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Mineral Products Association

Safer by Design

Bridge Saw Guarding

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Contents

Foreword

The law and requirements relating to risk assessment are well known, and one of the most important applications is that relating to machinery safety.

All workplaces have machinery, and moving machinery can cause injuries in many ways which the risk assessment must identify and prevent. The HSE currently serve more Prohibition and Improvement notices and successful prosecutions due to poor guarding standards of machinery than any other legal contravention.

This guidance focuses on the need to complete a thorough risk assessment covering all aspects of the machine and its use. The risk assessment process for machinery will need to consider a wide range of hazards and also relate to a range of standards and legal requirements. One of the key aspects of machinery is to consider the danger of moving parts and to guard these dangerous parts.

So what should be the methodology for risk assessment of machinery? What standards and legal requirements are relevant? What should be the approach for guarding machinery?

The guidance within only offers an opinion on the current available control measures used in other parts of the industry to guard against the physical hazards associated with the moving parts of the machine. Through the risk assessment process it will be the responsibility of the company to select the appropriate guarding specific to their operation whilst considering the hierarchy of control found Regulation 11 (2) of the Provision and Use of Work Equipment Regulations (PUWER) and referenced in section 18 of this document.

While the focus of this document is on Bridge Saws, the same principles can be applied to other machinery used for working natural and reconstituted architectural stone such as edge polishers and milling machines.

It is also worthy of note that whilst this document focuses on the control of the mechanical hazards, the risk assessment should also include the identification and control of the non-mechanical hazards such as dust and noise.

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Legal background

Regulation 3 of the Management of Health and Safety at Work Regulations 1999 (MHSWR) requires employers to perform risk assessments relating to their work activities; this extends to the use of machinery.

Nearly all equipment used at work is subject to the Provision and Use of Work Equipment Regulations 1998 (PUWER), which place duties on employers, the self-employed, and those who control work equipment

THE RISK ASSESSMENT PROCESS

The principles of risk assessment for the use of machinery are no different from any other work activity being assessed. The Health and Safety Executive's Five Steps to Risk Assessment can be used as a simple, but effective, methodology for machinery risk assessment. The five steps are as follows.

1. **Identify** the hazards
2. **Decide** who might be harmed and how
3. **Evaluate** the risks and decide on precautions
4. **Record** your findings and implement them
5. **Review** your assessment and update if necessary

At step 1, it is important to carefully examine the broad range of hazards that might be present.

For machinery, these may include:

- electrical hazards
- noise and vibration
- mechanical hazards, such as those presented by moving parts of machinery
- temperature (ambient and that of the machinery)
- manual handling
- ergonomic considerations
- risk of falls from work at height
- slip and trip hazards
- health hazards from associated use of chemicals, such as oils and cutting fluids and those that are created by the process e.g. dust (respirable crystalline silica)
- possible biological hazards associated with the use of the machinery, such as bacteria and viruses
- confined spaces hazards

During the risk assessment, it is absolutely critical to not only consider the routine use of the machinery, but also non-standard situations; for example maintenance, breakdowns and dealing with seizures, breakages or blockages. It is often in such circumstances that accidents occur.

When considering control measures to deal with the risks presented by the machinery, it should be noted that Schedule 1 of MHSWR requires a hierarchy of control measures to be applied. This means, in practice, that effort must be applied to the elimination of risks before considering other approaches. It also means that physical means of protection must be given preference over procedural measures, such as safe systems of work (including permits to work). Of course, in practice, the control measures may be a combination of measures mentioned below.

A flow diagram of the correct process can be found in Appendix 1.

It is noted that under PUWER regulation 11(3), consideration is given to the construction and use of guards and other protective devices. Specifically, Reg.11(3)d specifies that the selection of guarding or devices should not give rise to any increased risk to health or safety, so the correct selection of guarding or devices needs to be considered to ensure safety is consistent across all parts of the production process.

Introduction

1. Bridge saws are used to cut natural and artificial/reconstituted stone. The machine normally consists of a circular saw blade suspended within a carriage from an overhead beam.

2. In recent years accidents have been rare, but the potential for a serious or fatal accident is significant, especially where operators are able to come into contact with the moving parts of the machine. Unfortunately, many bridge saws have variable standards of guarding and, in some circumstances, there is no guarding at all. *See Fig 1a and 8a.*

KEY FEATURES OF BRIDGES SAWS

3. This beam runs along a rail on the top of two supporting walls, one each side. Cutting occurs in either a single direction only, in the x and y direction and/or at an angle. The saw can cut in either a single direction or in both directions and the saw head traverses in the non-cutting direction. *See Fig 1a.*

   Water is sprayed onto the blades to reduce friction whilst cutting and aid cooling. This type of saw gives accurate cutting, a high quality cutting finish and faster cutting. *See Fig 2b.*

Fig 1a: Typical bridge saws used for cutting stone

Fig 1b: Typical bridge saws used for cutting stone

Fig 2a: Bridge saw partly protected by the framework

Fig 2b: Operator position on mezzanine

4. The type of blade and speed of cut will vary depending upon the type of stone being cut. Cutting granite (abrading action with small diamonds) and sandstone (gouging with larger diamonds) will produce very different results. *See Fig 3b.*

Fig 2b: Water ejected when the saw is cutting the stone block

5. Saw blades are generally 0.5 to 3.5 metres in diameter with guards covering the top half of the blade only. Operating speeds are typically 26-28m/s or 740rpm for a 700mm diameter saw. *See Fig 3a and 3b.*

Fig 2d: 2500mm diameter bridge saw block

6. The rundown times to vary from 5 secs for a 700mm diameter saw to 240 seconds (4 minutes) for a 2500mm diameter saw.

7. The saw blades are diamond embedded blocks they do not have the same ripping action as wood saws but instead use an abrasive method of cutting.

Fig 3a: Blade of cutting saw

Fig 3b: Blade of cutting saw

Fig 3c: E-stop wire

RISKS TO SAFETY FROM BRIDGE SAWS

8. The most significant safety risk is from direct contact with the saw blade whilst it is moving, but incidents have occurred where operators have been injured by the moving bed. Access to the bridge saw is foreseeable and should be prevented so far as is reasonably practicable. Unfortunately many saws have little or no safeguarding.

   Other areas of concern relate to the risks during maintenance operations including blade changes, which should be covered separately and include robust isolation procedures.

9. Access is typically required to the bridge saw:

   - To put the stone onto the table (either manually or with mechanical assistance)
   - To align the blade with the stone (usually, though not always, when the saw is stationary);
   - To observe the cutting process, investigate unusual sounds and check for damaged corners or hidden irregularities in the stone;
   - To remove the cut stone;
   - To clean the worktable and remove off-cuts;
   - To undertake maintenance;
   - To retrieve a broken fragment of stone.

10. Reducing the need for the operator to be near the saw during operation reduces the risk of injury from contact with machinery.

11. In order to reduce the operator's need to access the hazardous zone, laser markers can assist with alignment and cut position. *See Fig 4.*

12. Consideration should be given to the positioning of the laser on machines to avoid contact or reflection of the laser beam into people's eyes. It is important that the correct class of laser is used.

13. It is recommended that only Class 2 lasers are used with a limited maximum output power of 1 milliwatt or one-thousandth of a watt (abbreviated to mW) and that the beam must have a wavelength between 400 and 700 nm. A person receiving an eye exposure from a Class 2 laser beam, either accidentally or as a result of someone else's deliberate action (misuse) will be protected from injury by their own natural aversion response (Note: laser beams can travel considerable distances).

Fig 4: Laser guide

SAFEGUARDING THE SAW

14. Working close to moving and rotating machinery or where parts may be ejected is inherently unsafe and there is a foreseeable risk of being crushed, cut, entangled or struck. This risk must be managed by undertaking a suitable risk assessment and implementing and enforcing the necessary control measures.

15. There is a risk of a serious or fatal injury from the following mechanical hazards:

- Impact from the moving saw head;
- Entanglement/cutting from the saw blade or where someone could trip and fall onto the blade;
- Crushing by the moving and rotating table or whilst handling the stone;
- Being struck by ejected stone fragments or break up of the saw blade.

16. It is foreseeable that an operator may be in close proximity to the machine. The use of perimeter fences and interlocked gates would prevent inadvertent access and the operator from working in close proximity to the machinery.

17. The saw blades are diamond embedded blocks and while they do not have the same ripping action as wood saws and are water cooled, making approach less likely, the risks are still present. The saws are often left running with the water turned off. *See Fig 3b.*

18. The hierarchy of controls listed in Regulation 11 (2) (of PUWER) are:

- the provision of fixed guards enclosing every dangerous part where and to the extent that it is practicable to do so, but where or to the extent that it is not, then;
- the provision of other guards or protection devices where and to the extent that it is practicable to do so, but where or to the extent that it is not, then;
- the provision of jigs, holders, push-sticks or similar protection appliances used in conjunction with the machinery where and to the extent that it is practicable to do so;
- and the provision of such information, instruction, training and supervision as is necessary.

Fig 5a: Perimeter guarding and interlocking

Fig 5b: Perimeter guarding and interlocking

Fig 5d: Perimeter guarding and interlocking

19. Fixed guards alone might not be feasible as access is required for loading and unloading the stone. The following would all offer a high standard of protection. *See Fig 5c and 5d.*

    - **a perimeter fence and interlocked guards,** such as manually-actuated sliding access gates. The interlocked guard must be fitted with a locking device so that the guard remains closed and locked until any risk of injury from the hazardous machine has passed, to allow for the rundown time of the saw blade.

    - Examples of interlocked perimeter guarding, along with videos can be found in the best practices ares on SafeQuarry.com. *See Fig 5a, 5b and 7a.*

    - **Electro-sensitive protective equipment** e.g. light guards at the front of the enclosure, in conjunction with an **electro braking system** to stop the movement before access to dangerous parts can be reached. Alternatively, the saw head should immediately return to a home position with a local guarding enclosure.

Fig 5e: Perimeter guarding and interlocking

Fig 5c: Perimeter guarding and interlocking

Fig 6 a&b: Use of Light Curtains at the entrance of a perimeter guarded system

- **local retracting guards** around the saw blade and pressure sensitive edges on the saw head and traversing table. This would have to be in conjunction with an electro braking system to ensure fast stopping times of the head and saw blade

20. Robotic and Computer Numerical Control (CNC) workstations require high standards of guarding. It should not be possible to access any of the dangerous parts whilst the machine is in production mode with full enclosure high perimeter type fencing of at least 1.8 m with suitable interlocked access. *See Fig 7a and 7b.*

Fig 7a: Example of CNC Machines

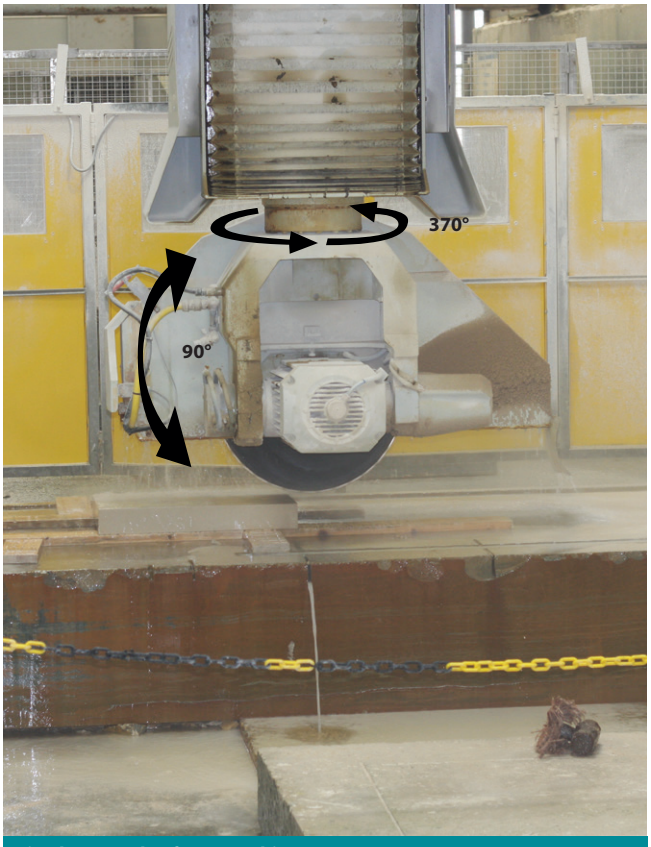


Fig 7b: Example of CNC Machines

21. Where local conditions prohibit the installation of interlocked guards or the equipment is too old for connection to the control system, alternative control measures should be implemented, such as;

    - Preventing access at the rear and sides of the machine by fitting fencing at the rear of the bridge support walls or between these walls and the building;
    - Fitting barriers to prevent inadvertent access from the front;
    - Installing flashing lights and an alarm to sound when the machine is about to start up;
    - Providing hazard markings on the ground to show the swept area of the saw head and bridge.

22. There may be a problem with long rundown times, particularly with the large diameter saw blades. This may be an issue with power consumption when constantly stopping the saw and running it back up to speed, or with durability of the motors due to regular starting and stopping. In such cases, consider a local guarding enclosure constructed at the home position of the saw blade with a limit switch to ensure it returns home before releasing any interlock.

23. Machines should include clear markings showing, for example, the maximum speed, maximum size of stone, cutting speeds for different types of stone, direction of rotation of the cutting wheel (indicated by an arrow on the guard), the maximum diameter of saw blade that can be fitted to the machine and warning decals informing users about any residual risks.

POSITIONING THE MACHINE TO CONTROL RISK

24. The control panel should be outside the swept area of the saw head and there should be clear vision of the work-piece from the control station.

25. The control panel should be positioned away from the spread of spray or mist from the water suppression.

26. Segregate the machine so that dust does not affect employees who may be working in adjacent areas. Partitions or curtain could form part of the perimeter guarding.

27. Where possible, use CCTV to monitor the process and reduce the need for people to approach the saw.

28. Floors should slope gently towards gullies, to help dust removal by wet washing.

Fig 8a: Old bridge saw with controls adjacent to the saw blade

Fig 8b: Cobalm Ideal Bridge Saw [Source: Stone Machinery UK Ltd]

EMERGENCY STOPS/PULL/TRIP WIRES

29. When an emergency stop control is fitted, it should act in priority to any other stop control and should not introduce any additional hazards by its operation. It should be available at all times irrespective of the particular operating mode. It must not impair the effectiveness of safety devices or of devices with safety related functions, or any facilities designed to release trapped persons.

    Emergency stops are intended to effect a rapid response to potentially dangerous situations. They should not be used as a functional stop control or replace normal stop controls.

    The risk assessment should take account of the emergency stop function so that the operator is not required to consider the resultant effects of actuation as part of the operating process. *See Fig 3c.*

    When undertaking a risk assessment, the use of emergency stops should be considered as an integral part of the risk evaluation and precautions stage. They should not be considered as an alternative for other precautions such as preventing access to the hazard.

    However, if those alternative precautions are not adequate to prevent risk under abnormal circumstances, an emergency stop should be considered. The risk assessment may require analysis of the consequences of actuation of the emergency stop function to fully evaluate its effectiveness.

30. Where appropriate, have emergency stop controls within easy reach, particularly on larger machines, so they can be operated quickly in the event of an emergency by the person within the potentially hazardous zone.

31. Ensure that a machine can only be restarted following a stoppage by use of the start control. It should not be possible to restart the machine simply by resetting a device such as an interlock guard or trip bar.

    Note: Before fitting emergency stop controls to machines that have not previously had them, it is essential to check that fitting them will not cause other risks. For example, some machines need the power supply to be on to operate the brakes. This power could be lost if the machine were to be stopped using the emergency stop control.

32. Where emergency DC injection braking is used to reduce speed to the quickest possible safe stop time, consideration needs to be given to prevent mechanical failure.

    Calculations are given in *BS EN 16564:2014 Guarding of Bridge Saws. Machines and plant for mining and tooling of natural stone. Safety. Requirements for bridge type sawing/milling machines, included numerical control (NC/CNC) versions* (page 21).

    We are considering whether the formula given and stop times in the above will cause mechanical failure on larger diameter rotary bridge saws. Further guidance will be given.

INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

33. Operation of bridge saws should be restricted to operatives who have received sufficient training and instruction and who are supervised and authorised by the company.

34. An operator's instruction manual should be available with the machine, along with company safe operating procedures for each specific machine.

35. Formal training courses are available through organisations such as MPQC. For non quarry operations, formal qualifications are not mandatory but are an effective way of ensuring and demonstrating that workers are competent.

36. Training and instruction should not only cover safe operation of the saw but all risks, including the health hazards that operators will be exposed to. Use of risk assessment is a viable tool in this process.

37. Formal safe systems of work should be established and written down if you have more than 5 workers. It should cover as a minimum the critical safety functions associated with setting up, starting, normal use, emergency, handling of the stone, maintenance and cleaning of the bridge saws.

MAINTENANCE, EXAMINATION AND TESTING

38. Minerals and silica-containing dusts are very abrasive. Plan regular maintenance. Follow the instructions in the manual to keep equipment in effective and efficient working order.

39. Adjustment, lubrication, repair, cleaning and servicing should be carried out whilst the machine is shut down. It is good practice to have a schedule showing the type and frequency of inspections (e.g. wear, corrosion, cracks) and replacement intervals.

40. Daily checks of your saw are necessary and could include;

- checking all guards and interlock systems are operating correctly
- checking the water suppression is positioned correctly
- checking the drift elimination baffles for signs of damage
- checking generally for any signs of leaks, wear or damage
- repairing any faulty equipment immediately

HEALTH AND SAFETY IN THE USE OF STONE CUTTING BRIDGE SAWS - FAQS

Do bridge saws pose a safety risk?

Yes. Working close to moving and rotating machinery or where parts may be ejected is inherently unsafe and there is a foreseeable risk of being crushed, cut, entangled or struck. UK health and safety legislation says that this risk must be managed by undertaking a suitable risk assessment and implementing and enforcing the necessary control measures.

HSE is concerned the risk is increasing. Faster, more versatile CNC machines need high standards of guarding maintained. In addition, an increasing number of inexperienced operatives are using bridge saws.

I am about to replace my saw, how should I expect the new saw to be guarded?

The first specific standard for Bridge Saws, BSEN 16564:2014, was published in December 2014. All machines purchased after that time should comply and that should be clear in the documentation. Second-hand machines that have been significantly refurbished may also need to comply.

I have been told my saw is not guarded correctly but I only bought it a few years ago?

Machines already in use should have been supplied to comply with the more general Machinery Directive. They should not need to be upgraded, but HSE frequently comes across machines that either never complied properly or have had safeguards removed. Unless you bought it recently, you may have little chance of redress and it is now your responsibility to guard the saw correctly.

My premises are small and I worry that guards will make loading the stone more difficult?

Loading and unloading the stone can also be a serious danger. Plan how you will load all the different types and sizes of stone you use before installing the guards. You may need to change your lifting practices, but do not make them more dangerous. This is not an excuse to avoid guards but there may need to compromise on the type of guard. For example you might need to have a moveable fence rather than bolt it to the floor.

A key risk to look out for is having a person trapped between a swinging load and a fence. You may need to accept that loading will take longer.

So do I have to have proprietary fences all the way round?

The rear and sides of the machine must be guarded as well as the front, but it is acceptable to use the walls of you premises on one or more sides instead of a fence. Fencing can be self-fabricated as long as it is robust, securely installed, is high enough and does not have gaps within it or below that arms or even fingers could go through and reach dangerous parts.

Where can I get more information on how to guard a bridge saw?

There is general advice on guarding bridge saws on the stone work pages of the HSE website: http://www.hse.gov.uk/stonemasonry/guarding-bridge-saws.htm

Member companies in the Stone Federation have been talking to HSE and the Mineral Products Association about acceptable guarding solutions and detailed guidance is will shortly be available on http://www.safequarry.com/

I have been told about guards but I do not know anyone who has guards on their saw – does anyone?

Yes, many companies have effective safeguards on their bridge saws. Some installed guards after an HSE inspection; others realised they needed to act anyway. The examples in this guidance are all in use in the UK. In any case, none of the solutions are unique and all have been used in other industries for a number of years.

My saws are CNC. Do I need to guard them differently?

With the greater risk posed by automatic and CNC machines, a fully interlocked enclosure is expected.

Do I need to put a brake on the saw?

With a light guard the expectation is the saw should stop within 10 seconds and that can mostly only be achieved with a brake on the blade. Most modern machines achieve this, but check by timing it yourself.

10 seconds can be dangerous and may not be technically possible on larger or older saws. In that case a light guard is not suitable and time delayed interlocked gates are needed. These remain locked until the saw has safely slowed.

I have light guards but turned them off because the spray kept cutting them out?

The spray will contain respirable stone dust which can cause serious ill health. You need to contain the spray more by adjusting the nozzle heads or improving the baffle/brush around the blades.

You may need to move the light guards away. The light guards should be reinstated.

My machine is old. Do I need to bother with guarding?

The types of safeguards described on the HSE website are being used successfully in stoneworking business around the UK. However, premises do vary and those solutions may not be reasonably practicable for all premises or machines.

It is particularly challenging with older machines or when the space at the premises is limited. The risk from the machinery may need, for example, to be balanced against increasing the risk of injury when loading stone blocks onto the saw bed.

It is the employer's legal duty to get competent advice to help them achieve the best practicable guarding in their circumstances. This could be from a supplier, but sales staff are not always competent in either engineering or health and safety.

Are there other risks I need to worry about?

The operation of stone saws poses a number of other risks. Operators can be exposed to dangerous levels of dust. Plan carefully how to load and unload stone from the saw table. Blade changing is another risky task. Noise is an obvious hazard.

Do I need to worry about stone dust from bridge saws?

Yes. Despite water suppression, operators can still be exposed to dangerous levels of silica containing dust in fine spray. Wearing RPE when operating the saw may be necessary. Exposure of saw operators to dust is particularly of concern when a high silica content stone is being worked or when there are a number of unsegregated saws operating at once in the same workshop.

See *HSE Coshh essentials sheet ST1 Primary and secondary sawing. www.hse.gov.uk/pubns/guidance/*

Is there a risk of Legionella from the water?

Legionella bacteria can grow in warm stagnant water and if breathed in cause serious ill health. You might be at risk if your water is not direct from mains supply or if it is recirculated. Keeping the water temperature below 20C is the most straightforward control. You may need to take other steps like flushing the system out in hot weather and checking water quality. More advice is available at www.SafeQuarry.com

I did not realise there was so much required for health and safety – where can I get more help?

Visit the HSE website. There are specific pages for the stone industry at http://www.hse.gov.uk/stonemasonry/index.htm There are also specific pages of guidance for quarries and for construction. Stone Federation members have access to free advice and access to the Federation's Stone Safe publications.

References

ISO STANDARDS

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

BS EN 16564:2014 Guarding of Bridge Saws. Machines and plant for mining and tooling of natural stone. Safety. Requirements for bridge type sawing/milling machines, included numerical control (NC/CNC) versions

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/uksi/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

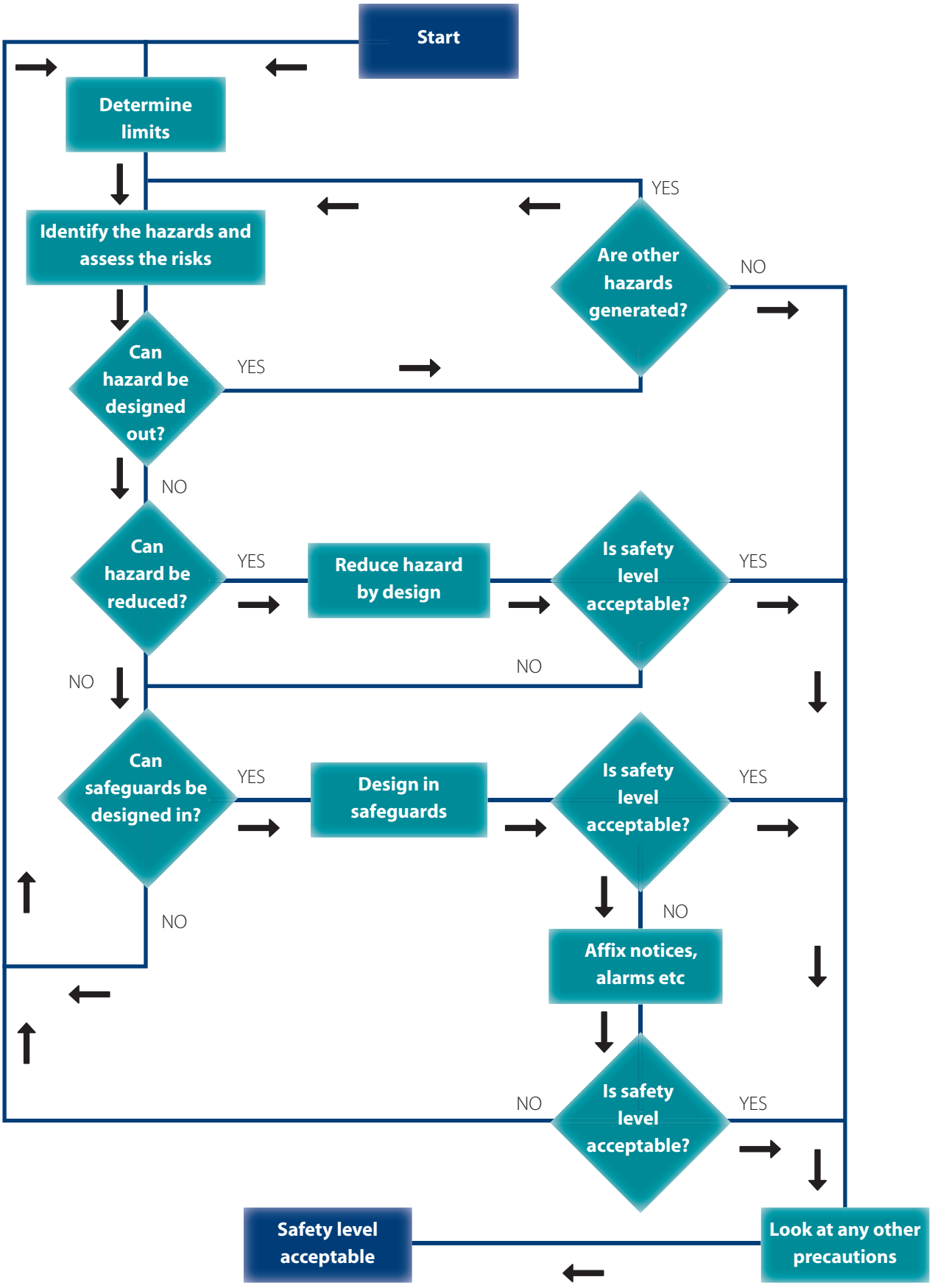
GUIDANCE

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

Appendix 1 - Risk assessment flow



Appendix 2 - Safer by design

Requirements	*Yes*	*No*	*N/A*	*Action Required*
Purchasing Natural Stone Working Machinery				
Do new machines have CE marking (unless it is partly completed machinery) and a copy of the EC Declaration of Conformity (or Declaration of Incorporation, if partly completed machinery)?				
Never assume that machinery is safe just because it has a CE mark; check everything!				
Have all new machines been assessed and comply with the minimum standards written in BS EN 16564:2014 **Machines and plant for mining and tooling of natural stone safety requirements for bridge type sawing/milling machines, including numerical control (NC/CNC) versions?**				
Has a manual been supplied which includes instructions for safe use, assembly, installation, commissioning, safe handling, adjustment and maintenance?				
Are the instructions written in English? *(If the maintenance is to be carried out by specialised staff from the manufacturer or supplier instructions may be written in another language)*				
Has there been adequate information provided about any remaining risks from the machine, and the precautions you need to take to deal with them? *(These may include electrical, hydraulic, pneumatic, stored energy, thermal, or health hazards)*				
Are all warning signs visible, pictograms, text in English and easy to understand?				

Appendix 2 - Safer by design

Requirements	*Yes*	*No*	*N/A*	*Action Required*
Have you completed your PUWER assessment against the relevant machinery standard before putting it to use for the first time?				
Have you carried out a risk assessment for the safe operation of the machine to include; loading, setting, cleaning, adjustments				
Have all operators received adequate information, instruction and training prior to use.				
In consultation with manufacturer create a schedule of regular checks for guarding, interlocking and safety critical controls. E.g emergency stops, pressure bumpers, light curtains, etc.				

Appendix 2 - Safer by design

Requirements	*Yes*	*No*	*N/A*	*Action Required*
Guarding Bridge Saws				
Has perimeter guarding either fixed or moveable been provided at height of 1.8 meters from the floor? *(As an exception, for bridge sawing machines when the diamond disk is protected with a fixed guard so to cover the disk up to the height of a maximum 40 mm from the fastening flange, the peripheral enclosure height shall be at least 1500 mm from the floor level and the distance from the top of the guard and the tool shall be not less than 850 mm)*				
Are all guards interlocked so that access gates cannot be opened until all saw movements have come to a safe stop condition?				
Where guards are fixed to a structure or the machine and do not require regular access (more than once a day) do all fixings require a tool to remove them and remain attached to the machine or the guard. (Unlosable screws)				
Are fixed and moveable guards of a suitable design that will prevent the ejection of materials and damaged tool parts?				
Where access is required to load and align materials tables are operated by hand hold run control devices and or pressure sensitive bumpers on all moving parts.				
Where light curtains are used are they located a suitable distance to allow all parts of the machine to come to a full stop or return to a safe condition before the operator can come into contact with moving parts, including the use of electrical braking?				

Appendix 2 - Safer by design

Requirements	*Yes*	*No*	*N/A*	*Action Required*
Controls - Emergency Stops				
Has an emergency stop device been provided at each working station and in particular:				
at the main control panel;				
at the mobile control panel, connected by cable or wireless system (if provided);				
adjacent to all hold-to-run controls;				
adjacent to all limited movement controls;				
at the workpiece loading and unloading area;				
close to or inside the tool magazine, where this is separated from the machining area;				
inside any enclosure fitted with access door if the operator does not have a clear view of the complete machining area from the control position;				
adjacent to all start control devices.				
When initiated, does the emergency stop;				
stop axes movements?				
stop spindle rotation?				
for machines equipped with powered workpiece clamping: maintain workpiece clamping until all parts of the machine have come to a complete and safe stop?				
disconnect the machine actuators (except workpiece clamping) from their energy sources?				

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The Mineral Products Association is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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