

Mineral Products Association

Guide to Cleaning Concrete Pan Mixers

Introduction

The Mineral Products Association and its members have committed to Vision Zero to ensure that everyone goes home 'Safe and Well Every Day'. A key part of Vision Zero is the continuing focus on 'The Fatal 6'; the high consequence health and safety hazards that account for the majority of the serious injuries and fatalities within the minerals sector. Through a range of strategies and measures, the aim is to eliminate fatalities and serious injuries linked to 'Fatal 6' causes by 2025.

The Fatal 6 Working Group on 'Contact with Moving Machinery and Isolation' has already produced a comprehensive handbook and a LOTOTO Guide which have been widely shared and distributed (both available on www.safequarry.com). Pan mixers are widely used within the industry and this machinery can present a clear risk of serious injury, particularly during cleaning operations which are a regular requirement. MPA has therefore produced this guide which provides information on the nature of the health and safety hazards which can arise during cleaning operations and the ways in which these can be eliminated or reduced by good design, automation and safe working practices.

The cleaning of pan mixers has the potential to cause harm if not undertaken correctly.

This document provides guidance on the elimination or significant reduction of risks to health and safety during the cleaning of pan mixers.

It provides guidance prepared by the MPA and takes account of:

- Industry incidents
- Health and Safety Executive Research
- Good practice

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Principal Hazards

Safety

- The crushing action of the rotating paddles in relation to the fixed pan.
- Leg and lower body injuries from the sliding motion of a pneumatically or hydraulically operated discharge floor and fixed parts of the mixer (and possible falls from height). An ancillary danger involves the sliding movement of a two-position wet/dry batch mixer.
- Head and upper body injuries caused by falling mixer lids.
- Being struck by the objects contained within the pan.
- Eye damage from abrasive materials/high pressure water jets.
- Manual handling injuries.



Principal Hazards

Occupational Health

- **Noise** - Regular and frequent exposure to high levels of noise, when using power tools such as chipping hammers and other noisy equipment to clean the mixer, can cause noise induced hearing loss that is permanent and disabling;
- **Hand-arm vibration (HAV)** - Regular and excessive exposure to HAV, when using power tools such as chipping hammers to clean the mixer, can lead to permanent ill-health known as hand-arm vibration syndrome (HAVS). HAVS is a permanent condition and at its advanced stage is seriously disabling;
- **Dust** - Breathing in the dust from the cleaning of solidified concrete inside the mixer on a regular basis will put the worker at risk of developing lung diseases such as Chronic Obstructive Pulmonary Disease (COPD), silicosis and cancer.
- **Alkaline burns** - Contact with wet cement, fresh concrete or mortar may cause irritation or burns to skin; and serious eye damage.
- **Dermatitis** - Skin contact with wet cement, fresh concrete or mortar may cause dermatitis.

Legal Background

Health and Safety at Work Act Section 2: Employers duty of care is set out in section 2 of the Act. Particular obligations include:

- Providing and maintaining plant and systems of work that are safe and without risks to health.
- Providing such information, instruction, training and supervision to ensure that employees can carry out their jobs safely.

Management of Health and Safety at Work Regulations 1999:

The regulations require employers to carry out a suitable and sufficient assessment of the risks for all work activities for the purpose of deciding what measures are necessary for reducing risks to health and safety. The risk assessment should include the principal hazards described in this document and the control measures determined should be based upon schedule 1 below, and this guidance.

Schedule 1 of the regulations sets out the principles of prevention (in order):

- avoiding risks;
- evaluating the risks which cannot be avoided;
- combating the risks at source;
- adapting the work to the individual, especially as regards the design of workplaces, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work-rate and to reducing their effect on health;
- adapting to technical progress;
- replacing the dangerous by the non-dangerous or the less dangerous;

- developing a coherent overall prevention policy which covers technology, organisation of work, working conditions, social relationships and the influence of factors relating to the working environment;
- giving collective protective measures priority over individual protective measures; and
- giving appropriate instructions to employees.

The risk assessment should also extend to identifying the necessary safety measures to control the risks from lone working (e.g. policies, training, use of personal alarms etc) and if applicable, young persons.



Provision and Use of Work Equipment Regulations 1998:

The recommendations made on the cleaning of concrete pan mixers, will need to be considered as part of the wider risk assessment process for machinery. Through this process, it will be the responsibility of the company to select the appropriate guarding and other controls specific to their operation whilst considering the hierarchy of control found in Regulation 11 (2).

A specific standard applies, BS EN 12151:2007 Machinery and plants for the preparation of concrete and mortar – Safety requirements. Further advice is contained within BS EN ISO 14119:2013, Safety of machinery — Interlocking devices associated with guards — Principles for design and selection.

Confined Space Regulations 1997:

The Confined Spaces Regulations 1997 require employers to minimise the need for employees and others to enter confined spaces but, where that is not possible, a comprehensive Risk Assessment should be carried out and action taken to reduce risk to the lowest level reasonably practicable.

A “confined space” under these Regulations has two defining features. Firstly, it is a place which is substantially (though not always entirely) enclosed and, secondly, there will be a reasonably foreseeable risk of serious injury from hazardous substances or conditions within the space or nearby.

Whether a pan mixer is a confined space (or not) will depend on individual circumstances such as the work being undertaken, specific hazards, access or lid arrangements etc. However, as a general rule where entry into the pan has been required, concrete pan mixers have been classified as confined spaces: requiring a Permit to Work and safe isolation and lock off.

Personal Protective Equipment at Work Regulations 1992 (as amended):

The main requirement is that PPE should be supplied and used at work wherever there is a health and safety risk that cannot be controlled in any other way. The regulations also set out requirements relating to assessment, training (including regular checks that PPE is used correctly), maintenance (including storage) and the requirement to use CE marked equipment.

The Control of Noise at Work Regulations 2005 (Noise Regulations):

The main requirements are to eliminate the risks from exposure to noise or, if this is not reasonably practicable, to reduce the risks to as low as reasonably practicable (ALARP); and when required, provide:

- suitable hearing protection and ensure their correct use;
- suitable and sufficient information, instruction and training;
- suitable health surveillance.

Control of Vibration at Work Regulations 2005 (Vibration Regulations):

The main requirements are to eliminate the risks from exposure to vibration or if this is not reasonably practicable to reduce the risks to ALARP; and when required, provide:

- suitable and sufficient information, instruction and training;
- suitable health surveillance.

COSHH (Control of Substances Hazardous to Health) is the regulation that requires employers to control substances that are hazardous to health. You can prevent or reduce workers exposure to hazardous substances by:

- finding out what the health hazards are;
- deciding how to prevent harm to health (risk assessment);
- providing control measures to reduce harm to health;
- making sure they are used;
- keeping all control measures in good working order;
- providing information, instruction and training for employees and others;
- providing monitoring and health surveillance in appropriate cases;
- planning for emergencies.



Strategies

Eliminating or significantly reducing risks

The key preventative measure in controlling the risk associated with cleaning activities, is to eliminate or reduce the need to enter the mixer in the first place. A range of strategies are being employed in the industry to achieve this.

Automatic Wash Systems:

High pressure water from spray heads clean all areas of the mixer with the pan lid in position. Sites using this system report that, as well as avoiding the dangers associated with entering the mixer, their automatic wash system is also far less time-consuming – taking 15 minutes, rather than one hour. Servicing is also required less frequently and the life of the wear plates has doubled.



Jetwash System



Wash Head

Various automatic wash systems are on the market and whilst every wash system leaves some material behind; certain systems have been found to perform better than others. Performance of wash systems can be enhanced by providing operatives with water lances with a range of fittings to reach the material left behind.

Reducing the need for entry also creates a better working environment and makes the job easier, a particular concern given the ageing workforce. Consideration should therefore be given to installing effective automatic wash systems and a high-pressure hand-held water lance, if practicable. This not only eliminates or significantly reduces the need for entering the mixer and the safety risks associated with it, but also the health risks arising from the use of power tools to clean out the built-up concrete.



Pneumatic Wash Down System



An ultra-high pressure, ergonomically designed, pneumatic lance has been designed that is in use at a semi-dry process factory. The system can operate at up to 55,000 PSI of air flow and, the jet of air and vapour is powerful enough to remove the cured concrete from the internal mixer drum.



The system allows the cleaning operative, who is positioned outside the drum, to hold and manoeuvre the lance easily, enabling them to remove all the internal debris. It only feeds up to four litres of atomised water a minute through the high-pressure lance, which means that there is a minimal amount of slurry to dispose of, without requiring

additional plant and equipment. The equipment is portable and is used for other cleaning jobs on the site – productivity has improved with the reduction in cleaning time and the pay back is under two years.

The system won an award at the MPA HS Awards and can be seen on video at https://www.youtube.com/watch?v=M50_5qUm5Fc

Tools:

In addition to water lances etc, other tools can be selected that eliminate or reduce the need for access into the mixer.



This photo demonstrates a tool designed by a maintenance team that is used for turning the mixer arms. "The benefit is that this is done external to the mixer, so negates the need of a person entering to push the arms around".

Batching Water:

Consider whether the batching water could be aimed into the mixer at high pressure to provide a crude wash type function; and follow the principle of water first, then materials.

Attitude & Culture:

Keep the pan mixer clean and set clear and appropriate standards. Site standards vary and individual attitude varies. One solution is to display a photograph of what the acceptable level of cleanliness is and to ensure that employees sign

- at the start of the shift, that the plant is in a clean condition.
- at the end of the shift that the plant has been left in a clean condition.

Instructions and supervision:

Provide clear instructions on when to use the system to clean the pan, for example when the next batch is two hours later, to avoid residual concrete hardening in the mixer. Supervision should be provided at an adequate level to ensure instructions and procedures are followed.

Maintenance:

Pan mixers should be maintained in good working order. The arms of the paddles should be set so that they just touch the floor or side wall to reduce the build-up. The tips at the end of the mixing arms receive the most wear and should be replaced when worn. Maintenance of automatic wash systems is also essential to ensure good performance.

Release Agents:

Mixed reports have been received on the performance of release agents, although they have been successfully used as a part of a range of measures to reduce build up. However, where there are suitable coating materials and/or agents to smooth the surface and reduce concrete sticking, their use should be considered to reduce the build-up of concrete in the pan mixer.

Coatings:

Have been trialled that resist the build-up of hardened concrete; however, it has been found that the abrasive environment always removes the coating. Plant is currently being trialled that uses ceramic /glass systems.

Recommendations

- Review risk assessments with the aim of removing/reducing the need for entry to pan mixers for cleaning purposes.
- Where practicable, install automatic wash systems and a high-pressure hand-held lance.
- Include automatic wash systems in the 'planned preventative maintenance scheme'.

Recommendations**Undertake a PUWER assessment and ensure that the mixer is;**

- suitable for the intended use.
- safe for use, maintained in a safe condition and inspected to ensure it is correctly installed and does not subsequently deteriorate.
- installed with an effective automatic wash system, if practicable, to eliminate or significantly reduce the requirement to enter the mixer.
- used only by people who have received adequate information, instruction and training.
- accompanied by suitable health and safety measures, such as guards, protective devices and controls. These will normally include emergency stop devices, adequate means of isolation and lock off from sources of energy, clearly visible markings and warning devices.
- see PUWER Approved Code of Practice and guidance.

Guarding;

- the mixer lid should be provided with a suitable electrically interlocked device to prevent the cover being opened unless the electrical power is disconnected and the dangerous parts have come to rest.
- any inspection hatches or openings should be provided with secondary grids to prevent contact with moving paddles.
- a guard with a hinged mesh access cover should be provided to the mixer discharge.

Isolation;

- prior to mixer entry (involving the risk of part or whole-body access) all power to the mixer e.g. the main mixer motor drive and any other power sources e.g. (hydraulic or pneumatic) driving the discharge door should be isolated and locked off. A trapped key system may provide both the interlocking, isolation and lock off function.
- consider all forms of stored energy (e.g. pressure in a hydraulic accumulator should also be discharged).
- Note that emergency stops are NOT isolation devices.

Access/Egress;

- consider whether specific tools could eliminate or reduce the need for access into the mixer (e.g. high-pressure hand-held water lance or mixer arm turner).
- ensure good access/egress to the mixer: and have a rescue plan for the recovery of injured parties.
- periodically inspect the structure supporting and providing access to the pan mixer - **an incident occurred where the platform around the mixer failed due to corrosion.**

Controlling Safety Risks

Guarding/ Isolation

Wherever possible, you should eliminate or significantly reduce the need to enter the mixer for cleaning purposes, for example by employing an effective automatic wash system and a high pressure hand-held lance.

There have been a number of deaths and serious injuries, where the mixer has been set in motion whilst an operator has been inside:

“During routine cleaning a labourer was killed within a pan mixer. He was crushed by the arm of rotating paddles which had started whilst he was scraping concrete from the components at the end of the day’s shift. It is known therefore that the procedure for locking off was not followed and there was another person at the control panel jogging with a star delta starter. Doing so to make it easier for the cleaner to complete his job. The mixer covers’ interlocks were so connected as to allow them to be open whilst power could be applied. It is believed this work around was custom and practice.”

Lid:

A hinged lid(s) fitted to the top of the mixer is preferred to an open top mixer within a guarded enclosure or compartment. When open, the lid(s) should give as much access to the inside of the mixer as possible and be positively and safely secured to prevent their inadvertent descent (see also 5.2).

Pan mixer interlock system:

The lid or gate giving access to the mixer should be electrically interlocked with the main mixer motor drive and with the power source (hydraulic or pneumatic) driving the discharge door.

The dangers presented by pan mixers require high-risk electrical interlocking i.e. power interlocking or its equivalent.

- Where the discharge door is pneumatically operated, a valve should be fitted in the air supply and included in the interlocking system to ensure that the air is isolated and the actuating cylinder exhausted to atmosphere before access can be gained into the mixer pan.
- Where the actuating mechanism of the sliding discharge door is hydraulically operated, the isolator to the motor of the hydraulic pump should also be included in the interlocking system. A single electric isolating switch may be provided for both mixer and pump drive motors. (If the hydraulic supply system includes a hydraulic accumulator, the stored energy within the accumulator must also be discharged e.g. via a dump valve).
- Direct mechanical control can be achieved by use of a trapped key system; and the mixer motor drive isolating switch should be as close as practicable to the mixer lid.

BS EN 12151: 2007 Machinery and plants for the preparation of concrete and mortar - Safety requirements

Enclosures which can be opened and where the risk of crushing or shearing is given shall be fitted with an interlocking device which automatically stops any hazardous movement of components inside the enclosure before the enclosure is accessible. The interlocking device shall meet the requirements of EN 1088:1995, 4.1.2.

Where once a day or more often access is needed via tool-operated openings, power-interlocking systems shall be required in any case, according to EN 1088:1995.

The danger of relying solely on LOTOTO for daily cleaning activities is that its' proper use is totally dependent on the user - frequency of use, complexity, practicality, lack of supervision are all factors in determining whether a 'shortcut' will be taken. However, full isolation and lock off of the mixer should be undertaken when working on the mixer. If more than one person is involved, the use of multi-hasps isolation locks where each person has their own lock (or key for a trapped key system) should be provided.

Any inspection hatches should be provided with secondary grids to prevent contact with moving paddles. (EN ISO 13857: 2008 provides standards for the size of opening and reach distances).

Where the inertia of the mixer paddles produces dangerous residual motion or overrun after the power has been disconnected, guard locking devices should be employed to ensure that the guards cannot be opened until such dangerous motion has ceased.

Procedures should ensure that everyone is out of the mixer before power is restored and machinery restarted.

Pan mixer discharge guarding:

A guard manufactured from sheet metal with a hinged mesh access cover should be provided to prevent access to moving parts of the mixer at the discharge point. The hinged mesh top cover should be secured and require a tool for it to be opened. If frequent access is required to this area, it should be electrically interlocked.

Other:

Depending on configuration, the following (and others identified by the risk assessment) may need to be included in the isolation system: material feed conveyors/screw conveyors, weigh hoppers, admixture systems, automatic washer cleaning heads and changes in centre of gravity (caused by the removal of hardened concrete which might cause movement of unrestrained machinery).

Controlling Safety Risks

Mixer Lid

Lids are heavy and if not appropriately restrained during inspection or cleaning activities, they present an entrapment/falling object hazard.

Operatives have been struck on the head or back, when the lid has fallen. This has been caused by a failure of the lifting system (e.g. a shackle has come loose through vibration or the lifting rope has snapped) and a failure to use the secondary retaining device (e.g. prop or safety chain).

Site rules/procedures should include clear instructions on lifting and securing mixer lids and also the use of safety/restraining devices. Employees should be suitably trained and be aware of the requirement to use the restraining equipment, such as safety chains/struts, whilst lids are in the raised position. This requirement should be enforced for example by checks/inspections/supervision etc.



This photo demonstrates the fitting of a new prop device to the lid and a 'cup' to the mixer wall. The prop device falls automatically into the cup as the door is lowered, preventing any further downward movement. This eliminates the possibility of the door dropping due to a failure of the winch mechanism and enables the task to be carried out by a single operator.



If space allows, and control measures are put in place to stop it from hitting anyone, a counterbalance could be fitted to the pan lid. This would remove the risk posed by the weight of the falling lid and also make it easier to raise the lid in the first place.

Recommendations

- Consider whether there is a better/easier means of raising the lid.
- Consider automating the support prop position, as the lid lifts.
- Ensure that lifting equipment is suitable for the task (e.g. meets the Safe Working Load legal requirements).
- Where the lid is raised by means of a chain, then a secondary means of restraint should be fitted and used.
- Lifting equipment must be subject to formal examination by competent persons in accordance with the Lifting Operations and Lifting Equipment Regulations.
- Safety chains or struts, used to secure lids in the open position, should also be subject to formal examination.
- Shackles should be fitted with locking pins or locking nuts.
- There should be clear rules and procedures on lifting and securing mixer lids, and operatives should be trained in their use, including pre-use inspections.

Controlling Safety Risks

Chute

Pan Mixers are often mounted at height and chutes can be difficult to access. However, with thought, it may be possible to provide safer access.

Control measures need to be put in place to control any work from height risk and any gates/chutes etc should fail to safe (e.g. so that if pressure is lost, a gap does not open that somebody could fall through), additionally the discharge/mixer would need to be appropriately isolated and locked off.



In the photograph, a modification has been carried out to enable the chute to be lowered using a winch and bearings attached to the frame. The operator now releases the frame by unscrewing two securing nuts and then presses a button to lower the chute to ground level for cleaning or maintenance.



In this photograph, a working platform has been fitted inside the chute to allow access for an employee to stand and work. This facilitates the cleaning of the underside of the discharge area (below a chute under the pan mixer). A task that was uncomfortable, claustrophobic and potentially dangerous, can now be undertaken with relative ease.



Non-stick surfaces such as Hawiflex® are being used for lining cones/chutes to reduce the frequency of cleaning.

Recommendations

Consider;

- How chute cleaning frequency might be reduced.
- Whether better access to the chute could be provided.

Controlling Safety Risks

Cleared Material

Measures should be put in place to control the risk from falling material beneath the pan mixer during cleaning activities and also to reduce the risk of slips, trips and falls from cleared materials; for example, by excluding personnel from the area below the pan mixer and ensuring rapid clear up.



The photograph illustrates an automated retractable mixer wash-out chute. The chute enables the mixer washed-out material to be fed directly into an above ground wash-out bay. Previously the mixer wash-out had dropped onto the floor.



Where it is impractical to fit an automatic washout chute, an alternative would be to park a loading shovel underneath to catch the washed-out material.

Recommendations

- Control risk posed by falling materials.
- Facilitate the rapid clear up of waste materials.

Controlling Safety Risks

Whip arrestors

Whip arrestors should be fitted where appropriate, such as on the couplings of a high pressure washing system.

Recommendations

- Fit whip arrestors

Controlling Occupational Health Risks

Health Risks

Alkali Burns

Eye contact with cement (dry or wet) may cause serious and potentially irreversible injuries. Prolonged skin contact with wet cement or wet concrete may cause serious burns because they develop without pain being felt.

A plant supervisor, who was cleaning out concrete build up from a pan mixer, suffered a first-degree chemical burn to his lower back. In the restricted space of the mixer, he had not realised his waterproofs had become torn.

Dermatitis

Cement may have an irritating effect on moist skin (due to sweat or humidity) after prolonged contact or may cause contact dermatitis after repeated contact. A reducing agent is added to lower the hexavalent chromium content to reduce the risk of contact dermatitis – this ingredient is only effective for the stated shelf life.

Noise, Vibration and Dust

Concrete in the pan mixer starts to set in about two hours. If the mixer is not cleaned sufficiently before the concrete hardens, it will need to be cleaned out periodically. This is often performed by hand-held power tools such as chipping hammers, which expose operators to noise and hand-arm vibration (HAV) at excessive levels and also to RCS and inhalable dust. Excessive and regular exposure to HAV can lead to permanent ill-health known as hand-arm vibration syndrome (HAVS). HAVS at its advanced stage is disabling.

Noise levels generated by chipping hammers inside the pan mixer could be more than 100 dB(A). 15 minutes of using a chipping hammer inside the pan mixer could result in the worker's daily exposure being at or above the upper exposure action value of 85 dB(A) LEP,d. Excessive exposure to noise can lead to permanent hearing damage and could cause disability.

In-use vibration magnitudes for chipping hammers used in the stone, concrete and quarries sectors gathered for HSE, show the range from 11 m/s² (10th percentile) to 22 m/s² (90th percentile) with a recommended initial value for risk assessment of 20 m/s² (75th percentile). Typical use of a chipping hammer for more than ten minutes is likely to result in a HAV exposure above the exposure action value (EAV) of 2.5m/s² A(8). Use for more than thirty minutes is likely to result in a HAV exposure above the exposure limit value (ELV) of 5m/s² A(8). The ELV must not be exceeded.

A number of workers in ready mix depots and manufacturers producing concrete products, who use chipping hammers to clean out the pan mixers, have been diagnosed with HAVS - enforcement action has been taken against companies where the risks from exposure to HAV have not adequately managed.

The dust produced while cutting, drilling etc dried concrete and mortar can cause serious lung disease, such as, Chronic Obstructive Pulmonary Disease (COPD) and silicosis. The Health and Safety Executive research found no exposure data for dust and respirable crystalline silica (RCS) for concrete mixer cleaning, but based on published data for the task of chipping concrete using multiple tools in construction, there is likely to be significant dust exposure and RCS exposure will be above the workplace exposure limit (WEL). Long-term high exposure to dust containing respirable crystalline silica (RCS) is known to cause silicosis and cancer.

Controlling Occupational Health Risks

Controls

Eliminate the health risks from using power tools by considering the elimination methods described in the Strategies section. If cleaning using hand-held power tools is unavoidable, consider whether a quieter technique or tools could be used. Provide good quality hearing protection and ensure that it is in good order and used correctly. Select the lowest vibration tool that is suitable and can do the job efficiently.

Ensure tools are used in accordance with manufacturer's instructions, maintained in good condition and are included in an inspection programme. Where the risks are low, the actions taken may be simple and inexpensive, but where the risks are high, i.e. exposures are likely to be above the upper exposure action value for noise or the exposure action value for HAV, they should be managed using a prioritised noise/vibration-control action plan and workers exposed should be provided with suitable health surveillance.

Any exposure to dust/respirable crystalline silica e.g. from breaking hardened concrete or from raw materials should be included in the site's COSHH risk assessment: and appropriate controls/Safe Systems of Work put in place. For further information see the MPA Safer by Association Dust audit.

Recommendations**Alkali Burns & Dermatitis;**

- Consider cement burns and dermatitis during COSHH risk assessments and the development of safe systems of work.
- Provide adequate PPE to protect against cement burns and dermatitis - ensure that it is well maintained.
- Train personnel in the risk of chemical/cementitious burns/dermatitis and the precautions that must be applied.
- Ensure that pre-use checks of PPE are undertaken.
- Include dermatitis in health surveillance (mentioned below).

Noise, Dust and Vibration;

- Assess the risks to your employees from noise, vibration and dust;
- Take action to eliminate or significantly reduce the noise, vibration and dust exposure that produces those risks e.g. by introducing automatic wash systems;
- Maintain the mixer and the wash systems in good condition;
- Consider using surface coatings to prevent concrete from sticking if they are suitable for your operations;
- Provide your employees with hearing protection if you cannot reduce the noise exposure enough by using other methods;
- Make sure the legal limits on noise and vibration exposure are not exceeded; and take appropriate action if the exposure action values are exceeded;
- Any exposure to dust/respirable crystalline silica should be included in the site's COSHH risk assessment: and appropriate controls/Safe Systems of Work put in place.
- Provide your employees with information, instruction and training on health risks and the actions you are taking to control those risks;
- Carry out health surveillance where there is a risk to health.
- Consult with employees on your proposals to control risk and to provide health surveillance.
- Keep a record of your risk assessment and control actions;
- Keep health records for employees under health surveillance;
- Review and update your risk assessment regularly; and if anything changes that is likely to change exposure levels.

Personal Protective Equipment;

- Ensure that PPE is properly assessed before use to make sure it is fit for purpose (including Face Fit Testing);
- Involve employees in the assessment and selection of PPE; choose equipment that suits the wearer.
- Ensure that all items of PPE are compatible with each other.
- Ask your supplier for advice on the types of PPE available.
- Choose good quality products which are CE marked in accordance with the PPE Regulations 2002 and meet any other relevant standards.
- Look after PPE; make provision for its storage and ensure that it is in good condition, for example by regular inspections.
- Provide signage to notify of specific PPE requirements.
- Ensure that PPE is readily available and that employees receive training and instructions on its use (including any necessary pre-use checks).
- Ensure that employees sign for any PPE and training that's been received.
- Provide appropriate levels of supervision/inspection to ensure that the PPE provided is being used correctly by employees.
- Keep records of the above.

Respiratory Protection

- Where respiratory protection is used, it must be face fit tested to ensure that it is suitable for the wearer. (Tight fitting respirators need to have a good face seal in order to prevent dust leaking into the respirator and then being breathed in by the wearer. Facial hair will prevent a tight fitting respirator from achieving a good seal and therefore would not be effective protection from the hazardous dust in the air. In these circumstances a tight fitting respirator would not be suitable and an alternative respirator with a loose fitting head top, such as a hood with an integral powered respirator would be appropriate).
- Respirators should have a minimum protection factor (APF) of 20, for example a respirator with a P3 filter.
- Disposable respirators and powered respirators are not suitable if there is a risk of oxygen deficiency in the air e.g. when working in a confined space.

References

ISO Standards

BS EN ISO 12100:2010 Safety of machinery. General principles for design. Risk assessment and risk reduction

BS EN 12151:2007 Machinery and plants for the preparation of concrete and mortar – Safety requirements

EN ISO 14119:2013 Safety of machinery — Interlocking devices associated with guards — Principles for design and selection. (It supersedes BS EN 1088:1995+A2:2008 which is withdrawn).

ISO 13850:2008 (EN 418) Emergency Stop devices, functional aspects— Principles for design. Provides design principles and requirements and additionally with the requirements of EN 60204-1:2006.

Legislation

The Management of Health and Safety at Work Regulations 1999 [http:// www.legislation.gov.uk/ukxi/1999/3242/contents/made](http://www.legislation.gov.uk/ukxi/1999/3242/contents/made)

PUWER ACOP: <http://www.hse.gov.uk/pubns/priced/l22.pdf>

Health and Safety Signs (Signals) Regulations <http://www.hse.gov.uk/pubns/books/l64.htm>

Control of Noise at Work Regulations 2005. Controlling noise at work. Guidance on Regulations <http://www.hse.gov.uk/pubns/priced/l108.pdf>

Control of Vibration at Work Regulations 2005. Hand-arm vibration. Guidance on Regulations <http://www.hse.gov.uk/pubns/priced/l140.pdf>

Control of Substances Hazardous to Health (COSHH) Regulations 2002. Approved Code of Practice and Guidance: <http://www.hse.gov.uk/pubns/books/l5.htm>

Safe Work in Confined Spaces. Confined Spaces Regulations 1997: <http://www.hse.gov.uk/pubns/priced/l101.pdf>

Guidance

Managing Health and Safety <http://www.hse.gov.uk/pubns/books/hsg65.htm>

Work equipment and machinery <http://www.hse.gov.uk/work-equipment-machinery/user.htm>

Guarding of Machinery (Guidance from the Quarry Products Association): <http://www.safequarry.com/hotTopics/QPA%20Guarding%20FINAL%20Aug05.pdf>

MPA Isolation Handbook https://mineralproducts.org/documents/MPA_Guide_to_Energy_Isolation_and_LOTOTO_Handbook.pdf

Appendix 1:

Example of a Safe System of Work: Mixer Cleaning (End of Day)

Please note that this is one company's view of what constitutes a safe system of work on a particular site with particular circumstances. It is offered up as an example of the sort of issues that might be considered when drafting a safe system of work.

1. Area Supervisor or his nominated delegate to be in attendance to issue the permit to work (worksafe sheet to be completed first to assist you).
2. Ideally at least one competent person in attendance with telephone, who's aware of the site emergency procedures and contact numbers. This person must be outside of the confined space being worked on at all times.

If there is no second person on site then the plant supervisor must contact his line manager before entering the mixer and also when out of the mixer.

If not able to communicate with line manager then access is not allowed.

Preferable this procedure should be completed in daylight hours, if not ensure plant flood lights are on, additional 110-volt lighting should also be used if necessary. Access into the mixer can only be allowed in dry weather conditions.

Access is only allowed for the cleaning of the mixer using the pressure lance and knocking off the build up from the mixer arms using a sledge hammer (Under no circumstances can a pneumatic gun be used).

Name: Dave Bloggs Mobile No: 00000 000000

3. All personnel to wear correct PPE.
 - a) Safety helmet
 - b) Overalls including waterproof over trousers
 - c) Safety footwear
 - d) Gloves (Red Fully coated knitwrist PVC Glove)
 - e) Ear Defenders (3M Peltor 2)
 - f) Full enclosed safety goggles to be used
 - g) Dust mask (FFP3)
- 4) Before entering the mixer ensure that it has been thoroughly washed out using the mixer wash system.



- 5) Turn the main electrical isolation switch off which is located in the batch cabin, this should now be secured using a Hasp Lockout system with a Padlock for each individual working on the mixer. Keep the key to the padlock on your person at all times. This will allow you to release the Castell key.



6. Test the controls on the 'x' system Batch Belt, Mixer Start, cement weigh hopper / discharge screw, water & admixture to ensure none are still operational and place the Man in Mixer Sign on the keyboard/screen.



7. Press the emergency stop button on the 'x' Control System.



8. Finally open the mixer lid by exchanging Castell keys located on the mixer rim.



9) Once the mixer lid has been winched back to a vertical position then the safety chain must be attached on a separate clip point to the winch cable.

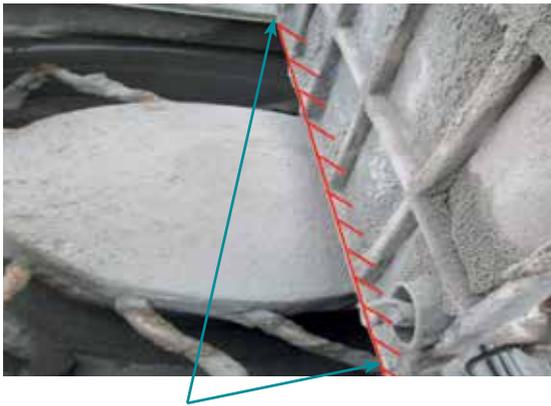
10. The line supervisor must now be contacted before entering the mixer.
Name: Dave Bloggs Mobile No: 00000 000000

11. A visual inspection of the access ladder must be completed to check for signs of damage. If there is damage to the ladder the procedure must be aborted until repaired. The access ladder can now be lowered into place.

12. Before entering the mixer, you must visually inspect both the pressure lance and sledge hammer for signs of damage (abort if damaged) then lower into the mixer. This will then enable you to keep 3 points of contact whilst accessing the mixer.



- Once you have entered the mixer you must never go further than the mixer lid split half point (as seen below).



Under no circumstances must you go further than this point whilst cleaning the mixer.

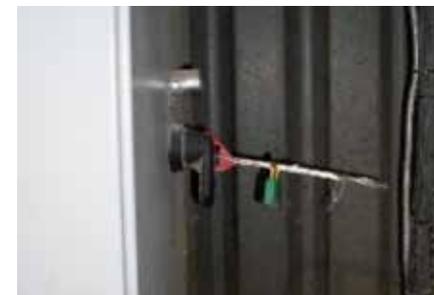
- You may now commence to clean the mixer for a duration not exceeding 15 minutes without contacting your line manager. If contact has not been received then the supervisor will make a return call.
- Before exiting the mixer, ensure all equipment has been removed from the mixer.
- Once the mixer cleaning has been completed and vacated with the steps removed, you must contact your line manager again to advise that you have exited the mixer.
- Once all the work has been completed, reverse the sequence, finally pressing the re-set on the 'x' Control System.

Appendix 2: Example of a Safe System of Work: Mixer Cleaning

Please note this is one company's view of what constitutes a safe system of work on a particular site with particular circumstances. It is offered up as an example of the sort of issues that might be considered when drafting a safe system of work.

Isolation:

- Area Supervisor or his nominated delegate to be in attendance to issue the Permit to Work (worksafe sheet to be completed first to assist you).
- Adhere to "Entries into Confined Spaces" Procedure (Copy located in ...)
- At least one trained person in attendance with telephone, who's aware of the site emergency procedures and contact numbers. This person must be outside of the confined space being worked on at all times.
- All personnel to wear correct PPE.
 - Safety helmet
 - Overalls
 - Safety footwear
 - Gloves
 - Ear plugs / ear muffs
 - Eye protection
 - Dust mask FFP3



- Firstly, the mixer isolation switch must be thrown to the off position, this should now be secured using a Hasp Lockout system with a Padlock for each individual working on the mixer. Keep the key to the padlock on your person at all times.



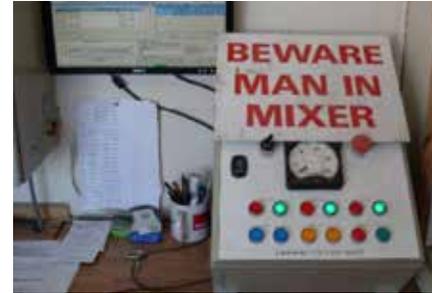
6. The authorised person will remove the castell key from the main control panel inside the Mixer room. This isolates the mixer motors, hydraulics, batch conveyor, water and admixture dispenser.



Test the controls on the 'x' system Batch Belt, Mixer Start, Mixer lift function, aggregate/ cement weigh hopper, water & admixture to ensure none are still operational.



7. Press the emergency stop button on the 'x' Control System.



8. Place the Man in Mixer sign on the Mixer Control Panel.



9. Exchange the Castell key in the door lock to gain access to the mixer room, keep exchange Castell key in a safe place on your person.

Once all the cleaning has been completed reverse the sequence, finally pressing the re-set on the 'x' Control System).

Cleaning:

1. Area Supervisor or his nominated delegate to be in attendance to issue the permit to work (worksafe sheet to be completed first to assist you).
2. Follow SSOW 7 (Isolation) and SSOW 8 (Mixer Entry).
3. At least one trained person in attendance with telephone, who's aware of the site emergency procedures and contact numbers. This person must be outside of the confined space being worked on at all times.
4. Cordon off area below mixer discharge chute.
5. Once the mixer has been isolated use a board to cover the discharge bowl thus preventing falling from height, areas either side of the mixer should have boards / grills placed over to prevent falling from height.
6. To allow ease of access to the mixer some side guards can be removed but barriers must be located into position to prevent falling from height. This will allow for emergency access/egress if the need arises. This route can also be used for cables and the passing of equipment.
7. Ensure the mixer unit cannot move by inserting steel sliders into the mixer cog system either side of the drum.
8. If possible remove mixer cone before entering the mixer, this must be completed by a competent fitter via pulley system.
9. Nose cone bolts must either be removed by tools or cut off if seized.
10. If nose cone cannot be removed due to build up access can only be allowed to remove sufficient material to allow cone to be removed. Persons entering the mixer during this process must wear a body harness to allow emergency retrieval.
11. Once nose cone has been removed the mixer can now be entered via the board covering the discharge cone. Caution must be taken during access and egress due to height differences of the floor.
12. Ensure adequate 110-volt light is used to illuminate the working area.
13. All persons entering the mixer using vibration tools must undertake Toolbox talk HS 27 Hand Arm Vibration. All persons using vibration equipment must ensure they keep warm, take regular breaks, keep hydrated and follow maximum trigger times allowed.
14. When gunning out the mixer from inside do not gun above waist height.
15. All personnel to wear correct PPE.
 - a) Safety helmet
 - b) Overalls
 - c) Safety footwear
 - d) Gloves (Anti Vibration)
 - e) Ear plugs / ear muffs
 - f) Eye protection
 - g) Dust mask FFP3
16. After a period of time the accumulated gunned out material must be removed from the mixer to allow sure footing. The area below the mixer room must be locked and cleared of all person during the mixer tipping process as the accumulated material will fall to the ground below. Ensure all guards are back into position and isolation process reversed before completing this task.

Please ensure that you report all accidents or incidents.

If you see anything on your sites or customer sites that you think is unsafe, it is okay to Stop and Report it as a Near Miss.

Compliance with any guidance set out in this document does not absolve the user from their legal duties under the Health and Safety at Work etc Act 1974 to form their own site-specific assessment of their workplaces and operations and to provide accordingly for such matters.



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