



### **Handling construction**

### **Tools, Equipment and**

### MaterialsLevel-I

### Based on March 2022, Curriculum Version 1



Module Title: - Handling construction tools, equipment and materials Module code: EIS SCW1 05 0322 Nominal duration: 35 Hour

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Acronym

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#### Introduction to the Module

Structural Construction work filed. Covers nearly all areas of the construction industry with a wide range of materials along with how, where and why they are used. However, no class is specifically geared towards educating students to learn about the tools and equipment that are required to complete most of the jobs in these industries. By offering a technical elective course that allows students to not only visualize but recognize what tools and pieces of equipment are most effective and acceptable for various applications, we can enable students to further understand issues of constructability and safety on jobsites.

This module is designed to meet the industry requirement under the irrigation and drainage occupational standard, particularly for the unit of competency: handling construction tools, equipment and materials.

#### This module covers the units:

- Work instruction
- Manually handle s construction materials
- Mechanical handling of materials
- Clean up

Learning Objective of the Module

- Plan and prepare
- Manually handle, sort, stack and store construction materials
- Apply for mechanical handling of materials
- Clean up

#### **Module Instruction**

For effective use this modules trainees are expected to follow the following module instruction:

- 1. Read the information written in each unit
- 2. Accomplish the Self-checks at the end of each unit
- 3. Perform Operation Sheets which were provided at the end of units
- 4. Do the "LAP test" giver at the end of each unit and
- 5. Read the identified reference book for Examples and exercise

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#### Unit one: Work instructions and operational details

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- work instruction and operation
- Following safety requirements
- Identifying and implementing signage.
- Tools and equipment
- materials
- Environmental protection requirements
- Clean-Up Management

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- applying work instruction and operation
- Following safety requirements
- Identifying and implementing signage.
- Selecting Tools and equipment
- preparing appropriate materials
- Identifying Environmental protection requirements
- Vibration and Clean-Up Management

#### **1.1. Work instructions**

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**Introduction:**-In construction site identify plan location and specification according to work instructions techniques. A work instruction is a document that provides specific instructions to carry out any activity. It's a step by step guide to perform a single instruction. A work instruction contains more detail than a procedure and is only created if detailed step by step instructions are needed.

#### 1.2. Follow Safety (OHS) requirements

Safety is to protect our self, co-worker, tools, equipment's & materials from danger or risk.

**Safety Engineering:** - may be defined as the application of the arts and sciences of engineering and education for the prevention of accidents and the conservation of health, life and property. It includes the following factors investigation, research, and analysis of accident and health problems, invention and design of physical means of preventing accidents and occupational illnesses, and the development and direction of educational programs designed to create and maintain safety awareness at every level of the organization.

Accident: - may be defined as an unplanned, non-controlled, and an undesirable event or a sudden mishap which interrupts an activity or a function.

**Injury:-** may be defined as the bodily hurt sustained as the result of the accident, such as a laceration, abrasions, bruise, puncture, wound, foreign body, fracture, etc.

**Unsafe Act:** may be defined as a departure from an accepted, normal or correct procedure or practice, an unnecessary exposure to a hazard, or conduct minimizing the degree of safety normally present. Not every unsafe act produces an accident. This is an important consideration in safety work. Generally a supervisor has ample opportunity to correct the unsafe act before an accident occurs.

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#### 1.2.1. Emergency procedures

An **emergency** plan is a written set of instructions that outlines what workers and others at the **workplace** should do in an **emergency**. An **emergency** plan must provide for the following: ... information, training and instruction to relevant workers in relation to implementing the **emergency procedures**.

#### 1.2.2. organisational first aid requirements

- First aid is the assistance given to any person suffering a sudden illness or injury. The key aims of first aid can be summarized in three key points, sometimes known as 'the three P's':
  - **Preserve life:** The overriding aim of all medical care which includes first aid, is to save lives and minimize the threat of death.
  - **Prevent further harm:** Prevent further harm also sometimes called prevent the condition from worsening, or danger of further injury, this covers both external factors, such as moving a patient away from any cause of harm, and applying first aid techniques to prevent worsening of the condition, such as applying pressure to stop a bleed becoming dangerous.
  - **Promote recovery:** First aid also involves trying to start the recovery process from the illness or injury, and in some cases might involve completing a treatment, such as in the Case of applying a plaster to a small wound.

#### A building site should have a first aid box which as minimum contents: -

- Plasters;
- Bandages;
- Ointments;
- Disinfectant

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#### 1.2.3. hazard control

#### The best way to control a hazard is to eliminate it.

- If a hazard cannot be eliminated altogether, there are several other ways to limit worker exposure to the hazard. Some of these ways are more effective than others. When all of these different hazard control methods are put in a chart, going from the most effective to the least effective way to control the hazard, the chart portrays the **"HIERARCHY OF**"

#### HAZARD CONTROLS".

It is considered good occupational safety and health practice to follow the hierarchy of controls.

#### HIERARCHY OF HAZARD CONTROLS

- 1. Elimination Most Effective Control
- 2. Substitution
- 3. Engineering Controls (Safeguarding Technology)
- 4. Administrative Controls (Training and Procedures)
- 5. Personal Protective Equipment Least Effective Control

#### EXAMPLES OF EACH STEP IN THE HIERARCHY OF HAZARD CONTROLS

#### 1. Elimination

The best way to control a hazard is to eliminate it and remove the danger. This can be done by changing a work process in a way that will get rid of a hazard; substituting anon-toxic chemical

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For a toxic substance; having workers perform tasks at ground level rather than working at heights; and other methods that remove the hazard all together.

#### 2. Substitution

The second best way to control a hazard is to substitute something else in its place that would be nonhazardous or less hazardous to workers. For example, a non-toxic (or less toxic) chemical could be substituted for a hazardous one.

#### 3. Engineering Controls (Safeguarding Technology)

If a hazard cannot be eliminated or a safer substitute cannot be found, the next best approach is to use engineering controls to keep the hazard from reaching the worker. This could include methods such as using noise dampening technology to reduce noise levels; enclosing a chemical process in a Plexiglas "glove box"; using mechanical lifting devices; or using local exhaust ventilation that captures and carries away the contaminants before they can get in the breathing zone of workers.

#### 4. Administrative Controls (Training and Procedures)

If engineering controls cannot be implemented, or cannot be implemented right away, administrative controls should be considered. Administrative controls involve changes in workplace policies and procedures. They can include such things as:

- ✓ Warning alarms
- ✓ Labeling systems
- $\checkmark$  Reducing the time workers are exposed to a hazard, and
- ✓ Training.

For example, workers could be rotated in and out of a hot area rather than having to spend eight hours per day in the heat. Back-up alarms on trucks that are backing up are an example of effective warning systems. However, warning signs used instead of correcting a hazard that can and should be corrected are not acceptable forms of hazard control.

#### 1.2.4. Hazardous materials and substances, including cement and curing agents:

- ✓ Immediately notify Ethiopian Police and/or Facilities Management of the situation.
- $\checkmark$  Evacuate the area.

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- $\checkmark$  If possible, control access to the affected area by closing doors as you leave.
- Individuals who were in the area or involved in the incident should remain in a safe location at the scene until responding police officers arrive.
- ✓ Consult Health Services, local EMS, or your own doctor to be checked for adverse medical symptoms (shortness of breath, fainting, etc.).
- $\checkmark$  If you notice anyone with adverse medical symptoms, call any numbers.
- ✓ If you know what chemicals were involved, please advise Ethiopian Police, Facilities Management, or other responders. Obtain Material Safety Data Sheets (MSDS) if appropriate.

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# **1.2.5.** Personal protective equipment (PPE) prescribed under legislation, regulations and workplace policies and practices:

An important aspect in the construction site is following safety to protect the work force from danger and to keep materials, tools and equipment's from damage.

Benefits of a construction safety program;

- Allow workers to go home safely at the end of the work day;
- Increase productivity;
- Provide higher profit margin for the company;
- Provide lower insurance costs;
- Enhance the company reputation;
- Offer better personnel policy;
- Support compliance with the law;

#### **Personal Safety**

Using personal protection and safety equipment as required by the organization;

#### Types of PPE (personal protective equipment)

#### Helmet

It is used to Protects the carrier from down falling items. It should be a must for everybody who works or moves on a building site.



Fig.1.2.2.Helmet

#### Ear protection

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- It is used to protect the carrier from damages of the ears. Continuously working in a very noisy environment harms the eardrums forever. Once the eardrums are damaged there is no way of restoring the sense of hearing again.



Fig.1.2.3. Ear Protection

#### Safety boots

- Safety boots are equipped with three safety measures. It must have:

Toes protection hood

A steel hood to protect the toes from down falling heavy thing

- ♦ A steel layer inside the soles protects the carrier from stepping into a tuned up nail.
- Benzene and oil resistant soles



Fig.1.2.4. Safety boots

#### Safety goggles

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- It is used to Protects the carrier from down falling items. It should be a must for everybody who works or moves on a building site.



Fig.1.2.5. Safety goggles

#### Knee pads

It used to protect the knees during long time kneeling.



Fig.1.2.6. Knee pads

#### Gloves

It used to protect the hands from the aggressive attack of the cement, very important.



Fig.1.2.7. Gloves

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## **1.2.6.** Safe operating procedures, including the conduct of operational risk assessment and treatments associate:

Safe operation of machinery and equipment necessitates that all foreseeable hazards are controlled. Effective control is achieved through a risk assessment process.

#### **General Safe Operating Rules**

Regardless of the particular risk reduction measures selected for a particular machine, there are some general safe operating rules that must be observed.

- Restrict access to shops and individual pieces of equipment/machines to authorized operators.
- ✓ Avoid working alone in the area so that someone is available to provide or summon assistance in the event of an emergency.
- Read and adhere to the manufacturer's operating instructions and warnings. Receive training in proper operation and demonstrate competency to an experienced and authorized operator for each type of task to be conducted before operating independently.
- $\checkmark$  Know the emergency stop/shut-down procedures for the specific machine operated.
- ✓ Inspect machines/equipment prior to each operating shift to ensure that:
  - Points of operation and surrounding areas are clean of debris and other hazards.
  - Shields and guards are in place and controls and interlocks or other safety devices are accessible and operating properly (pay attention to the point of operation, as well as the area behind, to the side, and above the machine).
  - Machine components are in good working condition (do not use damaged equipment).
  - > Labels and warnings are present and legible.

**Risk:** The likelihood, or possibility, that harms (injury, illness, death, damage etc) may occur from exposure to a hazard.

**Risk Assessment:** Is defined as the process of assessing the risks associated with each of the hazards identified so the nature of the risk can be understood. This includes the nature of the

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#### **Step 1: Identify Hazards**

In general, hazards are likely to be found in the following;

- ✓ Physical work environment,
- ✓ Equipment, materials or substances used,
- ✓ Work tasks and how they are performed,
- ✓ Work design and management

#### 1.3 Implement Signage/barricade requirements' construction site premise

Every working man should be protected against the dangers of injury sickness or death through safe and healthy working condition, thereby assuming the conservations of valuable manpower resources and the prevention of loss of damage to lives and properties. Construction work should be fenced off and suitably signed. This will protect people from site dangers. For some jobs the workplace will have to be shared. Perhaps the work will be done in an operating factory or office.

#### **Generally Construction site requires**

- Complete understanding between the owner and the contractor
- Practical experience in running construction jobs
- Accident prevention as part of advance planning
- Protection of workers and the public
- Applicable government standard regulations
- ✓ Barricades & Warning Devices

Road and highway work usually require a great deal of traffic control. Both require modifying the existing traffic patterns and, more importantly, the driving habits of the public. Today we will discuss the use of barricades and signs.

There are numerous specific rules for signs, barricades and warning device usage. It is important we properly use all the types of warning devices we have to protect us, the public and our work zones. These rules and specifications are contained in the

- ✓ Types of Accidents That Can Occur Without Proper Barricades & Warning Devices:
- Collision with construction equipment such as forklifts and trucks
- Collision with other vehicles
- Pedestrians (both workers and visitors) falling into excavations
- Driving into excavations

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- Driving into work areas
- Loss of control of vehicle due to changes in road conditions
- **1.3.1. Signage/barricade** is to defend or block something by building a barricade.

It's a line of objects placed across a road, etc.to stop people from getting pass.

Signage is the design or use of signs and symbols to communicate a message to specific group, usually for the purpose marketing or any kinds of visual graphics.

Barricades and signage that are no longer required are removed as Barricading controls shall be implemented and authorized as part of ... barricaded area it shall have its own barricading and label to identify the hazard. The identification, isolation, and control of these causes are ...distance Advance Warning Signs may be required on any type roadway, but particularly on multi- lane the lines, then barricades or cones shall be used to channel traffic around the work area.(this includes the driving tools and the implement being driven)

Signage and barriers use when construction is inactive. Contractor is responsible to implement any requirements specified in the contract. Determine the responsibility of each contractor for lights, barricades, and warning sign

#### 1.3.2. Construction safety signage

Safety signs in the workplace are an indispensable way of protecting employees from accidents. Their purpose is to convey information in a comprehensive way about objects and situations that can be dangerous. In case of a fire, for instance, well placed signs can speed up the evacuation of a building and help those giving first aid.

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#### Where signages are needed

- Usage of PPE prior to entry to the project site
- Potential risks of falling objects
- Potential risk of falling
- Explosive an flammables substances are used or stored
- Tripping or slipping hazards
- Danger from toxic or irritant airborne contaminates/ substances may exist
- Contact with or proximity to electrical/ facility equipment
- Contact with dangerous moving parts of machineries and equipment
- Fire alarm and firefighting equipment
- Instructions on the usage of specific construction equipment
- Periodic updating man-hours lost

#### 1.4. Tools and Equipment's

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#### General Requirements and Restrictions on Storage and Handling

Materials required in construction operations shall be stored, and handled in a manner to prevent deterioration and damage to the materials, ensure safety of workmen in handling operations and non-interference with public life including safety of public, prevention of damage to public property and natural environment.

#### Hand tools

Hand tool is used for the construction work. Such as :-

1. Meter - are used to take measurement.



2. Manson Squire - is used to check to get right angle.



3. **Plumb-Bob-** is used to check only that surface vertical leveling

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4. Masonry Hammer - is used to dress stones in the quarry.



5. Crushing Hammer - is used to remove irregular bushing and rough dressing.



6. Chisel - is used to dress hard stone , concrete etc.

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7. String - is use to make layout in excavation and maintain alignments.



**9. Rubber tube water level** - is PVC tube filled with water to check horizontal levels of floors and walls etc.



10. Trowel - us used for lifting and spreading mortar on the wall. for forming

joint and for cutting brick it's the major tool for brick, block and stone laying plastering.





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11. Bucket - is used to carry water, mortar, concrete from one place to another

place transporting in the construction site.



12. Float - could be made for metal, wood, sponge, plastic it used to have smooth

Mortar or concretefinish.



13. Claw hammer - is used to puling/driving and pushing nails.



14. Bow saw - it used to cutting wood and timber.



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15. Bar cutter - used for cutting soft, medium and hard metal/reinforcement.



16. Bar bender - used for bending reinforcing.



17. Hack saw - used for cutting reinforcement bar.



18. Crow bar - is used for pulling out nails and dismantle wooden materials



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19. Varner caliper - which used to measure the diameter of bar.



20. Scriber - used like pencil scribe lines on metal.



21. Spade - it used to mixing concrete and spreading excavation soil.



27. File - is used for cutting and smoothing wood surface



**28.** Saw - Carpentry's saw is used for cutting wood and mason's saw used for cutting soft stone and concrete block. Rubber and other materials may also be cut with saw.

#### Power Tools & Equipment's (Machinery)

Equipment is stationery /movable device

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#### Machinery:-

1. Extension cable- to connect all electrical driven equipment properly.



**2. Wheel barrow** - it used to dispose disposal materials from transport or serve materials and tools in the construction.



**3. Drilling machine -** to make or drill hole in the concrete. Drilling machine is depending up on the material to be drill, i.e. the drill bit.



# 1.4.1. Concepts of Calculate Material quantity requirements with plans and specifications

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unit of measurement for concrete is meter cube for thick surfaces such as ground floor, slab, beam,, hand brick meter and finishing square, stone masonry meter cube etc. The data given below can be used to calculated materials required for making concrete, the materials needed depends on the grade of concrete as given on the data.

#### **Calculating Quantity of Materials**

An estimate is probable cost of a building before construction. This estimate should not be far away from the actual cost of the building after completion of the project. It is done by mathematical calculation based on working trainings. First of all the quantity of the work is calculated based on standard unit of measurement for each work. This unit of measurement can be pieces (No), meter linear, meter square and meter cube.

quantities of materials for concrete such as cement, sand and aggregates for production of required quantity of concrete of given mix proportions such as 1:2:4 (M15), 1:1.5: 3 (M20), 1:1:2 (M25) can be calculated by absolute volume method.

This method is based on the principle that the volume of fully compacted concrete is equal to the absolute volume of all the materials of concrete, i.e. cement, sand, coarse

#### **1.4.2. Safely handling and locating use appropriate materials**

Introduction:

Handling and storing materials involve diverse operations such as hoisting tons of steel with a crane; driving a truck loaded with concrete blocks; carrying bags or materials manually; and stacking palletized bricks or other materials such as drums, barrels, kegs, and lumber..

The efficient handling and storing of materials are vital to industry. In addition to raw materials, these operations provide a continuous flow of parts and assemblies through the workplace and ensure that materials are available when needed. Unfortunately, the improper handling and storing of materials often result in costly injuries.

#### 1.4.3. Concepts of safely handling and locating use appropriate materials

Materials constantly in use shall be relatively nearer

the place of use.

Heavy units like precast concrete members shall be stacked near the

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hoist or the ramp.

Materials which normally deteriorate during storage shall be kept constantly moving, by replacing old materials with fresh stocks. Freshly arrived materials shall never be placed over materials which had arrived earlier.

Appropriate types of fire extinguishers shall be provided at open sites where combustible materials are stored and for each storage shed room where flammable/combustible materials

What precautions should workers take when moving materials manually?

When moving materials manually, workers should attach handles or holders to loads. In addition, workers should always wear appropriate personal protective equipment and use proper lifting techniques. To prevent injury from oversize loads, workers should seek help in the following:

• when a load is so bulky that employees cannot properly grasp or lift it,

- When employees cannot see around or over a load, or
- When employees cannot safely handle a load.

Using the following personal protective equipment prevents needless injuries when manually moving materials:

- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.
- Steel-toed safety shoes o boots.

• Metal, fiber, or plastic metatarsal guards to protect the instep area from impact or compression.

Employees should use blocking materials to manage loads safely. Workers should also be cautious when placing blocks under a raised load to ensure that the load is not released before removing their hands from under the load. Blocking materials and timbers should be large and strong enough to support the load safely

#### 1.5 Preparing Materials appropriate to the work application

Materials and safely handle and store them manually or in prepare for mechanical handling, which include location apply safe manual handling techniques

Safe storage of materials and equipment is essential for many businesses, such as construction job sites, laboratories, and other locations that handle chemicals, flammable gases and other hazardous materials. Storage methods and procedures are regulated for many

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such items; when in doubt it is always best to be cautious to prevent accidents. Locking storage cabinets and restricting access to storage areas will prevent unauthorized handling of stored items and minimize the possibility of theft.

#### 🖊 General Plan

Create a plan for storing all equipment and materials at your site. Assign a specific location to each item or type of item and label the space accordingly. Make certain that work areas and walkways are kept clear of all stored items. Use tape or paint to identify such areas on the floor of a large area, such as a manufacturing facility. In an office, laboratory or similar smaller setting, use cabinets with doors that close securely. Always leave at least 1.5 feet between the top of stored items and fire sprinklers, if present. Make sure that all stacks are solid and secure them whenever possible.

#### ✓ Flammable Materials

Materials that are highly flammable require special handling. Gases such as propane and butane must be kept in pressure-safe containers with appropriate labels. Flammable gases are to be kept in a separate, well-ventilated area. According to the Occupational Safety and Health Association, flammable liquids such as gasoline and kerosene must be stored in approved containers located away from other flammable materials. These can be stored only in a specially constructed room that is able to contain a fire for one to two hours. Keep flammable materials 50 feet away from sources of heat or flame.

#### ✓ Chemicals and Other Hazardous Materials

All chemicals, including cleaning materials, should be kept in their original containers or in properly labeled containers of an appropriate type. Every workplace that uses chemicals of Any type should have a book containing all material data safety sheets, and the book must be kept where it is easily accessible. Chemicals must be stored where there is no public access and where tipping or breaking can't happen, such as secure shelves inside a locked cupboard. The cupboard must be labeled with the type of materials it contains.

#### ✓ Machinery and Equipment

Machinery such as forklifts such must be kept in a safe location where it is protected from unauthorized access, weather and accidental damage. It must be kept away from driveways, walkways and other areas where access is required. All equipment should be turned off when not in use. If there is a chance of oil, hydraulic fluid or other liquids leaking from the vehicle

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while it is stored, use a drip pan underneath it to catch any spills. Check the area frequently for such leaks and clean them up immediately if any are found, as these represent significant fall hazards for employees.

Site storage involves the provision of adequate space, protection and control for materials, components and equipment that are to be kept on a construction site during the building process.

- There are several factors to be considered when deciding on the amount and nature of storage required.
- Physical properties: The size, shape, weight and mode of delivery.
- Organization: The planning process to ensure unloading is available and storage space has been allocated.
- Control: Processes for checking the quality and quantity of materials on delivery, and monitoring stock holdings.
- Protection: The necessary protection for durable and non-durable materials and components from damage.
- Security: Guarding against theft and vandalism.
- Costs: Costs associated with handling, transporting and stacking requirements, the workforce required, heating and/or lighting that may be required, facilities to be provided for subcontractors, and so on.
- Processing: What needs to be done to materials before they can be used. Is there packaging that needs to be removed or returned?

The type of material being stored also needs to be taken into account. If it is hazardous, it may require specific precautions and control measures such as bunds for toxic substances or it may need to be kept separate from other substances to prevent a reaction.

To reduce the risk of an accident, special containers are required to store hazardous chemicals and dangerous goods. These types of containers may have special provisions for things like natural ventilation, special compartments, electrical earthing, and warning signs.

#### **4** Materials storage

Different types of material will have different storage requirements, in particular depending on whether they are durable or non-durable.

• Bricks

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Bricks may be delivered to site loose or strapped in unit loads and stored on timber pallets to be transported using a forklift. Bricks should be stacked on edge in rows to a maximum height of 2.4 m. It is important that they are stored on level, well-drained ground and covered with a polythene sheet to protect against efflorescence and other issues. When calculating the area required for storage, allowance of around 5 m should be given for the forklift approach.

#### • Blocks

Blocks may be delivered to site loose or strapped in unit loads on timber pallets. They should be stacked in columns, to a maximum height of 8 courses, and covered with a protective sheet.

#### • Roofing tiles

Tiles may be delivered to site loose, in plastic-wrapped packs or in unit loads on timber pallets. They should be stacked vertically in rows, to a maximum of 6 in height. The tiles at the end of the row should be laid flat and staggered. Ridge tiles should be stored vertically on end.

#### • Drainage pipes

These are usually supplied loose or strapped together on timber pallets. They should be stacked horizontally with ends reversed in alternate rows. A driven-in timber stack or column of loose bricks can be used to form end restraints.

#### Corrugated and similar sheet materials

These should be stored flat on a level surface and covered with a protective polythene sheet.

#### • Timber

Timber and other joinery items should be stored horizontally and covered in a scaffold rack, although provision should be made for free air flow, usually by the rack having open ends and sides, while having a top that is covered. It is advisable for different timber sizes to be kept separate.

#### • Cement

Since any contact with direct or airborne moisture can cause cement to set, it must be kept dry. In terms of organization, it is advisable for a rotational system to be used, whereby the first batch of cement delivered is the first to be used.

• Aggregates

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It is essential for different aggregate types and sizes to be kept separate. They should be stored on a clean, hard, free-draining surface, surrounded by retaining and separating walls of bulk timbers. Stored aggregates should be regularly monitored for moisture content.

#### 1.6 Concepts of Identifying Environmental protection requirements for the project

Implementation of the requirements for Environmental Protection has been identified as a potential weakness for workshop.

Store all materials on pallets to discourage rodent infestation. Immediately clean up spills and leaks that create such rodent habitat.

Use slings to hoist bagged material, lumber, bricks, masonry blocks, and similar loosely stacked materials only if the slings are fully secured against falling by straps, sideboards, nets, or other suitable devices.

the staff in all technical departments are of sufficient numbers and experience to enable the staff to achieve the airworthiness, operational suitability and environmental protection objectives for the product."

Environmental protection is the practice of protecting the natural environment by individuals. Environmental policy is the commitment of an organization or government to the laws, the protection of natural resources. Environmental protection is balanced with other public policy concerns, such as ... and wildlife protection, such as the protection of endangered species.

#### **Types of Environmental Issues**

You are constantly surrounded by many different things on this planet earth. Most of the time, we take all these for granted. Your surroundings, be it living or non-living, the geographical area where you live etc. constituting your environment.

Do you think there is a need to protect the environment? Have you ever given thought to the after effects that will plague for not addressing the environmental issues on time? Let us analyses in brief the various environmental issues that are plaguing our current world as well as the harmful effects of these issues on the human population

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#### Self-check-1

#### Test-I choose

1. Is the design or use of signs and symbols to communicate a message to specific group?

A. signage B. barricade C. symbol D. none.

- 2. -----to make a design or an outline for building.
- A. Specifications B. PLAN C. A&B D. none
- 3.—is a state of being relatively free from harm, danger, injury or damage.
  - A. Safety B. hard hat C. Safety shoes D. Assessments

#### **Test-I** Matching

Instruction: select the correct answer for the give choice. You have given <u>1 Minute</u> for each question. Each question carries <u>2 Point</u>.

А	В
1. Tape	A. Used to measure short length
2. caliper	B. Used to measure outside dimension
3. Direct Measurement	C. The capacity of an object
4. Volume	D. Used when ruler is too short
5. Ruler	E. Comprehension method

#### Test II: short Answer writing

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F. Used when ruler is too long



**Instruction:** write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

- 1. What is the purpose mason squire?
- 2. Write down at least three measuring tools?
- 3. What is the difference between ruler and tape?

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#### Unit Two: Manually handle, sort, stack and store construction material

This unit to provide you the necessary information regarding the following content coverage and topics:

- construction materials
- construction materials and components
- construction materials and components
- Erecting signage and barricade
- avoid contamination of materials
- hazardous materials
- nontoxic materials
- dust suppression procedures
- Providing protection of material

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Moving construction materials
- Sorting construction materials and components
- Protecting construction materials and components
- Erecting signage and barricade
- Applying procedures to avoid contamination of materials
- Identifying and separating hazardous materials
- Carrying nontoxic materials
- Using dust suppression procedures
- Providing protection of material

#### **2.1.** Construction materials

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#### 2.1.1. Applying construction materials for manual handling techniques.

Materials shall be stored and placed so as not to endanger the public, the workers or the adjoining property. Materials shall be stacked on we-ldl rained, flat and unyielding surface. Material stacks shall not impose any undue stresses on walls or other structures.

Materials shall be separated according to kind, size and length and placed in neat, orderly piles. High piles shall be staggered back at suitable intervals in height. Piles of materials shall be arranged so as to allow a minimum 800 mm wide passageway in between for inspection and removal. All passageways shall be kept clear of dry vegetation, greasy substance and debris.

For any site, there should be proper planning of the layout for stacking and storage of different materials, components and equipment's with proper access and proper maneuverability of the vehicles carrying the material. While planning the layout, the requirements of various materials, components and equipment's at different stages of construction shall be considered.

Stairways, passageways and gangways shall not become obstructed by storage of building materials, tools or accumulated rubbish.

Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric actions, such as rain, sun, winds and moisture, to avoid deterioration.

Special and specified care should be taken for inflammable and destructive chemicals and explosive during storage.

#### • Materials and Storage

Proper way of storing material should be considered in schoolwork shops and training area and this has to be adopted in the real work of construction sites. It is use full to keep materials in a proper manner, to preserve materials long lasting, to secure chemical character of the material, for easy access and handling etc. In general proper way of storing material saves time and money. Accordingly methods of storing for some materials and hand tools are described and illustrated below.

#### • Storing of Binding Material /Cement and Lime/

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In general cement and lime should be stored in a way that it does not come in contact with moisture. As soon as it gets moisture, setting starts, which render it, unfit for future use. In order to avoid this cement and lime should:

Storing materials and tools depend up on the type, size, and product character, etc.

#### ✓ Cement

Cement is usually supplied in bags weighing 25 or 50kg. Loading and unloading the bags should be done carefully – preferably by manual labour

- To avoid any damages to the bags. If a bag is torn, moisture enters the cement and triggers the chemical action causing the cement to harden. Hardened pieces found when using the cement must be removed, because the strength of the concrete will be reduced if they remain inside the batch.

The cement should be stored in a dryy place where the bags do not get damp

or wet. The floor should have a good clearance from the ground or walls, to avoid moisture penetrating from below and secondly to allow for good ventilation.

Cement deteriorates with time and should therefore only be purchased just before it is to be used. The oldest cement in the store should be used first.

Does and do not of storage of cement bags on site

Cement should be kept in dry and air tight room.

You cannot store the Cement for a long time as its loses strength.

Cement stored more than six months from the date of manufactured can be test soundness test before we use it.

Cement should be stored on raised wooden platform 15 to 23cm from the floor level and 30 - 60 cm away from the wall.

Bags stacked should not be more than 10 layers (max 4.5m).

The bags should be placed closed together to reduce circulation air and all opening of the should be well closed. Cement should be removed in order of its storage period. store the cement in such a way that it is neither exposed nor comes in contact with moisture.

Always use cement on "first in first out" basis.

1. Cement should be kept in dry and air tight room.

2. You cannot store the Cement for a long time as its loses strength.

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Before ewe use it.

4. Cement should be stored on raised wooden platform 15 to 23cm from the floor level and

30-60 cm away from the wall.

5. Bags stacked should not be more than 10 layers (max 4.5m).

6. The bags should be placed closed together to reduce circulation air and all opening of the should be well closed. Cement should be removed in order of its storage period

7. Store the cement in such a way that it is neither exposed nor comes in contact with moisture

8. Always use cement on "first in first out" basis.



Fig 1.1 cement

### Storing of bricks, HCB and aggregates

- Bricks and stones should be piled near where they are needed
- They should be handle carefully to minimize breakage
- They should be piled on edges and a layer crossing over the previous
- The piles should be stable.
- Aggregates /Sand and gravels/ should be stored in bunkers to protect from surrounding impurities







Improper way of storing bricks

properly stored HCB

# 2.1.2. Manual handling

Slowly lift by straightening your hips and knees (not your back). Keep your back straight, and don't twist as you lift. Hold the load as close to your body as possible, at the level of your belly button.

Manual handling refers to the use of a worker's hands to move individual containers by lifting, lowering, and filling, emptying, or carrying them.

When heavy materials have to be handled manually each workman shall be instructed by his foreman or supervisor for the proper method of handling such materials. Each workman shall be provided with suitable equipment for his personal safety as necessary. Supervisors shall also take care to assign enough men to each such job depending on the weight and the distance involved.

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Fig Proper lifting technique

Follow these tips to avoid compressing the spinal discs or straining your lower back when you are lifting:

- Keep a wide base of support. Your feet should be shoulder-width apart, with one foot slightly ahead of the other (karate stance).
- **Squat** down, bending at the hips and knees only. If needed, put one knee to the floor and your other knee in front of you, bent at a right angle (half kneeling).
- Keep good posture. Look straight ahead, and keep your back straight, your chest out, and your shoulders back. This helps keep your upper back straight while having a slight arch in your lower back.
- **Slowly lift** by straightening your hips and knees (not your back). Keep your back straight, and don't twist as you lift.
- Hold the load as close to your body as possible, at the level of your belly button.
- Use your feet to change direction, taking small steps.
- Lead with your hips as you change direction. Keep your shoulders in line with your hips as you move.
- Set down your load carefully, squatting with the knees and hips only.

### 2.1.2. Mechanical handling

During day-to-day life, thought is rarely given to the mechanical handling systems technology that ensures we have access to the products we regularly rely on.

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Mechanical handling systems refer to the equipment which manages the storage and movement of products. They are essential to provide an efficient and consistent product distribution service.

### • Forklifts, pallet jacks and trucks

The right machine for the job can improve workplace safety and productivity, and can also help reduce the time needed to complete tasks, improve productivity and lower the overall cost of operations. Do you need to be certified to use a pallet jack? It's a question we're asked a lot. Regardless of the type of lift you use in your business, OSHA requires all operators, including pallet jack operators, to be properly trained and certified before your workers can use them.



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### Fig Forklifts, pallet jacks and trucks

### 2.1.3. Material handling in construction

In the construction industry, the term 'material handling' refers to the delivery, movement, storage and control of materials and other products. This forms part of the logistics management of a project.

✓ Types of plant used for material handling on site include; hydraulic excavators, telescopic handlers, cranes, forklift trucks, lifting devices, conveyor systems and so on.

From receipt and inspection of materials, through to storage, assembly and use, the material handling system should be well-coordinated and organised so that everyone on site is aware of how it works. When handling materials, safety should be the primary consideration. Prestart inspections are critical, load limits should not be exceeded, method statements should be followed, and it may be necessary for a banks man to direct material movements around the site.

### 2.2. Construction materials and components

### 2.2.1. Sorting construction materials and components with type and size

Many building materials can be reused or recycled. Facilities; market demand; quality and condition of materials and components waste tracking forms; sorting and handling requirements for each material type, Size of concrete pieces. Sizes of carpentry materials Carpentry materials are available in many different lengths, shapes and sizes, which you'll need to take into consideration when you're handling, sorting, stacking or storing them. Stock size/length timber The term 'stock length' or 'stock size' refers to standard lengths and sizes for timber that can be bought 'off the shelf' from suppliers.

Timber comes in 'stock' sizes. This means a size that's usually available 'off the shelf' from a timber merchant.

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Timber lengths can be bought in increments of 300 mm and in stock lengths of between 0.9– 6 m. Timber is also available in many different section sizes.

#### Sorting

Sorting generally involves loading materials onto an inclined metal belt a chain belt and passed across a manual sort line consisting of a flexible rubber belt and integral sort stations providing a place for several workers to stand, usually opposite from one another down the length of the belt. Materials are identified, grabbed, and deposited in vertical openings at each sort station. The effectiveness of the manual sort line is largely determined by the performance of the picking operation which precedes it; for example large materials on the belt can be difficult to manage and or obstruct recoverable materials passing by on the belt beneath

Material and equipment shall not be located within 7.5 m of a street intersection. These shall neither be so placed as to obstruct normal observation of traffic signals nor to hinder the use of public transit loading platforms.

#### Why Sort is important?

- Space, time, money, energy and other resources can be managed and used most effectively
- Problem and hassle in the work flow are reduced.
- Communication between employees is improved.
- Product quality and Productivity is enhanced



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Fig Before sorting materials



Fig After sorting materials

# 2.3. Construction materials and components

Protecting construction materials and components

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Site storage involves the provision of adequate space, protection and control for materials, components and equipment that are to be kept on a construction site during the building process.

There are several factors to be considered when deciding on the amount and nature of storage required.

- Physical properties: The size, shape, weight and mode of delivery.
- Organization: The planning process to ensure unloading is available and storage space has been allocated.
- Control: Processes for checking the quality and quantity of materials on delivery, and monitoring stock holdings.
- Protection: The necessary protection for durable and non-durable materials and components from damage.
- Security: Guarding against theft and vandalism.
- Costs: Costs associated with handling, transporting and stacking requirements, the workforce required, heating and/or lighting that may be required, facilities to be provided for subcontractors, and so on.
- Processing: What needs to be done to materials before they can be used. Is there packaging that needs to be removed or returned?
- Programmed: When are items required, what is the risk to the project of them not being available, how long in advance are they ordered and how long they will be on site.
- Ownership: Who is legally responsible for items, who will be using them and who owns them? See Materials on site for more information.
- Site allocation

# Stored items should not block or obstruct escape routes.

The type of material being stored also needs to be taken into account. If it is hazardous, it may require specific precautions and control measures such as bunds for toxic substances or it may need to be kept separate from other substances to prevent a reaction.

To reduce the risk of an accident, special containers are required to store hazardous chemicals and dangerous goods. These types of containers may have special provisions for things like natural ventilation, special compartments, electrical earthing, and warning signs.

### • Materials storage and requirements.

Different types of material will have different storage requirements, in particular depending on whether they are durable or non-durable.

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This section sets forth the requirements for handling, storage, and disposal of material. It specifically addresses the requirements for storing material in an open yard; stacking bagged material; storing material in bulk; storing lumber; storing bricks and masonry blocks; handling and storing cement and lime; handling and storing reinforcing sheet and structural steel; handling and storing pipe, conduit, and cylindrical material; storing sand, gravel, and crushed stone; handling and storing flammable and combustible liquids; handling asphalt and tar products; handling liquefied petroleum gas; and housekeeping.

- **Stacking.** Place pipe, conduit bar stock, and other cylindrical materials in racks or stack and block them on a firm, level surface to prevent spreading, rolling, or falling. Use either a pyramided or battened stack. Step back battened stacks at least one unit per tier and securely chock them on both sides of the stack.
- **Combustible Materials.** Stack combustible materials securely. Stacks or piles must be no more than 16 feet high. Store combustible material at least 10 feet away from a building or structure
- Fire Protection. Emergency fire equipment must be readily accessible and in good working order. Provide portable fire extinguishing equipment rated

2-A:40-B:C at accessible marked locations in the yard so that the nearest extinguisher is no more than 50 feet away for a Class B hazard or 75 feet away for a Class A hazard.

- Fire Prevention. When storing, handling, and piling materials, consider the fire characteristics. Store no compatible materials that may create a fire hazard at least 25 feet apart or separate them with a barrier having at least a 1-hour fire rating. Pile material to minimize internal fire spread and to provide convenient access for firefighting
- **Masonry Blocks.** Step back masonry blocks one-half block per tier above the 6-foot level.

### • Bricks

Bricks may be delivered to site loose or strapped in unit loads and stored on timber pallets to be transported using a forklift. Bricks should be stacked on edge in rows to a maximum height of 2.4 m. It is important that they are stored on level, well-drained ground and covered

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with a polythene sheet to protect against efflorescence and other issues. When calculating the area required for storage, allowance of around 5 m should be given for the forklift approach. Stack bricks no more than 7 feet high. Step back a loose brick stack at least 2 inches for every foot of height above 4 feet. Stack packaged brick no more than three units high.

### • Blocks

Blocks may be delivered to site loose or strapped in unit loads on timber pallets. They should be stacked in columns, to a maximum height of 8 courses, and covered with a protective sheet.

### • Roofing tiles

Tiles may be delivered to site loose, in plastic-wrapped packs or in unit loads on timber pallets. They should be stacked vertically in rows, to a maximum of 6 in height. The tiles at the end of the row should be laid flat and staggered. Ridge tiles should be stored vertically on end.

### • Drainage pipes

These are usually supplied loose or strapped together on timber pallets. They should be stacked horizontally with ends reversed in alternate rows. A driven-in timber stack or column of loose bricks can be used to form end restraints.

Corrugated and similar sheet materials

These should be stored flat on a level surface and covered with a protective polythene sheet.

### • Timber

Timber and other joinery items should be stored horizontally and covered in a scaffold rack, although provision should be made for free air flow, usually by the rack having open ends and sides, while having a top that is covered. It is advisable for different timber sizes to be kept separate.

### Cement storage

Cement can be safely stored in bags for a few months if kept in a dry room. paper bag s arebetter for storing than jute bags because paper bags perform better in regard to qualit y deterioration due to moisture. during the monsoon time, the cement storage plays an ev en moreimportant role, since the relatively higher humidity accelerates the deterioration pro cess of thecementbags should be stored on a raised wooden platform (e.g. timber pallets) about 15 to20 cm above the floor level and about 30 to 50 cm away from walls.the ceme nt stack should not be more than 10 bags high. the bags should be placed closetogethe r to reduce circulation

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of air.a cement bag should never be opened until its immediate use for mixing

### Use of fresh cement

• Ordinary Portland cement, which has been stored for over six months, should not b e used for plastering work.

The average reduction of strength in a 1:2:4 mix as a result of storage is:

Fresh cement	<u>strength</u>	<u>100%</u>
Cement after 3 months,	strength reduced by	20%
Cement after 6 months,	strength reduced by	30%
Cement after 12 months,	strength reduced by	40%
Cement after 24 months;	strength reduced by	50%

- Cement and Lime. Employees must wear appropriate personal protective equipment, as specified in the "Personal Protective Equipment" section and as identified in the JHA. Provide washing facilities, hand cream, chemical barrier cream, or similar preparations for protection from dermatitis.
  - Lime. Store UN slaked lime in a dry area and, because it presents a fire hazard, separate it from other materials.

### • Aggregates

It is essential for different aggregate types and sizes to be kept separate. They should be stored on a clean, hard, free-draining surface, surrounded by retaining and separating walls of bulk

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### 2.4. Erecting signage and barricade

### 2.4.1. Erecting Signage and barricades to isolate stored materials

The barricade shall be placed so that the whole area affected by the hazard is appropriately identified, taking the following factors into account:

- distance to/from the hazard;
- possible movement of an object inside the barricade if it falls;
- access and egress; and
- Sparks or slag generated from hot work activities.

An appropriate sign shall be affixed to barricades at all access points, indicating the following:

- The hazards present within the barricaded area; and
- The name and contact details of the person in charge of the barricaded area.

### 2.4.2. General Requirements

Barricading, demarcation and signage shall remain in place for the length of time that the hazard exists. If the hazard is permanent in nature, permanent barricading, demarcation and signage shall be erected in accordance with the requirements of section 4.5 of this work practice.

Temporary barricading, demarcation and signage shall be removed when the hazard no longer exists.

### • Barricaded area requirements

Barricading, demarcation and signage shall be erected at a sufficient distance away from the hazard to prevent physical contact being made between personnel or equipment and the hazard. The barricaded area must encompass the entire potentially affected area of the hazard,

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i.e. sparks, falling objects, leaks etc. (take into account the possible deflection of an object from a structure below if it falls).

# Barricade conditions

The barricade shall be maintained in good condition ensuring it remains effective as a control measure. The work area owner is responsible for inspection, monitoring and review of the condition of the barricade.

# • Tagging

Areas where health and/or safety hazards exist shall be barricaded with an information tag attached at all approaches and displayed on all side and approaches. Information tags shall be conspicuous, readily visible, legible, and display the nature of the hazard and any protective action required.

Where overhead work is being conducted, barricades must be erected around the work area to protect others from falling objects.

Where entrapment danger exist in an area in which materials may be dropped, dumped or spilled such as debris chutes shall be barricaded and protected by warning signs to prevent the inadvertent entry of workers.

A warning system for persons and mobile equipment must be in place surrounding all excavations. The warning system shall consist of barricades, hand or mechanical signals, and flashing lights at night.

### 2.5.3. Permanent Barricading

### Types of permanent barricading

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Permanent barricades, including platform hole covers, guards and handrails on steps, stairs, elevated walkways and elevated platforms shall constructed by a qualified person and conform with the requirements of Occupational Health and Safety Regulations.

### • Guard rails

Every open sided floor, working platform, runway, walkway or balcony over 1.22 meters above the existing floor or ground level shall have a guard rail installed that meets the requirements of Occupational Health and Safety Regulations

### • Approval for removal

No person shall remove any part of any permanent handrail, mid rail, platform, kick plate or stairway from any site fixed installation without use of the management of change process.

Solid/fixed barricading shall be used to barricade a Danger zone include, but are not limited to:

- Where the barricading needs to be higher than 1.8 meters / 6 feet or provide a solid fixed barrier
- Areas where flooring, hand rails, solid fixed barriers or equipment have been removed causing an opening and risk of falling
- Holes or excavations that are intended to be left in place.
- Work in manholes.

### 2.5. Avoid contamination of materials

During construction operations it is possible for contaminants to get mixed with the fresh concrete. Some of these materials have the potential to weaken the concrete and/or affect its durability. Source of contamination can be dirty aggregate that may include organic material, fine dust, or other reactive elements. Another source is construction related material such as grease/oil, nails/ties, tools and safety items, clothing, cigarettes, food, and other debris. Foreign material can impact the concrete by either replacing sound concrete with weak/incompatible filler, or by adding reactive elements that react inside the concrete. Contamination can be detected by inspections during construction, visual inspections for signs of distress such as spalls and cracks, and analysis of concrete removed from the structure (during demolition and coring). Precautions involve strict control of aggregate

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sources, good construction and safety practices, and an effective Quality Control (QC) program that monitors potential for contaminations.

Keep work and storage areas clean and orderly and in a sanitary condition. Keep stairways, access ways, and exits free from scrap, supplies, materials, or equipment.

• Waste Disposal. Collect, store, and remove combustible waste products at the end of each workday or at the end of each work shift. Use only noncombustible containers to dispose of waste and rubbish and equip them with fitted or self-closing covers. Promptly remove and dispose of spills of flammable or combustible liquids. Place scrap lumber in containers and do not allow it to accumulate in work areas. Remove or bend over protruding nails unless the scrap lumber is placed directly in containers for removal.



Contaminated land for construction ...

Fig contaminated land for construction

- Segregation of Materials and Waste. Consider storage segregation precautions for all materials. Use MSDS to determine appropriate storage segregation. Identify and label segregated material containers. Following are some examples of materials that must be segregated:
- A. Ordinary combustibles such as paper, wood, and natural fiber fabric
- B. Oily or flammable materials, such as saturated oily or solvent rags.
- C. Corrosive and caustic materials, such as batteries.
- D. Infectious materials that may cause infection, disease, or death.
- E. Reactive materials that may self-decompose or self-ignite because of heat, chemical reaction, friction, or impact.
- F. Radioactive materials.
- G. Toxic materials that may be fatal if inhaled, swallowed, or absorbed through the skin.
  - 4 Acids and Other Corrosive Materials Working with Acid/Chemicals

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When working with acids, bases, or other chemicals, one shall wear the proper clothing. The following are the five clothing items that shall be used while working with chemicals.

- A. Safety glasses/goggles: Should completely cover your eye at all times.
- B. Safety face shield: Wear over the top of any safety glasses or goggles.
- C. Full-length acid smock: Wear over the clean-room clothing.
- D. Rubber gloves: Wear with a two-inch cuff. This prevents acid from running down your arm. Also, inflate with nitrogen and submerse in water to check for pinhole leaks before using.
- e) Hard leather or other non-porous shoes

### 2.6. Hazardous materials

#### 2.6.1. Solvent hazardous materials

Solvents, often known as VOCs (volatile organic compounds), are used to dissolve or dilute other substances and can be found in many construction products such as paints, paint strippers, thinners and glues. Potentially harmful solvents include dichloromethane (DCM), also known as methylene chloride, toluene, xylene, white spirit, acetone and ethyl acetate. Certain tasks, such as spraying, can produce very high exposures

#### What you should know

Solvents can make you ill by:

**Breathing vapors** - paints and other products give off solvent vapors as they are applied, dry or cure.

**Skin contact** - some solvents can be absorbed through the skin. Repeated or prolonged skin contact with liquid solvents may cause burns or dermatitis.

**Eye contact** - contact with liquid solvent and solvent vapor can cause irritation and inflammation.

Ingestion - you can take solvents into your body on contaminated food, drink and cigarettes.

Different solvents can affect your health in different ways. High airborne concentrations of some solvents can cause unconsciousness and death. Exposure to lower levels of solvents can lead to short-term effects including irritation of the eyes, lungs and skin, headaches, nausea,

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dizziness or light-headedness. Some of these effects may also increase your risk of having an accident. There can also be long-term effects on your health from repeated exposure to particular solvents. These may include dermatitis and liver, kidney or neurological diseases. If you are unsure what solvent your product contains you should check the product label or ask your supplier for a safety data sheet

### 2.6.2. Solvents, glues, coatings and inflammable materials

Solvent-based products – including rubber cement, epoxy, instant glues, model glues and plastic adhesives are the most hazardous type and can be recognized by the words "flammable," combustible" or "contains petroleum distillates" on the label.

### Segregation of hazardous materials

This Technical Measures Document refers to issues surrounding the storing and segregation of hazardous materials and how it can be used to minimize the foreseeable risks of a major accident or hazard.

✓ General principles

The following aspects should be considered with respect to the Segregation of Hazardous Materials:

- Human factors;
- Poorly skilled work force;
- Ignorance towards physical and chemical properties of stored substances;
- Unconscious and conscious incompetence;
- Plant lay-out; and
- Plant siting.

### The following issues may contribute towards a major accident or hazard:

- Failure to understand the properties of substances handled;
- Failure to identify hazards associated with mixing substances and domino events;
- Failure of quality assurance procedures;
- Insufficient recording of chemical inventories at each location on site;
- Insufficient labeling of chemical storage containers (raw materials, reactants, intermediates, products, by-products and waste);
- Poor warehousing management systems;
- Poor housekeeping.

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### Major hazards could arise from the following:

- Storing incompatible substances together;
- Domino effects (e.g. thermal radiation from fires);
- Direction of leaks to common sumps/manifolds;
- Incorrect labeling/delivery of raw materials, intermediates and products;
- Introduction of ignition sources into segregated areas containing flammable, combustible and explosive substances (e.g. smoking, mobile equipment and vehicles, power tools);
- Use of non-intrinsically safe equipment within intrinsically safe zones;
- Poorly managed inventory control and identification systems for hazardous chemicals stored in drums and vessels;
- Poor housekeeping.

### 2.7. Nontoxic materials

**Nontoxic materials** means "materials for product water contact surfaces utilized in the transporting, processing, storing, and packaging of bottled drinking water, which are free of substances which may render the water injurious to health or which may adversely affect the flavour colour, odour, or bacteriological quality of the water."

Nontoxic materials are not considered to be harmful or destructive to human health. It is to be noted that at some level, every substance is toxic. Therefore the toxicity must be evaluated in terms of quantity of material. If the quantity of a substance that causes harm is less, its toxicity is determined to be higher.

Toxicity is the degree to which a chemical substance or a particular mixture of substances can damage an organism. [1] Toxicity can refer to the effect on a whole organism, such as an animal, bacterium, or plant, as well as the effect on a substructure of the organism, such as a cell (cytotoxicity) or an organ such as the liver (hepatotoxicity). By extension, the word may be metaphorically used to describe toxic effects on larger and more complex groups, such as the family unit or society at large. Sometimes the word is more or less synonymous with poisoning in everyday usage.

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Toxic substance is any liquid, solid or gas, which when introduced into the water supply creates, or may create a danger to health and wellbeing of the consumer. An example is treated boiler water. A non-toxic substance is any substance that may create a non-health hazard and is a nuisance or is aesthetically objectionable. For example, foodstuff, such as sugar, soda pops, etc. Therefore, you must select the proper device according to the type of connection and degree of hazard. There are five basic products that can be used to correct cross connection.

Toxic materials are substances that may cause serious harm to an individual if it enters the body. This document provides guidance on safe handling and storage practices, and how to work safely with toxic materials. For more information about the hazards of toxic materials and how they are identified, refer to the OSH Answers document called Toxic Materials and their Hazards.

### 2.8. Dust suppression procedures

### 2.8.1. Using correct procedures for dust materials to minimize health risk

Workers in baking-related jobs may inhale flour dust when it becomes airborne.

The health effects of inhaling flour dust depend on the concentration of the airborne. The most effective way to reduce the risk of exposure to flour dust .This involves eliminating the hazard by substituting a safer process or material,

### Cleaning – general procedures

Cleaning is important for infection control – particularly in work areas – because deposits of dust, soil and microbes on surfaces can transmit infection. Contaminated areas such as operating rooms or isolation rooms must be cleaned after each session, and spot cleaned after each case or thoroughly cleaned as necessary.

### The following basic principles should be followed:

written cleaning protocols should be prepared, including methods and frequency of cleaning; protocols should include policies for the supply of all cleaning and disinfectant products standard precautions (including wearing of personal protective equipment [PPE], as applicable) should be implemented when cleaning surfaces and facilities (see 'Standard and additional precautions')

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Sprays should not be used, because they can become contaminated and are difficult to clean. Sprays are not effective, as they do not touch all parts of the surface to be cleaned

## **\*** Cleaning – specific procedures

Surface cleaning

Floors in hospitals and day-care facilities should be cleaned daily or, as necessary, with a vacuum cleaner fitted with a particulate-retaining filter. The filter should be changed in accordance with the manufacturer's instructions.

The exhaust air should be directed away from the floor to avoid dust dispersal.

### 2.9. Provide protections of material

Material handling and storage is one of the most important aspects that can determine the success or failure of a construction project. If done well, it can help reduce costs and construction-related injuries. So, to ensure you've got a smooth construction process, it'd be helpful to implement the strategies mentioned here.

Safe handling and storage of materials are essential for many businesses, and construction firms are no exemption. Some materials found in a construction site are poisonous and others contain flammable gases. Coming into contact with such materials can leave you severely injured or even dead.

Also, when exposed to different weather conditions, some of the construction materials can lose their usefulness. That's why there's a need to develop some effective strategies to help you avoid these accidents.

So, if you want to keep your construction materials safe and retain their usefulness, it'd be beneficial to read this article because you're going to learn simple yet effective strategies. When properly implemented, these can help you handle and store construction materials properly. Read on.

### 2.9.1. Defining Material Handling and Storing

Material handling is the process of moving, protecting, storing, and controlling materials throughout the construction process. It includes the steps taken when dealing with construction materials from when they're delivered to the construction site until when they're

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disposed of. On the other hand, material storage is a sub-section of the handling process. It involves holding construction materials in a safe place until these are required during the construction process.

### 2.9.2. Handling and Storing Construction Materials Carefully

To ensure safety when dealing with construction materials, you must lay down some policies and procedures to be followed by everyone within the construction site. Proper implementation of these policies ensures both the workers and materials remain safe throughout the construction process.

For proper construction material handling and storage, employ the following strategies:

### **1. Train Your Workers**

As earlier noted, there are many risks involved in material handling and storage, and some of these are hazardous and can cause harm to the workers. However, training your workers about the best practices can help eliminate some of the risks and dangers involved.

So, before you commence your construction process, it'd be helpful to have safety training programs in place to ensure workers are equipped with enough knowledge about handling all the materials within the construction site.

In addition, the training of workers should be a continuous process, and any new recruited worker must be trained before commencing their assignments. Training allows workers to know how to handle and in what manner to store the materials. This allows the construction materials to retain their usefulness and prevents workers from injuring themselves.

### 2. Store Similar Materials Together

Some construction materials and chemicals can react to each other when put together. For instance, some are highly flammable and may react to each other. This poses a danger to both the workers and the material themselves.

When the fire consumes construction materials, it attracts more costs to your construction project because forced to go back to the shop to replace the lost ones. That's why there's a need to store materials and chemicals in different places.

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### 3. Dispose of Waste Construction Materials Appropriately

Sometimes, disposing of waste construction materials can be stressful and overwhelming. One of the best ways to manage your construction waste materials is by ensuring they aren't left uncollected for long.

When you fail to dispose of waste materials on time, they can interfere with the smooth running of the construction process. They can also injure your workers. That's why it'd be helpful to have measures in place to help dispose of waste construction materials appropriately.

### 4. Choose Storage Space

The quality of most construction materials can be affected by varying weather conditions. So, to ensure you retain their quality, it'd be helpful to store them in room temperature condition and carefully cover them.

Also, it'd be helpful to ensure your construction materials aren't placed on bare ground. This ensures they don't absorb moisture which can affect their quality. In addition, be sure not to place your construction materials on uneven areas as some construction materials are fragile and can easily break.

### 5. Know Each Storage Weight Limits

Each construction material has its storage weight limit, which is usually indicated on its outer cover. Not adhering to it can pose a great risk to the workers because those materials can easily fall. It can also cause some materials to break. You can avoid that by adhering to the recommended weight limits.

### 6. Consider the Security Of Your Construction Site

Most construction materials are expensive, and if lost, you'll spend a substantial amount of money on replacing them. That's why you need to ensure your construction site is safe from thieves and other intruders.

If your construction site isn't safe, you can consider storing your construction materials in a different place where the security is tight. And if you have to store your construction materials on the job site, it'd be helpful to implement security measures like installing to keep watch of your materials.

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### Self-check-2

## Test-I Matching

Instruction: select the correct answer for the give choice. You have given <u>1 Minute</u> for each question. Each question carries <u>2 Point.</u>

А	В
1. Fire protection	A. An Emergency equipment
2. Cement	B .Any contact with airborne moisture
3. Lime	C. Store un slacked

# Test II: short Answer writing

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**Instruction:** write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

- 1. What about manual handling
- 2. Write the use of manual handling

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### Unit Three: Mechanical handling of materials

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- metal construction materials
- Loading and unloading construction materials.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- metal construction materials
- Loading and unloading construction materials

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#### **3.1. Metal construction materials and components**

• Many accidents, some resulting in death and serious injury, continue to occur during the storage and handling of steel and other metal stock. They cause enormous social and economic cost over and above the human tragedy involved. It is in everyone's interest that they are reduced. Accident investigations often show that these injuries could have been avoided.

• This guidance is issued by the Health and Safety Executive (HSE) and outlines the health and safety standards that need to be met in order for such accidents to be prevented. The most successful metal stockholders are well managed and already implement this good practice and consequently have excellent safety records. Applying the guidance to your work will help you manage the risks better and create a safer working environment for everyone. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

### 3.1.1. Stacking and handling Metal construction materials and components

Many accidents, some resulting in death and serious injury, continue to during the storage and handling of steel and other metal stock. They cause enormous social and economic cost over and above the human tragedy involved.

It is in everyone's interest that they are reduced. Accident investigations often show that these injuries could have been avoided.

This revised guidance is aimed at directors, owners, managers and supervisors and pays particular attention to the most common hazards, including (un)loading of delivery vehicles, storage systems, workplace transport, mechanical lifting injuries from sharp edges. Storage

Good organization of stored materials is essential for overcoming material storage problems whether on a temporary or permanent basis. There will also be fewer strain injuries if the amount of handling is reduced, especially if less manual material handling is required. The location of the stockpiles should not interfere with work but they should still

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Flammable, combustible, toxic and other hazardous materials should be stored in approved containers in designated areas that are appropriate for the different hazards that they pose. Storage of materials should meet all requirements specified in the fire codes and the regulations of environmental and occupational health and safety agencies in your jurisdiction.





- Simple construction of vertical stanchions and horizontal arms which hold the stored material.
- Racks can be single or double-sided. Smaller versions with sloping arms are known as Christmas tree racking'.

New sections compare the use of single- versus double-hoist cranes and give additional information on the safe use of pendant and remote controllers, suitable lifting accessories, working at height and providing better access arrangements with stock products. There are now specific requirements which effectively prohibit the stacking of 'U' frame racking and 'barring-off'.

### **Steel Bars**

Steel reinforcement bars and structural steel shall be stored in a way to prevent distortion, corrosion, scaling and rusting. Reinforcement bars and structural steel sections shall be coated with cement wash before stacking, especially in humid areas.

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Ladder racks

- Similar construction to toast racks but have detachable horizontal metal members supported by vertical metal stanchions.
- Suitable for a variety of long, narrow products.
- Now rarely installed in the industry as safer and more efficient systems are available.



Fig Plate or sheet metal storage

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### **3.2.** Loading, unloading Construction materials and components.

### A. Loading and Unloading Rail Road Wagons and Motor Vehicles

Each workman shall be instructed for the proper method of loading and unloading from rail wagons and motor vehicles, and provided with necessary equipment for safety. Supervisors shall ensure that the required number of workmen based on the weight and the distance involved in each job is available and engaged for the particular job Warning signals shall be displayed to indicate that the rail-wagons must not be coupled or moved while loading and unloading are carried out. The wheels of wagons and vehicles shall always be sprigged or chained while these are being unloaded; brakes alone shall not be relied upon.

Special lever bars, rather than ordinary crowbars, shall be used for moving rail wagons. Where gangplanks are used, either cleats at lower end of gangplank or pin through end of gangplanks shall be used to prevent sliding and slipping. If the gangplank is on a slope, cleats or abrasive surface shall be provided for the entire length.

When rail road wagons and motor vehicles are being loaded or unloaded near passageways or

Walkways, adequate warning signals shall be placed on each end of the way.



Loading and Unloading

### b) Manual

### Handling

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Loading and unloading of heavy items shall be done with cranes or gantries, if available. The workmen shall stand clear of the path of the material being moved by mechanical equipment. The slings and the ropes used shall be of adequate load carrying capacity. For loading heavy and long components manually into motor vehicles, rail wagons, trailer etc., either wooden sleepers or steel rails of sufficient length and properly secured in position shall be put against the body of the wagon/vehicle at three or four places. The slope of such makeshift ramp shall be less than 300 with horizontal.

Long items shall be dragged, one by one, gently and uniformly along the ramps by means of ropes

Loaded items may be shifted by crowbars and other suitable leverage mechanism in their right position. These shall not be pushed or moved by hand. Similar procedures as outlined above shall be followed for manual unloading of long or heavy items.

For regular and frequent handling, the maximum load a single workman is subject to carry shall be limited to 20 kg. Workmen to carry heavier loads shall be specially selected, and if necessary, trained.

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### Self-check-3

## Test-I Matching

Instruction: select the correct answer for the give choice. You have given <u>1 Minute</u> for each question. Each question carries <u>2 Point</u>.

А	В
1. Warning signals	displayed to indicate
2. Manual Handling	B. Workmen to carry
3. be limited to 20 kg	C. Loading and unloading

### Test II: short Answer writing

**Instruction:** write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

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### Unit Four: Clean up

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Clearing work area
- Disposing and reusing materials
- Cleaning, checking, maintaining and storing tools and equipment

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Clearing work area
- Disposing and reusing materials
- Cleaning, checking, maintaining and storing tools and equipment

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### 4.1 Clearing Work area and reusing

Before setting up the work area you will first need to clear it.

- Start by removing all unwanted building materials away from the work area. Place them in a secure area where they won't get damaged. Dispose of rubbish in the following way.
- Place metal, recyclable plastic, paper and cardboard in the appropriate recycling bins. Stack timber off cuts in a firewood pile. Store hazardous materials such as adhesives/paints for collection by the local council. Place general rubbish in rubbish bins.
- If you are working inside, sweep the floors to remove all dust and debris from the work area.

### 4.2. Disposal of Materials.

Disposal methods adopted depend on the nature of the material. To obtain this information, a comprehensive sampling and analysis program is required so that the correct route for disposal can be determined. For an old tip, sampling should also ascertain the odour levels, presence of methane, groundwater levels and leachate quality.

Solid inert waste found on plastering work site usually consists of building rubble, but may also include as demolition material timber, cement, and sand, lime, plastic and lath metals. Such wastes should be reused, recycled, or disposed of to a landfill site licensed to take such wastes

### 4.2.1. Contaminated Material and wastes

To ensure that all contaminated material uncovered on a construction site are excavated and disposed of in an environmentally responsible manner. Suggested measures

- Assay material uncovered on-site prior to disposal.
- Excavate material in a manner which avoids off-site environmental problems.
- Seal remaining contaminated material or wastes, where only part of the tip has been excavated, to ensure that there is no off-site effect now or in the future.
- Transport odorous wastes in covered vehicles.

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Dispose of contaminated material in a land fill licensed to take the type of contaminated material or wastes uncovered.

**Waste Disposal** Collect, store, and remove combustible waste products at the end of each workday or at the end of each work shift. Use only non-combustible containers to dispose of waste and rubbish and equip them with fitted or self-closing covers. Promptly remove and dispose of spills of flammable or combustible liquids. Place scrap lumber in containers and do not allow it to accumulate in work areas. Remove or bend over protruding nails unless the scrap lumber is placed directly in containers for removal.

The regular collection, grading and sorting of scrap contribute to good housekeeping practices. It also makes it possible to separate materials that can be recycled from those going to waste disposal facilities.

When choosing between waste minimization options, the following hierarchy for waste management is preferred:

- i. waste avoidance and/or reduction
- ii. Reuse
- iii. Recycling Diverting the waste stream in these ways means that waste treatment and waste disposal options can be reduced. Construction sites should pursue this hierarchy and seek out waste reduction opportunities. To identify opportunities it is necessary to consider all aspects of the project and the wastes it generates. Waste can be minimized by using improved technology, recycled or reused on-site, or by making purchasing decisions that favor recycled products. Wherever possible, include performance measures and targets for reduction, reuse and recycling options in the environmental management plan

#### Waste minimization opportunities include:

- obtaining construction materials, paints, lubricants and other liquids in reusable packaging or containers
- using noise barriers made from recycled materials
- Using overburden to construct temporary noise barriers.
- using contaminated water out of sediment dams for dust suppression and irrigating adjacent vegetated land
- Sending waste concrete from demolition activities to a concrete recycler instead of landfill.

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- segregating and recycling solid wastes generated by construction activities, offices and mess-rooms
- collecting lubricating oil from the construction vehicle fleet and sending it to a recycle

# 4.2.1. Recycling regulations/codes of practice and job specification Recyclability

Recyclability measures a material's capacity to be used as a resource in the creation of new products. Steel is the most commonly recycled building material, in large part because it can be easily separated from construction debris by magnets.

Many building materials that cannot be reused in their entirety can be broken down into recyclable components. Often, it is the difficulty of separating rubble from demolition that pre- vents more materials from being recycled.

### 4.3. Cleaning, checking, maintaining and stored Tools and equipment

### 4.3.1. Maintaining Plant, tools and equipment

Tool housekeeping is very important, whether in the tool room, on the rack, in the yard, or on the bench. Tools require suitable fixtures with marked locations to provide an orderly arrangement. Returning tools promptly after use reduces the chance of it being misplaced or lost. Workers should regularly inspect, clean and repair all tools and take any damaged or worn tools out of service.

- Only tools and equipment which are in good condition may be used.
- Tools shall only be used for the purpose for which they were designed.
- Employees shall make frequent inspections of tools and equipment, and immediately remove from service any items found defective.
- When using hand tools, the employee shall place himself in such a position that he will avoid injury if the tool slips.
- Only soft faced hammers (brass, plastic, rubber, or similar materials) shall be used on highly tempered steel tools such as cold chisels, star drills, etc. Proper eye protection must be worn when performing such an operation.
- Files, rasps, and other tools having sharp tangs shall be equipped with approved handles.
- Tools which are not in use shall be placed where they will not present a tripping or stumbling hazard.

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- Pointed tools shall never be carried edge or point up in pockets.
- Tools shall not be thrown from one worker to another, or to another working location.
- Extensions shall not be used on wrenches to gain leverage unless the wrench is designed to be used in such a fashion.
- When cutting wire or any other material under tension, the material being cut shall be secured to prevent the ends from snapping free.
- All power tools must be properly grounded before their use.
- Gloves shall not be worn when operating lathes, drill presses, power saws, or similar equipment. Loose clothing must not be worn and long sleeves should be rolled up prior to operation.
- Hooks, brushes, vacuums, or special tools shall be used to remove dust or chips. Compressed air shall not be used.
- All machinery must be turned off when unattended.
- Maintenance, repairs, adjustments, and measurements must not be made while saws, lathes, grinders, and similar equipment are in operation.
- Compressed air shall never be used to dust off clothing, or be directed toward another person.
- Saw blades, gears, sprockets, chains, shafts, pulleys, belts, and similar apparatus shall not be operated without the proper guarding.
- Safety glasses, goggles, or face shields shall be worn when operating power tools

### 4.3.2. Checking and maintenance

- Before every use, look for signs of damage to blasting equipment and power tools.
- Before use, check compressed air lines; check that any compressed air cutout works properly.
- At least once a week, check the condition and operation of blasting equipment.

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- At least once a quarter, maintain the equipment according to the manufacturer's instructions.
- Keep this information in your testing logbook.

Use care when handling hawks and trowels as the edges can become sharp with use. Keep the surfaces of application tools clean during use and when the work is done. Ensure that application tools are dry before storing them. Never use a trowel for chipping or chopping

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