

## **M2-EN.4 MACHINES**

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### **M2-EN.4.1 Introduction**

In this chapter, the typical risk factors when working with machines on a construction site are described. The aim of this chapter is to:

- Identify the most common risk factors
- Describe the constitution of the risk
- Make proposals on how to reduce these risk factors

The structure of the chapter is as follows: First, a section on the general risks when working with machines and the general requirements for buying, maintaining and using the machines is presented, being followed by a section with a more detailed interpretation of risks when working with specific types of machines and the necessary precautions.

General hazards when working with machines:

- Dangerous parts of the machinery
- Flying fragments
- Wrong illumination
- Defects on the machine
- Instability of the machine
- Surfaces, edges and corners
- Electricity

- Static electricity
- Danger of fire and explosion
- Din and vibrations
- Troublesome smoke, dust, gasses, etc.
- Awkward working postures
- Inconvenient working methods

### **M2-EN.4.2 Common Machine Safety**

Machines must always be organized in a way so that they may be used in conformity with their purpose without imposing danger on safety and health. When delivered they must be equipped with the necessary protection equipment and must be as easy to operate and comparatively noiseless as possible. Instructions and information on the demands for training, use of means of personal protection etc. must come with the purchase of the machine. Information on din and vibrations from the machine must likewise appear in the instructions. Users of the machine, including employers, foremen, service mechanics etc. are obliged to ensure that the machine is in order and that the necessary protective measures are available and function according to their design. (M2.4.1.jpg, M2.4.2.jpg)

Furthermore, do observe the specific rules for workers under the age of 18 and the possibility of specific rules at specific types of machines.

### **Risk Factors**

- Dangerous machine parts might be touched or grasp people nearby
- Flying fragments
- Noise
- The operator may lose the control of the machine
- Risk of radiation from draught, cold, heat, light, radioactivity or laser

### **Impact on Human Health**

- Injury or amputation of body parts
- Muscular rheumatism, injury to the eyes or skin
- Hearing problems
- General malaise

### **Safety Measures**

- Make sure that dangerous machine parts are securely screened. When the screen is off, the machine must be unable to function.
- Do observe that starter buttons and pedals are secured in a way that makes it impossible to start the machine unintentionally. Also observe that emergency shutdown buttons are visible, accessible and organized in conformity with the specifications

- Make sure that the machine is correctly equipped with dead-man control, panic switch or two-hand control device where required
- Make sure that the safety of the machine is controlled in conformity with the specifications

### **M2-EN.4.3 Machines for concrete Work**

When using machines in connection with concrete work the general rules for working with machines are valid (**M2.4.3.jpg**). One must pay special attention to mobile machines, e.g. an archer with rotary discs or airscrews that might be dangerous for the feet if the operator loses control of the machine. The screen and the dead-man control must function correctly.

#### **Risk Factors**

- Heavy work at e.g. mixing machines
- Emission of carbon monoxide from the engine's exhaust
- Vibrations
- Skin contact with concrete

#### **Impact on Human Health**

- Back, arms and legs are worn out
- Carbon monoxide is deadly toxic
- Vibrations may damage the circulation and cause white fingers
- Skin irritation

#### **Safety Measures**

- Use the necessary aid at heavy work
- Only out-door use of machines with petrol engines or in well ventilated rooms
- Minimize the working time with vibrating machines. The vibration damper must be maintained
- Use PPE i.e. gloves and eye protection

### **M2-EN.4.4 Machines for Wood Processing**

These are stationary machines, circular saws, band saws and smoothing-planes. Normally, workers under the age of 18 may not operate these machines. The instructions of the machine must contain information on the safety regulations. (**M2.4.4.jpg – M2.4.6.jpg**)

#### **Risk Factors**

- Rotary and fast-moving cutting tools
- Ejection of material or broken blades
- Heavy or unmanageable materials

- Dust or steam
- Electricity

### **Impact on Human Health**

- Cutting off finger or hands
- Injury from flying fragments
- Loading and wearing out of the body
- Impact on the eyes, mucous membranes or lungs
- Electric shock

### **Safety Measures**

- Make sure that the machine and the safety screen work correctly and that they are organized in conformity with the specifications
- Do not wear gloves, jewellery or loose clothes when working
- Do examine that the blade is sharp, flat, without wavering and without blue spots or cracks
- Make sure you have a good working height and a good support for the units
- The exhaust system must be able to pick up dust and shavings at the cutting edge. The air from the exhaust must not be re-circulated in the working area
- Maintain the machine properly

### **M2-EN.4.5 Power-driven Hand Tools**

Power-driven hand tools include among other things circular saws, chain saws, smoothing planers, drilling machines, groove milling machines and different types of grinding machines. If the vibrations are strong, there may be restraints on the daily use of the machine. (M2.4.7.jpg – M2.4.9.jpg)

### **Risk Factors**

- The machines vibrate, produce dust and are noisy
- There is a risk of the unit getting stuck in the machine
- In grinding machines the disc may burst
- Working with heavy tools is hard and there is a risk of loosing control over them
- Flying fragments
- Damaged cables

### **Impact on Human Health**

- There are the same risks when working with hand tools as when working with other types of machines, including to a considerable degree the risk of injuring parts of the body, hands or feet

- When working with granite, concrete, tile etc. the dust may cause silicosis or asbestosis
- When the disc bursts, fragments are ejected with a power strong enough to penetrate the body of a human being
- Electric shock

### **Safety Measures**

- Always make sure that the tool is in order and well maintained
- If possible choose tools with vibration damper
- Use hearing protector for noisy work, and breathing masks when dust is produced if there is no mechanical exhaust system
- Do not use engine chain saws on a ladder or above shoulder level. Always wear a helmet, safety spectacles, hearing protector, leg protector and foot protector when working with an engine chain saw
- When working with grinding machines, always be meticulous concerning the correct fixing of the disc. Never drive faster than the limits of the disc. Do always observe the specifications. Always use exhaust, safety spectacles and hearing protector.
- Do not wear loose-fitting clothes e.g. scarves which may be caught by the machine

### **M2-EN.4.6 Bolt and Nail Guns**

Bolt guns are shooting tools where the muzzle velocity of the bolt for some types may exceed 100 m/s. Nail guns shoot with a lesser power, but are as dangerous as bolt guns. Both types of tools must have at least two independent safety catches, which prevent unintended start. (M2.4.10.jpg) The tools must only be used by workers over the age of 18, who must be thoroughly instructed and trained in operating the tools.

### **Risk Factors**

- Risk of shooting through the material
- Risk of smashing of the material or throwing back the bolt

### **Impact on Human Health**

- Bolt as well as nail guns shoot with great power, therefore, injection of bolts and nails from these tools may cause injuries on human beings which in worst case may cause disabilities or death

### **Safety Measures**

- Make sure that shooting through the material cannot happen – or that nobody stands in the shooting direction
- Always use the gun in conformity with the specifications
- Wear a helmet, closely fitting safety spectacles and hearing protector

- Put up warning signs

### **M2-EN.4.7 Compressed-air devices**

Compressed-air devices must be set up so that they are not exposed to collision or bumps and strokes. Containers must be equipped with pressure gauge, safety valves and drain cocks for condensation (**M2.4.11.jpg**). Containers with a high pressure must be examined in conformity with the current specifications at least every four years. Besides, the common regulations also include pneumatic machines and tools. There are specific rules for storing, protecting from fire and using pressure bottles.

#### **Risk Factors**

- Production of noise and dust from pneumatic tools
- Working with concrete and brickwork may generate quartz dust
- Vibrations may cause damage on buildings
- Risk of falling of broken bricks
- High pressure cleaners and cutters act as cutting tools. Jets may be thrown back from hollow spaces and curved surfaces. The jet has a powerful backlash

#### **Impact on Human Health**

- Dust may be injuring to the eyes, mucous membranes and lungs
- Quartz dust is specially dangerous, since it may cause silicosis and cancer
- Din may damage the hearing
- Vibrations may damage the circulation, muscles and joints
- Jets from high pressure cleaners and cutters may cause deep and severe injuries

#### **Safety Measures**

- Vacuum cleaning in connection with the work may reduce the inconvenience. Always wear safety spectacles, breathing masks and hearing protector when working with pneumatic hammers
- If possible avoid hand used tools or use mechanical support
- At sand blasting, do wear air supplied breathing masks and dust repellent clothes. Moisten the used sand before it is swept off. Do not wear the working clothes in the canteen
- Do not use hand held high-pressure cleaners and cutters if the pressure is more than 800 bar. Make sure that no one else is in the working area. Make sure you have a non-skid foothold and never stand on ladders. Use the necessary means of personal protection