 11: Transport by crane

The lifting points for lifting the entire machine are marked. The manufacturer’s instructions must be followed.

Use only appropriate means of transport and lifting equipment of adequate load-bearing capacity. Lifting equipment, lifting tackle, support trestles and other auxiliary equipment must be reliable and safe in operation.

Only load the machine on stable loading ramps of adequate load-bearing capacity. It must be ensured that the machine cannot tip over or slip.

Secure the machine on the transport vehicle to prevent it rolling away, slipping and toppling over.

11.2.1.3 Towing

Only have the machine towed in accordance with the Operating Instructions. Only the towing hitches provided may be used for towing. The truck manufacturer’s instructions must be followed.

You must comply with the prescribed driving position, permitted speed and itinerary when towing.



11.2.2 Stationary machines

11.2.2.1 Lifting machines and components

Machines which are transported to the setup site in individual parts or not under their own power must only be lifted with suitable lifting equipment in accordance with the specifications in the Operating Instructions. The lifting gear on the machine must be capable of accepting the lifting equipment and lifting the load. Noone should stand under suspended loads. Before work is started, a subject expert must check that the assembled machine is working properly.

11.2.2.2 Loading and transporting

Machines must only be loaded and transported using suitable equipment with sufficient load-bearing capacity. It must be ensured that the machine cannot tip over or slip.

The machine/components must be properly secured during transport. Observe the markings on securing points.

Many lifting points fitted to the machine are provided for assembly purposes only. They are not suitable for lifting the complete machine. The lifting points for lifting the entire machine are specially marked.

The transport vehicle and machine must be marked to conform with the road traffic regulations in the country concerned if they are to use the public highway. *(Driving/transport P. 60)*

11.3 Communication on the construction site/instruction

Report to the site management before working with the machine.

Agree clear hand signals or other signals with all persons involved so that you can communicate with each other.

The signaller must maintain constant contact with the machine operator and be able to monitor their assigned danger zone.

11.4 Moving the machine to the working position

11.4.1 Setting up the machine

11.4.1.1 Mobile machine

Setup site

Check the route to and from the set-up site.

If you are unsure whether the route to and from the site is suitable:

- Walk the route to and from the site in advance and have it prepared.

Hazardous areas are difficult to spot, particularly in the dark and at dawn or dusk. Have any materials or equipment that hinder your approach removed.

You should repeat this exercise again before leaving the construction site, as conditions on construction sites can change quickly.

If you need to reverse:

- Ask for a signaller.

Site management must prepare and assign the set-up site.

As a machine operator:

- Check the set-up site carefully.
- If there are safety concerns:
  - Refuse to set up the machine.
- You must familiarise yourself with the working area and surroundings before starting work.
- You are responsible for ensuring that the machine is operated safely during set-up, in accordance with the manufacturer’s Operating Instructions.

The working area and surroundings include, in particular, obstacles in the work and travelling areas, the load-bearing capacity of the supporting ground and any barriers separating the construction site from public roads.

If the machine is to be set up for operation in public spaces, this must only be done in accordance with the relevant traffic management order issued by the competent authority. The site management must

have received the traffic management order. Information regarding the requirements of the traffic management order can be obtained from the site management. The machine operator must not deviate from the traffic management order.

The setup site must be adequately illuminated in order to ensure a safe set-up of the machine.

Incidents of overlapping with the working areas of other machines (particularly cranes, other placing booms, etc.) should be avoided as far as possible. If this is not possible, special care and attention is required when setting up and operating machinery. Discuss the necessary measures with the health and safety coordinator (HSC) for the construction site. The HSC must establish the necessary safety measures.

Supporting ground

The supporting ground must be level and even. Never set the machine up on backfilled ground, obvious or known voids or uneven ground.

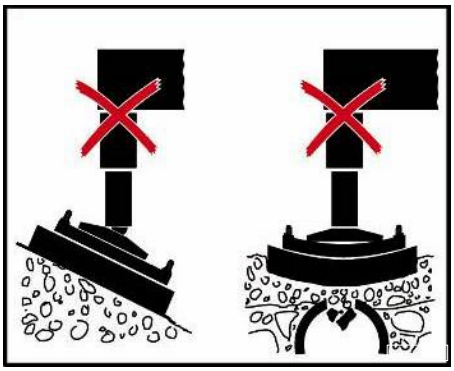


Figure 12: Supporting – unsuitable supporting ground

The support plates supplied by the manufacturer must always be used.

If the load-bearing capacity of the supporting ground requires it:

- Increase the support area.

Additional support plates and timber blocks may be used to increase the support area. The supports must be undamaged and free from ice, oil, grease, etc.

The support plates and timber blocks must be laid under the support foot plates such that the load is distributed uniformly and the support leg cannot slip off the side of the support.

Check stability regularly during operation.

If stability cannot be guaranteed:

- Stop the pumping operations.

Examples of factors that compromise stability:

- Modifications to the ground conditions, particularly caused by rain water or the thawing of frozen ground
- The support sinking on one side

Supporting forces

The maximum supporting force is indicated on each support leg.

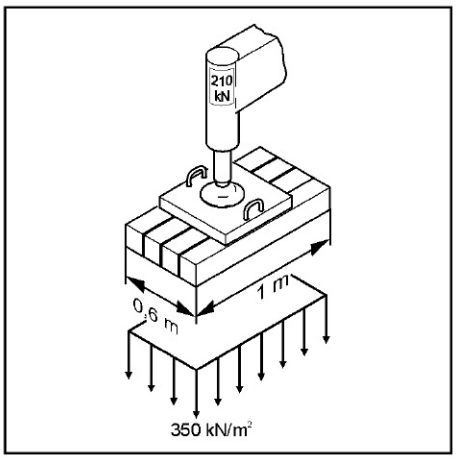


Figure 13: Increase in support area

Depending on the soil type, keep a sufficient safe clearance from pits and slopes. Maintain a safe clearance as shown in the figure below:

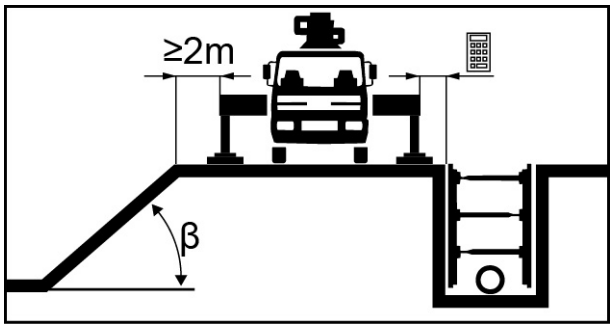


Figure 14: Distance to slopes and pits while supporting the machine

The following guide values apply:

- On undisturbed, compacted ground, the safe clearance corresponds to the pit depth, but must be at least 2 m.

  The approach angles must not be below the following values without providing a mathematical justification:

  - On non-cohesive or soft soil: β < 45°
  - On stiff or semi-solid soil: β < 60°
  - On rock: β < 80°
- Where pits are supported by shoring, sheet piling or bored piles, a mathematical proof must be carried out.

If you are unsure, contact the site management and ask what the required minimum clearance is.

Supports

Swing out and telescope the support legs one at a time until they are in the correct horizontal position, monitoring the danger zone as you do so. Check the corresponding notes in this regard in the operating instructions.

Lock all supports mechanically, if this is provided for in the design.

Set the machine so that it is horizontal. Provided the manufacturer does not state otherwise in the Operating Instructions, the maximum permissible deviation from the horizontal is 3°. Exceeding the permitted deviation from the horizontal overloads the placing boom's slewing gear and the entire support structure, thereby compromising the machine's stability.

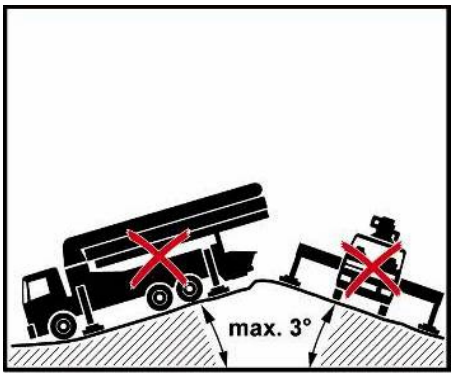


Figure 15: Maximum tilt angle when setting up

Check that the machine is stable.

11.4.1.2 Stationary machine

Setup site

For stationary machines, the requirements set out in the “Mobile machines” chapter *(Mobile machine P. 64)* apply.

When selecting the setup site, also keep in mind that the machine must be dismantled and transported away again at the end of the job. The ambient conditions may change as construction work progresses.

Stationary placing booms

Stationary placing booms can be erected on tubular columns, lattice booms or other base structures. The base/structural elements to which the base structure is fixed must be able to withstand the forces and moments transferred via the base structure, as specified in the manufacturer’s information. The base frame of the base structure must be fastened in place so that it is level on the base/structural elements in every direction. Check the documentation provided by the manufacturer in this regard and the corresponding notes in the operating instructions.

11.4.2 Unfolding the placing boom

- Only raise a mobile placing boom from the driving position once the machine has been supported in accordance with the Operating Instructions.
- Stationary placing booms may only be raised after the proper set-up has been checked by a subject expert.
- Only raise the placing boom in the sequence described in the Operating Instructions.

The correct sequence depends on the “Folding system” (roll-and-fold system, Z fold system, etc.).

Standing under the placing boom while it is being unfolded is prohibited.



11.4.3 Moving the placing boom safely

If the placing boom moves unintentionally:

- Immediately press an EMERGENCY STOP button.
- Stop the work.
- Have the cause of the fault rectified.

Placing booms with placing boom hinges which allow considerable flex angles have a very large potential working area. This high manoeuvrability means different placing booms can also be moved into dangerous positions. Refer to the “Impermissible working area” chapter *(Impermissible working area P. 29)* as well as the manufacturer’s Operating Instructions for details of prohibited working areas.

There is a risk that you will damage the truck, truck superstructure or obstacles on the construction site with the placing boom. Under certain circumstances it is even possible to overload or cause damage to the placing boom. Uncontrolled movements may result from the sudden, violent release of the placing boom after collisions. This may also result in (possibly fatal) personal injury.

11.5 Pumping operations

When starting to pump, there is a risk of the end hose whipping around due to air in the delivery line. This risk is also present after breaks in pumping or other interruptions, or when the delivery line or parts of the delivery line need to be modified and/or refilled.

As a machine operator:

- Your primary duty is to observe the placing boom and the site of concrete placement.
- Whilst pumping, monitor the stability of the machine, as described in the “Supporting ground” chapter *(Supporting ground P. 65)*.

  If you notice any changes that are not permitted according to the manufacturer’s information:

  - Take the necessary countermeasures.
- Remain at your place of work while the machine is ready for operation (e.g. during breaks in pumping, interruptions or maintenance work).
- If you step away from your place of work:

  - Secure the machine to prevent unauthorised use.

11.5.1 Hopper

Concrete may spray from the end hose due to the presence of air in the delivery line. To prevent air from being sucked in, the hopper must be sufficiently filled with concrete.

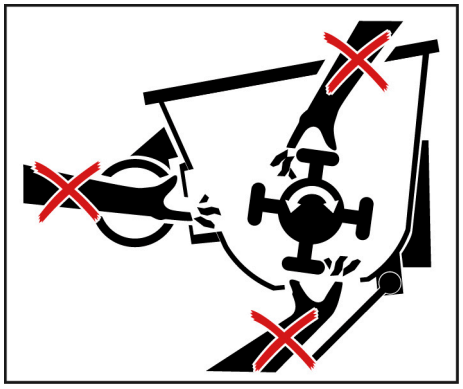


Figure 16: Mechanical hazards in the hopper

Do not reach into the hopper with your hand or any other part of your body, whether the machine function is running or switched off.

Do not insert any objects (shovel handle, trowel, etc.) into the hopper. Such objects could become trapped and dragged into the machine. They might then hit you or be torn from your hands and cause you injury.

11.5.2 Placing booms

You should avoid standing under the placing boom. The hoseman may remain underneath the placing boom, if this is the only option due to space constraints at the site of concrete placement. See also the “End hose” chapter *(End hose P. 71)*

As a machine operator:

- Control the placing boom so that the hoseman can guide the end hose without power consumption.

The hoseman must not carry the end hose by hand, because the weight of it may cause permanent personal injury.

In the case of stationary placing booms, (work) platforms and ladders are only provided for assembly and maintenance work. It is forbidden to use these while the machine is in operation.

11.5.3 End hose

Do not stand under the end hose. Falling concrete can injure people, for example when changing the site of concrete placement.

When starting to pump, there is a risk of the end hose whipping around due to air in the delivery line. This risk is also present after breaks in pumping or other interruptions and during cleaning, or when the delivery line or parts of the delivery line need to be modified and/or refilled. In such cases, the end hose must be allowed to hang freely and no one must be in the danger zone.

When using a longer end hose/end hose combination, the diameter of the danger zone also increases – see the “End hose” section in the “Danger zone” chapter *(End hose P. 23)*.

The end hose must not impede the movement of the placing boom; in particular, the end hose must not catch on the reinforcement or formwork. There is a risk of death if the machine topples over or the end hose shoots out on further movement of the placing boom.

If the manufacturer defines the weight rather than the length of the end hose, you can use a reducer pipe with a longer end hose, for example. This is referred to as an end hose combination. The quoted gross weight must not be exceeded.

End hoses/end hose combinations with a length of less than 2.5 m or more than 4 m must not be guided by hand.

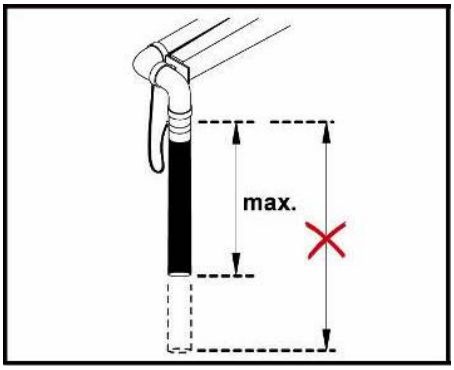


Figure 17: Permitted end hose length

Do not kink the end hose. Never attempt to straighten a bent end hose by increasing the pressure. The end hose must not be submerged below the surface of the concrete being delivered, otherwise the concrete may spray upwards.

The end hose/end hose combination must be secured against falling.

The hoseman must guide the end hose in such a way that prevents excess spraying of concrete, and so that concrete is directed precisely into the site of concrete placement.

11.5.4 Truck mixer

There is a risk of crushing between the truck mixer and the machine.

As a truck mixer driver:

- Make sure that no-one stands between the approaching truck mixer and the machine.

11.5.5 Delivery line systems

11.5.5.1 Suitable delivery lines

Use only delivery lines, end hoses, delivery line couplings, etc. which are in perfect condition and suitable for the delivery job. Exceeding the permitted operating pressure may result in accidents.

If these separate delivery lines are not your responsibility:

- Ask the site management to confirm the permitted operating pressure

11.5.5.2 Securing the delivery lines and delivery line couplings

Delivery lines which are not laid along placing booms, must be securely fastened in order to transfer the forces generated in them into the structure or other structural members. Run the delivery lines in such a way that kinks, sharp bends, tension points and damage are avoided during pumping operations.

Delivery line couplings must be secured to prevent them from opening accidentally.

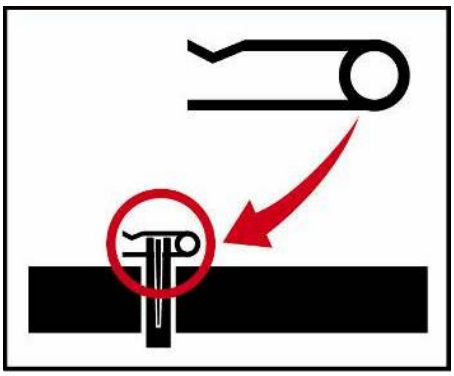


Figure 18: Securing delivery line couplings

11.5.5.3 Clearance to delivery lines

Noone should remain in the vicinity of separate delivery lines during pumping operations. Cordon off the danger zone.

If the danger zone cannot be cordoned off over a sufficiently large area:

- Cover the delivery line using suitable materials.

11.5.5.4 Preventing and clearing blockages

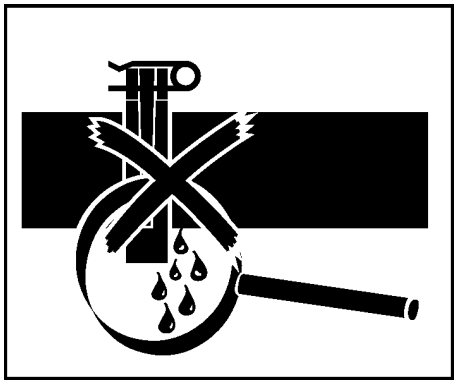


Figure 19: Leak detection

Prevent blockages by adjusting the operating conditions. Remove blockages by reverse pumping and then restarting forward pumping. Repeat this process several times if necessary.

If the blockage is not released:

- Dump the pressure in the delivery line before removing the relevant section of the delivery line.

Never check the fill level of the delivery line by tapping it with a hammer while it is under pressure. The delivery line may be damaged and burst when tapped.

11.5.5.5 Opening delivery lines

Delivery lines must not be opened or tapped off while they are pressurised. Concrete exiting under pressure can cause injury. The concrete column must be depressurised by reverse pumping before the delivery line is opened. Never bend over the delivery line coupling directly when you are working.

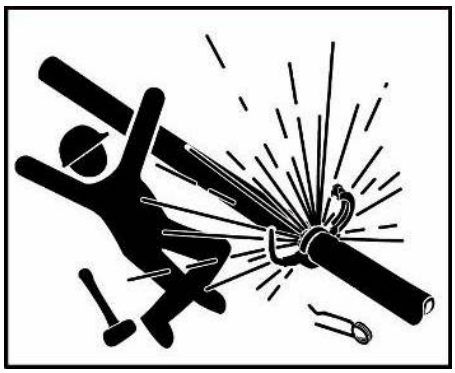


Figure 20: Do not open the delivery line while it is under pressure

11.5.5.6 Devices for shutting off, diverting and cleaning

Use only devices that are suitable and in perfect working order to shut off, divert and clean the delivery line. Defective and unsuitable devices can lead to damage to the entire delivery system and injure people in the vicinity if they fail.

Observe the Safety Manual for the machine and the device when connecting and operating a device. Make sure that no-one is in the danger zone before operating devices.

11.6 Interruptions in operation

If you need to step away from your place of work:

- Switch off the remote control and secure the machine to prevent unauthorised use.

11.7 Cleaning

11.7.1 General

Drain the delivery line, pump and hopper completely.

Mobile machine must not be moved with the placing boom unfolded or the support legs extended, even over short distances, unless this is expressly permitted by the manufacturer. This rule also applies when you have to drive the machine to a different site for cleaning. The placing boom and support legs must be fully retracted and secured before driving.

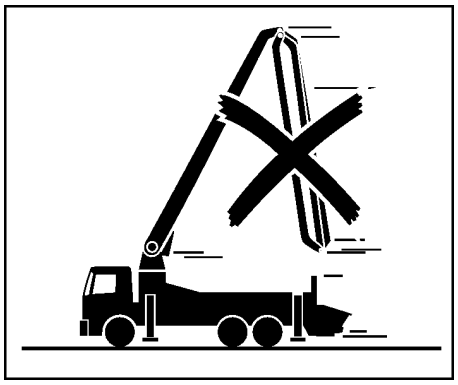


Figure 21: Only drive with the placing boom in the transport position

A properly cleaned delivery line is the best preventive measure against the formation of blockages. Blockages increase the risk of accidents. *(Opening delivery lines P. 74)*

The preferred methods for cleaning the delivery line are reverse pumping or forced cleaning with water. Use a catch basket, pipe cleaning head and wash-out ball for forced cleaning to prevent any water from flowing into the formwork. Switch on the agitator when reverse pumping. Otherwise, the concrete flowing back into the hopper can bend the agitator shaft.

Do not spray electrical/electronic components with barrier agents (mould oil, etc.). This causes significant corrosion damage to the electrical system.

Only point the water jet into the hopper to clean the machine components. Do not insert the hose. It could become entangled with moving machine components.

11.7.2 Cleaning agents

Take care when using aggressive cleaning agents. Aggressive cleaning agents may attack materials (e.g. rubber) and painted surfaces. You can use standard paint cleaning agent and preservatives. Ask the manufacturer of the cleaning agent to confirm its suitability. Observe the manufacturer's instructions regarding use and safe handling. Wear protective clothing. Thoroughly wash away any cleaning agents with clean water. Do not leave any puddles.

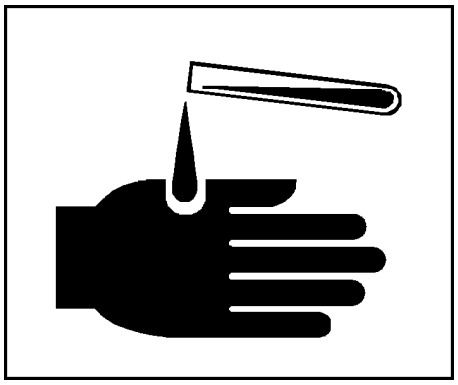


Figure 22: Corrosive functional fluids

Do not use sea water or other water containing salt for cleaning purposes.

Do not use any highly flammable agent for cleaning; there is a risk of fire.

11.7.3 Cleaning with compressed air

When the delivery line systems are being cleaned with compressed air, there is an increased risk of accidents caused by compressed air escaping explosively, spurting concrete, and the delivery line systems moving uncontrollably.

Compressed air should only be used for cleaning purposes under the supervision of a subject expert. All persons participating in the cleaning procedure must be instructed in the safety regulations.



General restrictions:

- Only blow out delivery line systems that have the same nominal diameter throughout their length. Empty and rinse the reducer pipes by hand.
- Individual delivery pipes and pipe runs up to 10 m in length must not be blown out with compressed air. There is a risk of accident from rebound.
- Separate delivery line systems that are cleaned with compressed air must be securely fastened so that they cannot move uncontrollably.
- The wash-out adaptor must be fitted with a separate, large dump cock and a pressure gauge.
- The sponge ball or the plug used to push the concrete out must seal the line well enough so that the air does not pass past it into the concrete.

  In addition:

  - The delivery line must be sealed to the rear when the sponge ball or plug is caught in the catch basket.

Cleaning with compressed air – preparations:

- If downstream distribution systems (e.g. rotary distributors), gate valves or other delivery line components are connected to the delivery line system:
  - Secure this accessory so that it cannot move around freely.
- Remove the flexible delivery line sections from the end of the delivery line system.
- A catch basket must be fastened at the end of the delivery line system and a wash-out adaptor must be fitted at the start of the delivery line system. The catch basket and washout adaptor must fit the delivery line system.
- For rotary distributors:
  - Remove the delivery line elbows from the end of the delivery line.

Cleaning with compressed air:

- There must be no persons present within the danger zone around the delivery line, at the end of the delivery line and, in particular, in front of the opening in the catch basket. Concrete may shoot out of the catch basket, injuring people or causing damage to property.
- The concrete must be able to flow freely from the end of the delivery line.
- The dump cock must be opened in such a way that no-one can be injured by concrete residue that might be expelled from the dump cock.
- The pressure gauge on the wash-out adaptor must be monitored at all times during the washing out process. The pressure in the delivery line must be rapidly dumped via the dump cock in the event of a sudden drop in pressure (concrete column exiting from the end of the line) or increase in pressure (risk of blockage).

11.7.4 Protection against water

Before cleaning the machine with water, a high-pressure cleaner or other cleaning agents:

- Temporarily cover or seal all openings into which water or cleaning agents must not enter for safety and/or operational reasons.

Electric motors and electric cabinets are particularly at risk. Check with the machine manufacturer to what extent the electrical equipment is protected against water and dust.

11.7.5 Post-cleaning procedure

Look out for leaks, loose connections, chafe marks and damage during the cleaning procedure. Rectify any defects found immediately.

After cleaning:

- Remove all temporary covers and tapes completely.
- Check the machine's readiness for operation *(Before working with the machine P. 59)*.

After cleaning the machine with a high-pressure cleaner:

- Lubricate the machine.



12 Recurring inspections (safety inspection)

12.1 General

After initial commissioning of the machine, the operational safety of the machine must be checked regularly by a subject expert.

The inspection intervals depend on the age of the machine. The older the machine, the greater the probability of damage. For this reason, recurring inspections of the machine, appropriate to its age, must be carried out in order to detect damage in good time. Recurring inspections must be arranged by the operating company. The recurring inspections must be carried out in accordance with the following requirements.

12.2 Scope of inspection

Recurring inspections must include at least the following activities:

- Checking the condition of the components and equipment, especially any cracking, damage, wear, corrosion or other changes
- Checking the completeness and effectiveness of the safety equipment
- Checking the effectiveness of the measures taken to rectify any defects
- Checking components that are used together with the machine (in particular conveyor line components and accessories)
- Observing specific manufacturer’s instructions on maintenance and inspection for the operating company

12.3 Inspection intervals

The inspection intervals are fixed as follows:

Machines up to and including 5 years old:

- Inspect after every 1000 operating hours or 1 year, whichever is soonest.
- The interval is repeated after every inspection.

Machines more than 5 years old:

- Inspect after every 500 operating hours or 1 year, whichever is soonest.
- The interval is repeated after every inspection.

Machines more than 10 years old:

- Inspect after every 250 operating hours or 1 year, whichever is soonest.
- The interval is repeated after every inspection.

The day of initial commissioning in accordance with the handover report and the machine's operating hours meter are definitive for the intervals. This operating hours meter records the hours of pumping operations. The operating hours meter must always be kept in good working order. It must not be tampered with. For machines without an operating hours meter, the operating hours must be recorded in a traceable form in writing.

12.4 Documentation

The results of the inspection must be entered in the check book and signed. The check book must always be kept with the machine and must be produced upon the request of the national supervisory bodies.



13 Maintenance

As the operating company:

- Comply with instructions and intervals for maintenance work specified in the Operating Instructions, including specifications for the replacement of parts and equipment.

Maintenance work must only be carried out by qualified personnel.

Before carrying out maintenance work:

- Inform the affected persons before carrying out any maintenance work. Someone should be nominated as the person responsible for this.
- Appropriate workshop equipment is required to carry out maintenance work.
- Secure a wide area around the maintenance area as far as is necessary.
- Only carry out maintenance work if the machine is parked on level and sufficiently supporting ground and is secured to prevent it rolling away.
- Be aware of stored energy in hydraulic or pneumatic systems:
  - Depressurise the systems.
  - Secure mechanical components to prevent them from moving unintentionally.
  - Relieve the tension on systems under mechanical stress.
- Clean the machine, especially joints and threaded unions, to remove any hydraulic fluid or oil, fuel or preservatives. Do not use aggressive cleaning agents. Use lint-free cleaning rags.

During maintenance work:

- Be aware of hot functional fluids and surfaces (hydraulic fluid, hydraulic fluid radiator, etc.).
- A machine that has been completely shut down for maintenance and repair work must be secured to prevent it being restarted inadvertently:
  - Lock the main control devices and remove the key.
  - If a main switch is fitted, attach a warning plate to it.
- Use specially designed or otherwise suitable climbing aids and working platforms when carrying out assembly work above head height.

- Never use machine parts as climbing aids. Keep all handgrips, steps, railings, platforms and ladders free from dirt, snow and ice.
- Do not open gas-filled spring elements, as used on maintenance flaps, for instance. The gas-filled spring elements are filled with gas under high pressure which can escape explosively if you attempt to open them.
- Carefully secure individual parts and large assemblies to lifting equipment when carrying out a replacement operation. Use only suitable and technically perfect lifting equipment and suspension systems with adequate lifting capacity. Never stand under suspended loads.
- If you have loosened any threaded unions during maintenance or repair work:
  - Tighten these again in accordance with the manufacturer's instructions, or replace them.

Following maintenance work:

- If changes have been made to the machine, it must be checked by a subject expert before recommissioning.
- Ensure that all functional fluids, consumables and replaced parts are disposed of safely and with minimum environmental impact.

13.1 Safetyrelevant components

Work on safety-relevant components requires particular specialist knowledge.

The repair, replacement or adjustment of safety-relevant components and adjustable devices (pressure limiting valves, potentiometers, fluid flow limiters, hydraulic cylinders, sensors, etc.) must only be carried out by qualified personnel authorised by the manufacturer.

13.2 Welding, cutting and grinding work

As the operating company:

- Only carry out welding, cutting and grinding work on the machine if it has been approved by the manufacturer.

Only qualified personnel may carry out welding work in line with manufacturer's specifications on the placing boom, on the supports, on load-bearing parts, on fuel and oil tanks or other components which are important for industrial safety. This work must be checked by qualified personnel.

As the operating company:

- Document evidence of the qualifications of your qualified personnel.

Always attach the earth cable of the welding unit directly to the component which is being welded. The welding current must not flow through hinges, cylinders, etc. Significant damage may be caused in the event of a flash over.



Figure 23: Welding

Electronic components can be destroyed by stray voltage during arc welding processes.

How to avoid external voltage:

- disconnect the remote control cable from the control console;
- Disconnect all cables leading to the receiver of the radio remote control
- Protect sockets with caps
- Disconnect the positive and negative leads from the battery

Clean the machine and its surroundings of dust and flammable substances and make sure that the premises are adequately ventilated before carrying out welding, flamecutting and grinding operations, otherwise there is a risk of explosion.

13.3 Working on the placing boom

Only carry out maintenance and repair work on the placing boom if the placing boom is folded or properly supported, the motor is switched off and the support legs are secured.

Support the placing boom arms to prevent accidental movement before starting work on the valves, cylinders or hydraulic lines of the placing boom.

The delivery line was installed without tension with the placing boom in the driving position and can only be replaced without difficulty in this condition. Stresses may be generated on folding if the delivery line is replaced when the placing boom is unfolded.

Do not remove the entire delivery line but rather replace it bit by bit, e.g. replace one placing boom arm at a time. Otherwise, the pivot points of the new delivery line will have to be redetermined using special equipment.

13.4 Inspection of the delivery line

Delivery lines are subject to wear which varies according to the delivery pressure, concrete composition, the material from which the delivery line is made, etc.

- Measure the wear to the delivery line at regular intervals.
- Refer to the manufacturer’s specifications for wear limits.
- Replace the elements of the delivery line once they have reached their wear limit.

13.5 Software

Unauthorised interventions in the machine’s software may lead to severe damage and accidents.

If a machine is equipped with software:

- Use the software only as specified in the manufacturer’s Operating Instructions.



13.6 Protective and safety equipment

If protective devices or safety equipment have been removed for maintenance work:

- Install and check the protective devices and safety equipment immediately after completing the maintenance work.

All safety and accident prevention equipment (warning and information plates, grilles, protective coverings, etc.) must be in place once maintenance work has been completed. They must not be altered or damaged.



14 Disposal

As the operating company:

- Follow all the disposal regulations applicable in your country.

Observe the following in particular:

- Remove the functional fluids, particularly hydraulic fluids, motor oils, fuel, brake fluid, concrete admixtures, any environmentally hazardous functional fluids or functional fluids which are hazardous in any other way, and dispose of these correctly.
- Remove the operating equipment, particularly the hydraulic fluid reservoir, hydraulic cylinders, hydraulic fluid radiator, hydraulic lines and hoses and other components which may contain residual functional fluids, and dispose of these correctly.
- Remove the steel structure and dispose of it correctly, e.g. by recycling.
- Dispose of the truck or the drive unit correctly.



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