

Guideline

Machine Safeguarding

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1 Purpose

This guideline provides the responsible line managers with general guidance and sets up standard requirements regarding machine safeguarding.

Any measures taken have to comply with all applicable laws and regulations as well as with HeidelbergCement site standards and guidelines. Whenever a discrepancy occurs between local laws/ regulations and these minimum requirements, operations shall comply with the more stringent of the two.

2 Objective

The objective of this document is to increase risk awareness and to minimize the risk of incidents arising from running or moving parts of machines by ensuring machines are appropriately safeguarded and persons working on or around machinery are protected. By creating or optimizing appropriate technical, organizational, and personal measures, the operations should be made as safe as possible for site personnel.

3 Scope

This guideline is applicable at all locations and operations where the HeidelbergCement Group exercises management control (HeidelbergCement sites).

The obligation to properly safeguard machines applies to equipment already installed and planned new equipment.

Any equipment brought onto our sites by contractors, must be safeguarded, too. It is the responsibility of the contractor to ensure compliance of his equipment with this guideline. Furthermore the HeidelbergCement Group guideline "Visitor and Contractor Safety" has to be taken into consideration.

"Shall-, should- and can-" requirements are recommendations that need to be implemented unless there are equivalent measures in place.

4 Roles and responsibilities

The local HeidelbergCement line management is responsible for implementing this Group guideline and to arrange its translation into local language.

Local line management must ensure that appropriate and effective measures are in place and complied with. It is responsible to ensure that all relevant persons are made familiar with these machine safeguarding requirements and that they are trained accordingly.

By means of contractual regulations, it must be ensured that contractors are obligated to follow this guideline and must be informed about it. It has to be ensured that they have the same responsibility to adhere to this guideline and additional HeidelbergCement Group guidelines affecting their work as do HeidelbergCement employees and management.

5 Definitions

Guard: Any system preventing/ reducing the access to dangerous points of machines and equipment having sufficient force in motion to cause injuries (including containing ejected parts, tools, off-cuts or swath)

Nip point: Where two parts move together and at least one of them moves in a circle with potential to cause risk or injury via entanglement or catching

Synonyms: pinch points, mesh points, run-on points, entry points, etc.

6 Principal hierarchy of control

The precautionary principle to prevent accidents should be followed by the HeidelbergCement sites. Depending on the local situation in most cases a mixture of various controls might be used.

The hierarchy of control is:

1. Elimination or Substitution

Elimination means to completely remove the hazard, or the risk of hazard exposure. Substitution involves replacing a hazardous part of machinery or a work process with a non-hazardous one. For example:

- Installation of conveyor scraper instead of manual belt cleaning

2. Engineering

If a hazard cannot be eliminated or replaced with a less hazardous option by appropriate efforts, the next preferred measure is to use an engineering control. For example:

- Guarding machinery
- Automating a process, e.g. palletizer

3. Organization

Where 'Engineering' cannot fully control an H&S risk, organizational measures have to be used to reduce risk and limit employee exposure. For example:

- Training employees in correct and safe operation
- Developing Safe Work Practices
- Reducing the number of employees exposed to the hazard
- Reducing the period of employee exposure
- Developing and implementing lock-out procedures
- Displaying appropriate warning signs

4. Personal Protective Equipment (PPE)

- Personal protective equipment should be used in conjunction with higher order control measures. It is mandatory when other higher order control measures are not possible, and only as a short-term solution

In any case taken measures and persons have to comply with all applicable laws and regulations as well as with all HeidelbergCement site standards and regulations.

7 General requirements

7.1 Risk assessment

- If there is a reasonable potential to get caught by equipment, a risk assessment (Job Safety Analysis) has to be conducted and recorded before an equipment is used for the first time
- Risk assessments have to be revised on a regular basis (recommended is at least once per year)
 - (1) A review immediately becomes necessary if the system changes, e.g. due to new parts or the equipment performs differently. A review is also required when a relevant incident has occurred in a comparable equipment set-up
- The risk assessment has to consider the frequency and level of exposure as well as the severity of any incidents taking into account the existing risk control measures
- The findings of the assessment have to be translated into appropriate safe work measures (technical, organizational, or personal) before using the equipment
- Similar equipment can be assessed as a group (e.g. belt conveyors)

7.2 Guard design

- Guards have to be designed and installed in a way to fulfill the protective functions without interrupting the regular work flow (e.g. machine cleaning, greasing or adjustment)
 - (1) The access to greasing points must be safe
- If necessary a combination of two or more different guard types may be used to increase workers' safety
- Types of guards can be fixed barriers, interlocking guards (electrical, mechanical), adjustable and self-adjusting guards
- The design of fixed barriers must consider a minimum need for removal. To remove a fixed guard, a tool or key has to be required to detach the guard
- Guards must also be designed so they are easy to refit after maintenance work has been conducted
- The environmental conditions (e.g. temperature, weather) must be taken into account for the selection of sustainable solutions
- If fixed barriers are used, the mesh size in respect to the size of other openings must depend on the distance of the guard to potential nip points (see Annex 1: Dimensions for guard openings). For example, if there is no admittance for fingers through the mesh, the moving parts can be nearby the guard. In case the hand can reach through the mesh openings, the distance to the machine must be larger. The guards should provide adequate protection against loose clothing and long hair becoming trapped

7.3 Emergency stop systems

- Emergency stop systems (buttons, pull cords, etc.) have to be installed for those equipment where a risk of entanglement or other types of injury remains consistent with all applicable rules and regulations
- The emergency stop systems have to be maintained and tested on a regular basis

7.4 Warning signs/ signals

- Correct signage is important to raise the awareness towards hazards. It may also serve to act as a last warning against hazards for people who are unfamiliar with them
- Signs should be used in any area where people could be exposed to hazards or in situations where somebody could do something to create a hazardous situation. Typical use of signs include:
 - (1) warning workers of areas with restricted access
 - (2) highlighting areas where correct safety clothing is compulsory
 - (3) reminding workers of something that needs to be done before another action is carried out
- Optical or acoustical warnings have to get initiated before start of any machine with moving parts, if the work environment cannot be visually overlooked by the person, who starts the equipment, to ensure nobody is in the danger zone

8 Guarding for different machine types

The following list illustrates the basic principles of equipment guarding and is not meant to be an all-encompassing list. Further equipment with a need for guarding may be installed and used at the sites and will need appropriate guarding. This equipment should be identified by the obligatory risk assessment procedures.

8.1 Conveyor

Belt, screw, apron and bucket conveyors are the primary types for bulk handling in our business. All nip points, where there is a risk to be caught have to be guarded in a solid and appropriate way. This includes all drive-, and tension pulleys/ drums, all tension idlers/ rollers, and conveyors with constrictive parts such as feed bins/ hoppers or baffle/ skirts above where the belt cannot give way.

- No protection is necessary for idlers / rollers, where the belt can be lifted more than 50 mm.
- Idlers / rollers at belt conveyor sections with more than 3° change of direction (conveyor curves/ increase of tension case) have to be equipped with protection devices.
- Form-fitting guards may be used, if the maximum distance between the guard and the rotating part (with smooth surface) can be kept within a tolerance of 5 mm. This is also valid for junctions between two conveyors.
- Deteriorated belts or belt splices can trigger drawing-in, burns, pokes or cuts and must therefore get maintained or even changed.

Unguarded parts of conveyors next to walkways must be equipped with emergency stop cords or railings.

- The emergency stop cord must be sufficiently tight to assure the conveyor drive motor will be deactivated when the cord is pulled.
- The emergency stop device must be located in such a way that a person falling on or against the conveyor can readily deactivate the conveyor drive motor.
- Alternative railings must be positioned and constructed to prevent persons from falling on or against the conveyor without creating new hazards.

If a hazard is less than 2.5 m from the floor or working platform (throughways), additional protection measures like protection plates have to be installed.

8.2 Rotating cutting machines

Rotating machinery includes cut-off saws, planers, milling machines, friction cutters and drilling equipment. Hazards arise from exposed blades with risk to cut flesh or limbs, cause entanglement, or injure staff with ejected parts.

- Protection is normally provided by fixed and adjustable guards.

8.3 Power transmissions

Parts of power transmission equipment where there exists risk of entanglement (such as rotating shafts, clutches, fan belts, gears, and sprockets) must be protected.

- This is normally done by fixed metal guards of proper size.

8.4 Presses

The main hazard of presses is where the punch and die come together. Suitable methods to control hazards associated with presses may involve a combination of guard types.

- For example: fixed and interlocked guards for a power press during production run, whereas presence-sensing or two-handed control devices may be used to guard a brake press

8.5 Robotics

The main hazards with respect to robotics are in relation to installation, repair and maintenance. Installations may be safeguarded by one or more guarding and presence sensing devices.

- Attention must be paid to adjacent areas. For example: loading or unloading stations and associated equipment.

8.6 Fans

Fan blades need to be guarded where they can be contacted.

- This is normally done by fixed meshes of proper size.

9 Maintenance, house keeping

The following requirements apply to own employees as well as for all contractor or subcontractor employees doing this type of work.

9.1 Safe work procedures

Safe work procedures have to be derived from the risk assessments and documented.

- All regular inspections, cleaning and maintenance procedures must be described in written form based on the results of the risk assessment
- They have to define the responsibilities of each person involved in the activity, including first responders should an incident occur
- They have to define how and in which order tasks are to be performed for a specific piece of equipment
- The safe work procedure has to be provided in an appropriate language and mode to all affected employees
 - (1) If workers do not understand the language in which the safe work procedure is provided, they must be informed in their language by any other means. This must be documented. The responsible line management must ensure that the workers understand the procedures
- All instructions have to be reviewed periodically to stay relevant. This should be done at least once a year and if any new information arises, such as lessons learnt from previous tasks or safety reports from in- or external sources.
- Any extraordinary task, where there is a risk of entanglement requires a thorough risk assessment and planning before commencing work

Violations of the safe work procedures or safety rules are to be treated with disciplinary actions in accordance to the local rules and regulations

9.2 Machine isolation procedures

- Before undertaking any cleaning, maintenance, repair or unjamming work in a machine's danger zone, proper measures have to be taken to achieve a "zero energy" state before performing work.
 - (1) Turn the machine's power supply switch to the off position
 - (2) Bring the machine to a complete stop and ensure all inherent energy sources like electrical, mechanical, hydraulic, pneumatic, steam, gravity is released
 - (3) Each person exposed to danger must lock off all the machine's sources of energy in order to avoid any accidental start-up of the machine for the duration of the work
 - (4) To be able to identify the owner of the lock a tag or any other documentation system should be used. Further information, e.g. date and time might be documented, too. It acts only as a means of providing information to others at the workplace

- Please note, that detailed guidance towards machine isolation (lockout/ tag out) procedures is given in a the Group guideline “Equipment isolation”

9.3 Guard rebuilding/ refitting

- After accomplishment of the maintenance work all guards have to be immediately rebuilt/refitted and if appropriate tested to ensure a safe use of the machine
 - (1) If applicable this has to be done according to the manufacture’s provision

10 Purchasing new equipment

When new machinery is purchased or existing machinery modified, the protection of moving parts has to be considered from the very beginning. A risk assessment has to be done, in which the supplier and the appointed health & safety adviser(s) are to be involved as early as possible.

At least the following topics have to be considered:

- What kind of risk exists?
- What kind of people will work with the machine and how will work be carried out?
- What supporting documentation and training will accompany the new equipment?
- How much space does the machine require and is there enough room to access the machinery for servicing, maintenance, repair or cleaning?
- Does the machine interrupt regular operations or is special maintenance work required?

A risk assessment must be undertaken. The equipment’s suppliers should be asked for support and cooperation.

11 Training

- Individuals intended to work with or near by of moving and rotating equipment, where there is a risk of entanglement, must be adequately and verifiably trained on a regular basis, at least annually. Documentation of this training is mandatory
- Additional training needs to be conducted before starting work when there are changes in procedures, equipment, personal protection equipment (PPE) or if there are new hazards
- Training (and retraining) is important for all staff, but it is especially critical that people like contractors, casuals, new starters, and anyone else who will be exposed to machines be fully briefed and familiar with the inherent risks
- Training must include instructions on how to wear the appropriate PPE
- Other persons who could be affected by work on or around machinery need to be trained on right behavior, in order to avoid accidents

12 Implementation process and control

A gap analysis against new requirements due to the revision must be performed within 3 months after publication of the revised version of this guideline. In order to close any identified gaps, an action plan with responsibilities and due dates must be set up immediately and implemented within the stipulated time frame.

The implementation and compliance with this guideline has to be checked in the future through appropriate measures, such as H&S Management system audits.

13 Further information

Further applicable documents are the Group H&S Policy and applicable Group guidelines such as “Visitor and contractor safety” or “Equipment isolation”.

Additional information (e.g. training material, good practice examples) are provided at the Group H&S homepage:

<http://unite.grouphc.net/wok/hs/Pages/default.aspx>

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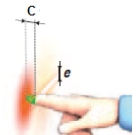
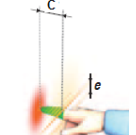
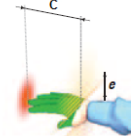
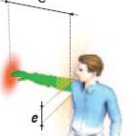
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14 Annex 1: Dimensions for guard openings

Guards can have openings. Specifications for allowable dimensions for guard openings are shown in the below table.

Guard opening dimensions can be verified with a tool called Safety Ruler. This tool makes it possible to check if the hazard can be reached through the guard.



Dimensions for guard openings (source: NF EN ISO 13857:2008)				
Part of the body concerned	Opening width e (mm)	Safe distance c (mm)		
		Slot shape	Square shape	Circle shape
Extremity of the finger 	$e \leq 4$	≥ 2	≥ 2	≥ 2
	$4 < e \leq 6$	≥ 10	≥ 5	≥ 5
	$6 < e \leq 8$		≥ 15	≥ 15
Finger 	$6 < e \leq 8$	≥ 20		
	$8 < e \leq 10$	≥ 80	≥ 25	≥ 20
	$10 < e \leq 12$	≥ 100	≥ 80	≥ 80
Hand 	$12 < e \leq 20$	≥ 120	≥ 120	≥ 120
	$20 < e \leq 30$		≥ 120	≥ 120
	$30 < e \leq 40$		≥ 200	≥ 120
Arm 	$20 < e \leq 30$	$\geq 850^*$		
	$30 < e \leq 40$	≥ 850		
	$40 < e \leq 120$	≥ 850	≥ 850	≥ 850

*: If the length of the slot is less or equal 65 mm, the safe distance can be decreased at 200 mm (blockage due to the thumb).