

# **STRUCTURAL CONSTRUCTION WORKS**

## **LEVEL – II**

**Based on March, 2022 (Version - I) Occupational  
Standard (OS)**



**Module Title: - Carry-out Concrete Bursting and  
Crushing Operations**

**Module code: EIS SCW2 M09 0322**

**Nominal duration: 80 Hours**

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## Acronym

1. PPE Personal protective equipment
2. BCPSAG Building construction Performance Standards Advisory Group
3. LAP test Learning Activity Performance test
4. OSHA Occupational Safety and Health Administration

- 5. WHS Workplace health and safety
- 6. BCB Building Control Body
- 7. LABC Local Authority Building Control
- 8. AIBC Private sector Approved Inspector Building Control

## Introduction to the Module

In structural construction work; the Concrete Bursting and Crushing Operations module helps the trainee how to prepare work site and operation of equipment in save way for Bursting and crushing reinforced concrete. And it is also designed to meet the industry requirement under the structural construction work occupational standard, the knowledge, attitudes and skills required in carrying out of concrete bursting and crushing operations

### This module covers the units:

- Prepare for work.
- Prepare work site
- Burst and crush reinforced concrete
- Clean up

### Learning Objective of the Module

- Prepare for work.
- Prepare work site
- Cary out Burst and Crush reinforced concrete
- 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

## Unit one: Prepare for work

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

- Work instructions
- Safety requirements
- Tools and equipment.
- Environmental protection requirements

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:

- Apply Work instructions
- Follow safety requirements
- Select tools and equipment.
- Identify environmental protection requirements

### 1.1. Work instructions



### 1.1.1. Information about the work

- Work instruction is a description of the specific tasks and activities within an activity. A work instruction in a project will generally outline all of the different jobs needed for the operation of the firm in great detail and is a key element to running a project smoothly. In other words it is a document containing detailed instructions that specify exactly what steps to follow to carry out an activity. It contains much more detail than a Procedure and is only created if very detailed instructions are needed. For example, describing precisely how a Request for Change record is created in the Change Management software support tool.
- Describe what workers need to be able to do on the job
  - Work functions
  - Key activities of each work function
  - Performance indicators
- Describe what task to be done or work roles in a certain occupation

### 1.1.2. Job Specification

A statement of employee/workers characteristics and qualifications required for satisfactory performance of defined duties and tasks comprising a specific job or function.

Placing of reinforcement bars for structures requires a working drawing or reinforcement plan, containing all the necessary information. It is important to be able to read this plan in order to cut and bend the required bars to the correct size and shape.

## 1.2. Safety requirements

### 1.2.1. Occupational Health and Safety (OHS)

OHS requirements are legislation/regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of firefighting equipment, enterprise first aid, hazard control and hazardous materials and substances.

Personal protective equipment includes those prescribed under legislation /regulations/ codes of practice and workplace policies and practices. Safe operating procedures include the conduct of operational risk assessment and treatments associated with workplace

organization. Emergency procedures include emergency shutdown and stopping of equipment, extinguishing fires, enterprise first aid requirements and site evacuation.

Occupational safety and health (OSH) also commonly referred to as occupational health and safety (OHS) or workplace health and safety (WHS) is an area concerned with the safety, health and welfare of people engaged in work or employment. The goals of occupational safety and health programs include fostering a safe and healthy work environment. OSH may also protect co-workers, family members, employers, customers, and many others who might be affected by the workplace environment. In the United States the term occupational health and safety is referred to as occupational health and occupational and non-occupational safety and includes safety for activities outside work.

Occupational safety and health can be important for moral, legal, and financial reasons. In common-law jurisdictions, employers have a common law duty (reflecting an underlying moral obligation) to take reasonable care for the safety of their employees. Statute law may build upon this to impose additional general duties, introduce specific duties and create government bodies with powers to regulate workplace safety issues: details of this will vary from jurisdiction to jurisdiction. Good OSH practices can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs.

### **1.2.2. Protective clothing and equipment**

Personal Safety is designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. So there are many equipment those are used by worker that protect from themselves. Rebar up to #4 can often be bent and cut by hand. Larger diameter rebar is not typically used outside commercial or industrial concrete work and usually requires specialized equipment such as hydraulic shears and benders. When cutting bar of 1/2 inch (number 4) rebar which is a common rebar found in residential landscaping and concrete work we have to follow the following safety rules

- A. Selecting and checking PPE.** Concrete Bursting and Crushing Operations is heavy and always wear eye protection, sleeved shirts, long pants, gloves, and sturdy boots when handling rebar



Fig.1.1. *Personal protective equipment (PPE)*

Personal protective equipment (PPE) is used to protect an individual from hazards associated with their work tasks or environment. Specific types of personal protective equipment include protective clothing, eyewear, respiratory devices, protective shields, gloves, and hearing protection.

Protective equipment that must be available may include the following:

- Eye protection (goggles)
- Rubber gloves or leather gloves

- Overalls.
- Face shields.
- Face mask and ear protectors
- Steel capped boots/shoes
- sunscreen lotion

### **Eye protection (goggles)**

It is required to use eye protection equipment like goggle, eye shield, to protect our eye from dusts, chemicals, etc by all workers engaged in hazardous activities or are exposed to identify eye hazards.



*Fig.1.2 Eye protection (goggles)*

### **Hand Protection (leather glove)**

It is required to use appropriate hand protection when hands are exposed to hazards, such as:

- Skin absorption from harmful substances;
- Cuts, lacerations or abrasions;
- Chemical exposure;
- Thermal burns and/or temperature extremes
- Potentially infectious material.



*Fig.1.3 Hand Protection (leather glove)*

### **Body Protection**

**Chemical Resistant Clothing:** Protective apparel designed to provide a barrier against a variety of chemical hazards. Chemical resistive clothing may be required for tasks where chemical splashing is anticipated or large volume transfers are conducted. Prior to selection of chemical resistant clothing, **Laboratory Apparel and Scrub Suits:** A wide variety of styles and materials are available to protect employees during laboratory operations. The selected type of lab coat or other apparel is designed to protect the wearer against accidental splashes or day-to-day handling of chemicals;



*Fig.1.4 Overall*



*Fig.1.5 Steel capped boots/shoes*

### **Ear and Hearing Protection**

Ear plugs and muffs are available for any employee potentially exposed to noise levels



*Fig.1.6 Ear and Hearing Protection*

### **Head protector (hard hat)**

**Hard hat:**-Protects head of the worker from any falling objects dropping from high level during construction.



*Fig.1.7 Head protector (hard hat)*

### **Training Employees in the Proper Use of PPE**

Employers are required to train each employee who must use PPE. Employees must be trained to know at least the following:

- When PPE is necessary
- What PPE is necessary?
- How to properly put on, take off, adjust and wear the PPE.
- The limitations of the PPE.
- Proper care, maintenance, useful life and disposal of PPE.

Employers should make sure that each employee demonstrates an understanding of the PPE training as well as the ability to properly wear and use PPE before they are allowed to perform work requiring the use of the PPE. If an employer believes that a previously trained employee is not demonstrating the proper understanding and skill level in the use of PPE, that employee should receive retraining. Other situations that require additional or retraining of employees include the following circumstances: changes in the workplace or in the type of required PPE that make prior training obsolete. The employer must document the training of each employee required to wear or use PPE by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification.

#### **B. Workplace hazards**

Although work provides many economic and other benefits, a wide array of workplace hazards also present risks to the health and safety of people at work. These include "chemicals, biological agents, physical factors, adverse ergonomic conditions, allergens, a complex network of safety risks," and a broad range of psychosocial risk factors.

#### **C. Physical and mechanical hazards**

Physical hazards are a common source of injuries in many industries. They are perhaps unavoidable in certain industries, such as construction and mining, but over time people have developed safety methods and procedures to manage the risks of physical danger in the workplace. Employment of children may pose special problems. Falls are a common cause of occupational injuries and fatalities, especially in construction, extraction, transportation, healthcare, and building cleaning and maintenance.

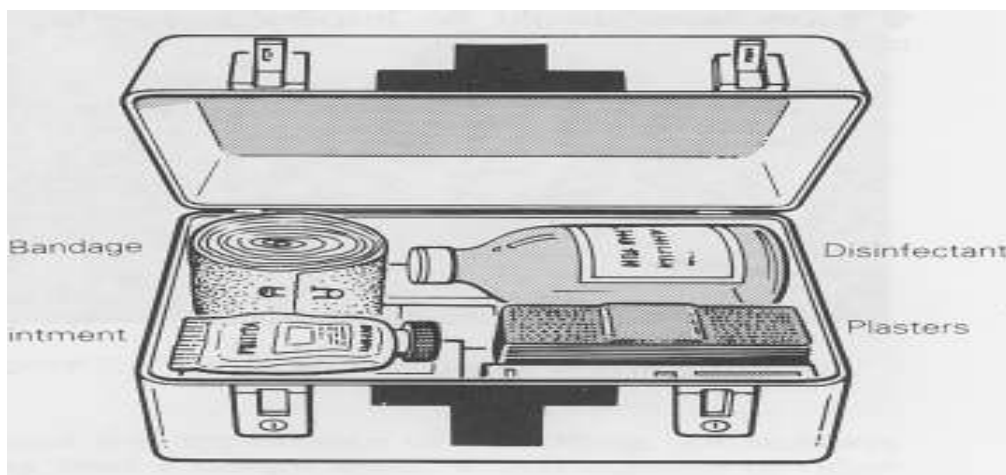


*Fig.1.8 At-risk workers without appropriate safety equipment*

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

- Plasters;
- Bandages;
- Ointments;
- Disinfectant.

Someone on site should be in charge of the box and know how to with broken bones, burns and electric shocks.



*Fig.1.9 A simple first aid box*

#### **D. Workplace environment and safety,**

**Setup a workspace.** Rebar comes in very long rods (typically 8–20 foot and up to 40 feet in length). Due to its length, tendency to be covered with mill scale or rust, and overall



weight rebar is usually best handled in a large open area with few obstructions. Cutting rebar often creates very hot sparks so make sure the area is clear of flammable materials. The rust and sparks from rebar can ruin clothing so wear something sturdy and old.

## 1.3. Tools and equipment

### 1.3.1. Tools

The following are some of hand tools used for performing the bursting and crushing concrete activities

#### A. Trowel

This is a tool, which every mason needs. Used for picking up mortar out of the barrel, spreading mortar on the wall, bed joints and cutting off excess mortar. In addition to the picture shown, a Triangular and rectangular trowel are also used by the mason.



*Fig.1.10 Mason trowel*

#### B. Walling Hammer/Mason hammer/

Walling Hammers are used especially to knock of parts of walling unit blocks, /brick, concrete blocks etc/. The hammer weighs about half a kilogram and is made of steel. It has a wooden handle, which should always fit, firmly to the hole in the head. The flat part of the hammer at one of its end is called cutting edge/use to cut bricks or concrete blocks/ and the square head of the hammer on the other end is called striking face which is used to strike laid stones. The hammer must be formed in a kind that the cutting edge and central line of the hammer head lie in a circular arc.



*Fig.1.11 Hammer*

#### C. Chisel



Used to cut concrete blocks, bricks, plaster surface and to remove mortar projections etc. Cold chisels are available in different sizes and shapes. The operation is done together with a club hammer.



*Fig.1.12 Flat chisel*



*Fig.1.13 pointed chisel*

#### **D. Mortar barrel/ drum**

This is used by mason, plasterer, tiller, etc, and serves to prepare small amount of mortar right at the working place. It is also used as temporary mortar storage, supplied from mixing station, and to control water ratio of the mix when it gets dry. Always, keep it workable and clean.

A Bucket is used to serve small amount of water or material and to take the tools after



*Fig.1.14 Bucket*

#### **E. Brush and Broom**

Is used for wetting the building stones, cleaning fresh mortar joints of masonry wall, to clean hand tools before and after use and to clean dust on surfaces.



*Fig.1.15 Broom*



*fig.1.16 Hand broom or brush*

### **1.3.2. Equipment**

Breaking down large pieces of concrete can seem like a challenging job. Attempting to remove concrete structures can be a time-consuming, messy and incredibly noisy task. However, with the right equipment, removing even the most awkward pieces of concrete becomes a straightforward task.

Concrete bursting equipment can make light work of any concrete obstruction which you need to remove. To use concrete bursting equipment as part of your concrete removal

method, you simply need to drill holes in the piece of concrete. Once you have created holes in the correct places, the concrete bursting equipment is then placed in the holes. The hydraulic power of the concrete bursting equipment then gets to work, and the pressure that it exerts splits the concrete block apart. You will be left with smaller pieces of concrete that are far easier to remove.

### **A. Benefits of Concrete Bursting Equipment**

This useful equipment offers many benefits for the breakdown and removal of concrete in construction projects:

Using concrete bursting equipment creates less mess, as far less dust is generated when the concrete is broken down.

Concrete bursting equipment reduces the risk of injury to workers, as the method is far safer, and the broken down pieces of concrete are easier to remove.

Using concrete bursting equipment is a far less labour-intensive way to remove concrete. The power of hydraulic pressure performs the task instead of your workforce.

Breaking down the concrete with concrete bursting equipment is a much quieter way to get the job done when compared with other methods of concrete break down and removal.

### **B. Bursting and Crushing Operations Equipment**





*Fig.1.17 Equipment required for use Bursting and Crushing Operations*

## 1.4. Environmental protection requirements

### 1.4.1. What is Environmental Management?

Environmental management (EM) is a subject that combines science, policy, and socioeconomic applications. It primarily stresses on finding solution to practical problems that people face in cohabitation with nature, resource exploitation, and waste production.

In a purely anthropocentric sense, environmental management is all about dealing with the fundamental issue of how to innovate technology to evolve continuously while limiting the degree to which this process alters natural environment. Thus, Environmental management is closely linked with issues regarding sustainable economic growth, ensuring fair and equitable distribution of resources, and conserving natural resources for future generations.

There are a number of advantages to undertaking environmental management and these include:

- I. Cost savings
- II. Ensuring legislative compliance
- III. Anticipating future legislation
- IV. Reduced environmental risk
- V. Meeting supply chain requirements
- VI. Improved relations with regulators
- VII. Improved public image
- VIII. Increased market opportunities
- IX. Employee enthusiasm

### 1.4.2. What is an Environmental Policy?

An environmental policy is a document prepared by a company or an organization which clearly sets out its overall aims and intentions with respect to the environment. An environmental policy provides a sense of direction for a company and shows that it is committed to managing its environmental affairs in a responsible way. The policy should be endorsed by the company's senior management and should be publicly available. It should be an integral part of the business strategy and be compatible with company's other policies (e.g. on quality and on health and safety).

Each of these benefits is now examined below:

#### ❖ **Cost Savings**

Most, if not all people, wish to protect the environment. However, many businesses fear that protecting the environment by improving their environmental performance will cost money.

They fear there will be a conflict between their desire to protect the environment and their desire to keep down costs and run a successful business.

The good news is that many businesses have discovered that far from increasing costs, improving environmental performance actually reduces costs. Many companies have found that it is possible to save money, sometimes large sums of money, by improving their environmental performance.

Cost savings within a company or a firm can be achieved through changes in areas such as:

- i. process efficiency
- ii. Product design
- iii. Waste disposal
- iv. Sourcing of raw materials
- v. infrastructure
- vi. Packaging and transport

Various ways of achieving cost savings are described briefly below:

#### ❖ **Process Efficiency**

Improving the efficiency of existing processes

Optimizing the performance of existing processes minimizes the use of raw materials and energy and the production of waste. Reduced use of raw materials and energy and reduced waste production are all good for the environment and the reduced resource costs and waste disposal costs are good for business. Proper maintenance of equipment is

important as it minimizes costly downtime and the resource waste often associated with shutdown and start-up periods.

Introducing more efficient processes

Introducing new and more efficient processes also reduces resource use and waste production. Many companies have been able to make large cost savings by reducing the amount of raw materials, energy and water that they use.

#### ❖ **Product Design**

It may be possible to redesign a product so as to reduce the amount of resources it contains whilst still maintaining the level of service it provides.

#### ❖ **Waste Disposal - Making Money from Waste**

As mentioned above, improving process efficiency will reduce the amount of waste that a process produces. Once waste has been generated, it is often possible to reuse it or pass it on to other companies that can use it and so avoid the costs of waste disposal.

#### ❖ **Sourcing of Raw Materials**

Changing the source of raw materials used in a particular process can result in cost savings. Companies could make large savings by using recycled wool rather than virgin wool to manufacture its products, or use recycle paper rather than manufactured paper that could save substantial number of trees being felled.

#### ❖ **Infrastructure**

It is also possible to make savings by making efficiency changes to infrastructure e.g. installing energy efficient lighting, insulating buildings, improving the efficiency of heating systems.

#### ❖ **Packaging and Transport**

Once goods have been produced, they need to be packaged and transported. It is possible to make cost savings in these areas at the same time as improving environmental performance.

#### ❖ **Ensuring Legislative Compliance**

By ensuring that it complies with relevant environmental legislation, a company or a firm can avoid the possibility of being fined by the regulatory authorities for noncompliance and the adverse media publicity and public criticism & outrage that can accompany such fines.

#### ❖ **Anticipating Future Legislation**

Developing an awareness of likely changes in environmental legislation allows companies to plan for these changes and make appropriate investment decisions. If a company or an organization is not aware of proposed legislation it may make investments that are futile when the new legislation is enacted. Alternatively, a company may find out about a legislative change at the last minute and be forced to undertake rapid investment to comply with its requirements. Prior knowledge of likely changes allows a longer time period over which to make the necessary investment and prevent possible cash flow problems.

❖ **Reduced Environmental Risk**

Environmental risk is the single largest hidden risk for many companies. By undertaking environmental risk assessment as part of the environmental management process it is possible to reduce the risk of the occurrence of events that could have adverse environmental consequences. Banks, insurance companies and investors all base their decisions on an assessment of risk. The higher the risk, the less likely a bank is to lend, the less likely investors are to invest and the higher insurance premiums are likely to be. Therefore a reduction in environmental risk is likely to be viewed favorably by all these parties, putting a company in a better position to obtain loans and insurance cover and to attract investment.

❖ **Meeting Supply Chain Requirements**

An increasing number of large organizations are requiring their suppliers to demonstrate sound environmental management and are prepared to delist those that fail to do so. In some cases having an environmental policy is not considered sufficient proof of sound environmental management and evidence is required that a company is taking action to meet the commitments set out in their policies. Hence, undertaking effective environmental management will increasingly be necessary to gain or maintain supplier status with large organizations.

❖ **Improved Relations with Regulators**

The ability to demonstrate sound environmental management may lead to environmental regulators taking a more “hands-off” approach to regulation e.g. a reduction in the number of inspection visits required per year.

❖ **Improved Public Image and Community Relations**

By publicizing its efforts to improve environmental performance, a company can improve its public image, thereby enhancing its position in the market place. And by demonstrating sound environmental management, a company can reassure the local community about its activities and thus build up good community relations.

❖ **Increased Market Opportunities**

Lower production costs resulting from environmental management and good public image resulting from publicizing good environmental performance can result in a company increasing sales and gaining a larger market share.

❖ **Employee Enthusiasm**

The environment is an issue about which many people are concerned. Undertaking environmental management can generate a lot of enthusiasm within a company as it allows employees to express their environmental concern in a practical way by contributing towards improving environmental performance

<b>Self-Check 1</b>	<b>Multiple choice</b>
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***Instruction: Select the best answer and encircle the letter***

1. Why Concrete Bursting and Crushing Operator wear the right safety equipment?
  - A/ The Concrete may be sharp and is heavy
  - B/ Concrete can create dust when being cut.
  - C/Concrete has a harmful chemical
  - D/ All of the above are correct**
  
2. All are PPE for a Concrete Bursting and Crushing Operator worker **EXCEPT**
  - A/ Eye protection
  - B/ Sleeved shirts

- C/ Gloves, and sturdy boots  
D/ None of the above
3. Which one of the following is not Responsibility of bar bender?
- A/ wearing of personal protective equipment  
B/ Clean of his hand tools after finishing his work  
C/ Work carefully all the time  
D/ Providing Main Electric supply line for crushing concrete with power saw
4. What is the advantage of Lubricating tools?
- A/ Helps Tools to perform better and reduces wear and tear of components  
B/ It prevent corrosion  
C/ To repair and replace Tool parts Easley  
D/ All of the above are correct
5. Why we store our material properly?
- A/ To prevent from thief  
B/ To manage it properly  
C/ To avoid wastage of material  
D/All of the above
6. If you store you bar outside of the shade what must be the measure you will take to avoid rust that appear due to moisture?
- A/ Put the rebar on top of a raised non-metallic platform, such as wooden pallets.  
B/ Put the rebar on ground

**Note:**

- **Satisfactory rating – above 3 points**
- **Unsatisfactory - below 3 points**

**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.

1. What is the purpose of Personal Safety?
2. Write down at least three Environmental Policy
3. What is the advantage of Chisel?

### Operation sheet 1

Operation Title	Preparing Work Area
<p><b>Purpose:-</b> To apply quality work and health care</p> <p><b>Instruction:</b> - Using the right tools to perform your task within the given time. You have given 10Minut for the task.</p> <p>Equipment and Tools</p> <ul style="list-style-type: none"> <li>➤ Shovel</li> <li>➤ Chisel</li> <li>➤ Brooms</li> <li>➤ Concrete Saw</li> <li>➤ Hammer</li> <li>➤ Drill</li> <li>➤ Cleaning Materials</li> </ul> <p><b>precaution:-</b></p> <ul style="list-style-type: none"> <li>✓ Safe working area environment</li> <li>✓ Ensure the work area hazard free</li> <li>✓ Avoid horse play</li> </ul>	

- ✓ Availability of proper tools and equipment

**PROCEDURE,**

1. Wear your PPE properly.
2. Secure workshop manuals, Specifications, tools and equipment.
3. Sort different tools and materials based on their size and kind.
4. Select appropriate way of house cleaning.
5. Identify and prepare resources and technical requirements for Carry-out Concrete Bursting
6. Observe the proper application of Occupational Health and Safety requirements.

**Quality Criteria:** Assured to follow the kaizen principle

<b>LAP Test 1</b>	<b>Practical Demonst</b>
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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time started: \_\_\_\_\_

Time finished: \_\_\_\_\_

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks within 10 min.

Task 1: Prepare Work Area

## Unit Two: Worksite Preparation

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

- Audit of property/dilapidation audit survey
- Confirmation existing services
- Hazardous material
- Fall protection devices.
- Mechanical equipment/plant

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:

- Conduct an audit of property/dilapidation audit survey
- Obtain confirmation of supervisor/regulatory authorities
- Identify hazardous material
- Install fall protection devices.
- Position mechanical equipment/plant.

## 2.1. Audit of property/dilapidation audit survey

### 2.1.1. Conducting audit of Property/Dilapidation Survey

A dilapidation survey done by a Professional Building Surveyor is an inspection of the existing structural condition of the surrounding buildings and structures before the commencement of a demolition, construction or development



*Fig.2.1 Carking Wall*

A dilapidation report is a report on the condition of a property at a given point in time. It records any existing damage, and the state of any particular aspects of the property that are likely to be affected by construction work, excavation or demolition dilapidation surveys are important tools in your hand to protect yourself and your hard-earned money from being caught up in a bad property deal. This detailed assessment is necessary when a building is about to go into demolition or new development phase or when it is about to be sold or purchased.

The responsibility of assessing whether protection of adjoining property protection works is required for certain building works lies with the relevant building surveyor for the project. The building surveyor will consider the impact of the new works associated with adjoining

property, building and public protection. Examples of building work that will invoke protection of adjoining property notification procedures under the *Building Act 1993* include:

- Retaining walls in close proximity to the property boundary.
- Bulk excavation works in close proximity to the property boundary.
- Structures proposed to be built right up the boundary.
- Underpinning or footing works that may undermine the adjoining owners footings, property, footpaths, or garden beds.
- The placement of anchor fixings that go under adjoining properties.
- New works that are supported by an existing common party wall.
- Structures in close proximity to the property boundary line and that are being built higher than the existing adjoining structures.
- Demolition works in close proximity to the boundary.
- Access to the adjoining property for the construction of works associated with the protection works.

## 2.2. Confirmation of supervisor/regulatory authorities

### 2.2.1. What is the role of supervisor

Civil engineering professionals work as consultants for engineering consulting companies. They plan, design and execute structures like buildings, highways, water treatment plants, airports, railroads, etc. A consultant in a construction project must do the following to serve the client:

1. The consultant must provide guidance and advice on setting up a project.
2. He must define the project with perfect clarification.
3. The consultant not only must develop the project design but also co-ordinate the design.
4. He collects and prepares the product information and the documents for tender.
5. The client carries out the contract administration.
6. He must inspect and correct the works of the contractors.

In short, civil engineering consultants are functioned to perform an extensive analysis of the structure under consideration. They also analyze the environmental factors so that the structure finally constructed is durable, sustainable, functional and safe buildings

## 2.2.2. How to obtaining Confirmation from supervisor/regulatory authorities

- **Building regulations approval**

Building Regulations approval can usually be obtained in 1 of 3 ways:-

1. By the full plans method where drawings are deposited with a Building Control Body such as an Approved Inspector or the Local Authority and are subsequently checked for compliance with the Building Regulations.

The various stages of the work are also inspected and checked for compliance with the relevant technical requirements of the Building Regulations; by a Building Control Surveyor employed by either the Building Control Body (BCB).

Unlike planning permission, work may start before approval has been granted. It is also quite usual for the final building to differ in some respects to that which received full plans approval, in which case amended "as built" plans are often required to be submitted to the appropriate Building Control Body.

2. By the building notice method where notice of commencement of (minor) building work is given to the Local Authority at least 2 days prior to the commencement of work. The various stages of the work are then inspected and approved by the L.A but no plans are checked. Note that this method may not be used if the premises contain a workplace, or creates new flats.

3. Approved inspectors must issue their "Initial Notice" (stating that that particular Approved Inspector is the building control body for the specified work project, at a specific address and/or building site) to the relevant local authority before any controlled building work starts on site.

Generally Fees are paid to the Building Control Body, with each application, will vary depending on the size and value of the project and between different Local authorities across the country and each Approved Inspector is free to set their own levels of charges. Some types of work may be exempt fees, e.g. adaptations or alterations for Disabled Persons.

Some work such as Electrical and Heating installations can be carried out by persons who can certify work as being Building Regulation compliant, without further inspection by either the Local Authority or an Approved Inspector. Any work certified in this way must however be registered with the Local Authority in the geographical area in which the work has been carried out. A Building Control Body should issue a "Completion Certificate" or "Final

Certificate" upon the practical completion of each building project, to state that the work meets the technical requirements of the Building Regulations.

If an Approved Inspector cannot do this due to omissions and/or known failures of the building work to show compliance with the relevant technical requirements of the Building Regulations, then the relevant local authority should investigate and consider the need to take appropriate enforcement action recorded in the Local Lands Charges Register, held as a 'public record' by the relevant local authority. Solicitors must search these records prior to any purchase of any building.

- **Where to get approval?**

The role of checking that Building Regulations are being complied with falls to Building Control Bodies (BCBs). There are two types of BCB;–

- Local Authority Building Control (LABC) and
- Private sector Approved Inspector Building Control (AIBC).

Customers are free to choose which type of Building Control Body they use on their project.

There are voluntary Performance Standards in place for Building Control Bodies.

### **Local Authority**

- ✓ Approved Inspector

Approved Inspectors are companies or individuals authorised under the Building to carry out building control work.

- ✓ Competent Person Self-certification

Competent person schemes were introduced by the Government to allow individuals and enterprises to self-certify that their work complies with the Building Regulations as an alternative to submitting a building notice or using an approved inspector.

- ✓ 3rd Party Certification

The performance of an element of a building will be partly dependent on two things:

- ✓ Building Control Performance Standards

These Standards and the associated guidance have now been revised by the Building Control Performance Standards Advisory Group (BCPSAG).

- ✓ Building Regulations:

Ensure that only properly trained and familiarized personnel are authorized to operate with powered equipment as referenced in the Statement of Best Practices of General Training and Familiarization.

Read and understand the manufacturer’s instructions for all equipment to be used.

Choose the correct AWP equipment to reach the work.

Monitor the operator/occupant(s) performance and supervise the work to ensure the application and operation of the AWP equipment is in conformance with the lift manufacturer’s operator’s manual and all applicable standards, regulations and safety rules.

Direct and monitor the operator(s)/occupant(s) who operate with equipment to ensure that each person wears PFP equipment when required.

Ensure that only qualified personnel inspect and maintain PFP equipment. Ensure that each operator/occupant is properly trained.

Immediately remove from service personal fall arrest systems or components subjected to impact loading (e.g., involved in a fall). Use PFP equipment only for its intended use.

Avoid PFP equipment contact with sharp edges. Ensure that all edges that PFP equipment may come in contact with are smooth, rounded or chamfered.

Ensure that the AWP equipment guardrail system is properly installed and positioned, and access gate(s) and opening(s) closed per the manufacturer’s recommendations.

Approved Inspectors are companies or individuals authorised under the Building to carry out building control work.

### 2.3. Hazardous material

The construction industry has been seen as one of the hazardous industries. This is because the industry has a poor health and safety performance record compared to other industries all over the world.

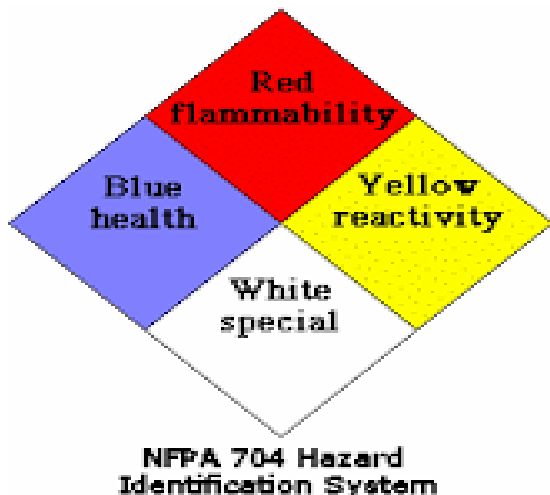
Hazardous materials must be disposed of properly to protect human health, safety and the environment. Many materials being used at the University present some type of hazard (biological, chemical, physical, or radiation) and specific disposal procedures are required. Therefore, all materials being used by a laboratory or laboratory-related unit shall be disposed in accordance with the University of Kansas Hazardous Materials Waste Management Program.

*Hazardous materials* are often subject to chemical regulations which include *materials* that are radioactive, flammable, explosive, corrosive, oxidizing, asphyxiating, bio hazardous, *toxic*, pathogenic, or allergenic.



### 2.3.1. Identifying Hazardous materials

The Hazardous Materials Identification System (HMIS) is a numerical hazard rating that incorporates the use of labels with color-coded bars as well as training materials.



- **Blue/Health**

The Health section conveys the health hazards of the material. In the latest version of HMIS, the Health bar has two spaces, one for an asterisk and one for a numeric hazard rating. If present, the asterisk signifies a chronic health hazard, meaning that long-term exposure to the material could cause a health problem such as emphysema or kidney damage.

- **Red/Flammability**

For HMIS I and II, the criteria used to assign numeric values (0 = low hazard to 4 = high hazard) are identical to those used by NFPA. In other words, in this category, the systems are identical

- **Orange/Physical Hazard**

Reactivity hazard are assessed using the OSHA criterion of physical hazard. Seven such hazard classes are recognized: Water Reactive, Organic Peroxides, Explosives, Compressed gases, Pyrophoric materials, Oxidizers, and Unstable Reactive.

- **White/Personal Protection**

This is by far the largest area of difference between the NFPA and HMIS systems. In the NFPA system, the white area is used to convey special hazards whereas HMIS uses the white section to indicate what personal protective equipment (PPE) should be used when working with the material.

### **2.3.2. How to construction Hazardous material handling**

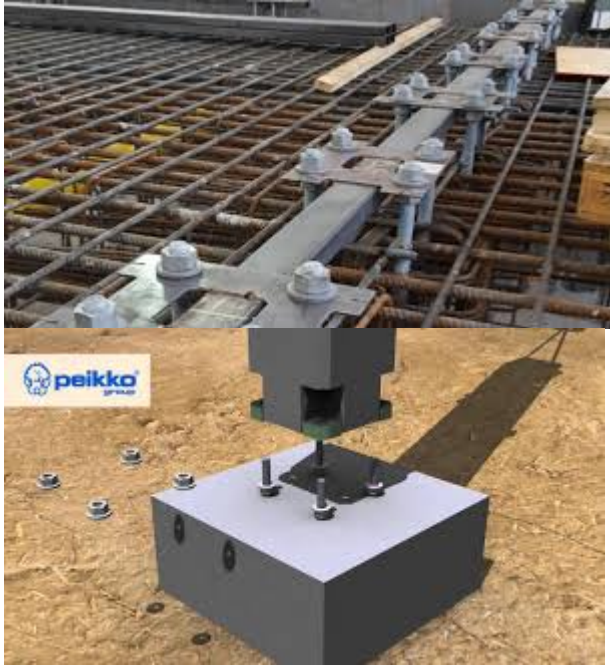
1. Carefully read the ingredient list of any product or chemical you use. ...
2. Purchase the proper personal protective equipment like gloves or goggles. ...
3. Be aware of the hazardous materials you come in contact with. ...
4. Follow safe procedures when you handle hazardous material.

## **2.4. Fall Protection Devices.**

### **2.4.1. Installing and anchoring Fall protection devices**

Anchors, otherwise known as an earth, percussion driven or mechanical anchors, are versatile devices used to hold, restrain and support building, civil engineering and other structures, either permanently or temporarily

Worker at risk of falling certain distances must be protected by guardrails or, if guardrails are not practical, by a travel restraint system, fall-restricting system, fall-arrest system, or safety net. This chapter describes travel-restraint systems and fall-arrest systems. Personal fall protection equipment consists of the components shown in the following illustration.



*Fig.2.2. Anchoring works*

*Fig.2.3. Cast anchoring*



*Fig.2.4. wall anchoring*

### **A. Safety Net**

The personnel safety net must be installed within at least 4.6 m below the work area. The net must extend 2.4m beyond the work area on all sides. The net must be set up to ensure that a falling worker cannot come in contact with another surface or any other obstruction if the worker falls into the net.

### **B. How to install anchors**

All post-installed anchors require the drilling of a hole. Generally that is done with a rotary hammer. Note that a rotary hammer and a hammer drill are not the same tool. A hammer drill

is a drill with a mechanism to vibrate the bit tip, which is useful for drilling holes in concrete block

### C. How to remove anchor

- ❖ Remove the nut and washer from the anchor.
- ❖ If the hole beneath the anchor is deep enough, simply pound it into the concrete with a hammer.
- ❖ Cut off the threaded, above-ground section of the anchor. If you have a Bolt breaker, slide it over the protrusion, rock back and forth once, and rotate until the bolt snaps off below the surface. Alternatively, cut through the bolt with a hacksaw or grinding wheel.
- ❖ If necessary, make the remaining nub flush with the surrounding concrete. Sleeve anchors can often be knocked deeper into the ground with a hammer. Hammer or

grind any  
protruding rod  
as necessary

## 2.5. Mechanical equipment/plant

### 2.5.1. What is plant on a construction site?

The term 'plant' refers to machinery, equipment or apparatus used for an industrial activity. Typically, in construction, 'plant' refers to heavy machinery and equipment used during construction works the term 'plant' refers to machinery, equipment or apparatus used for an industrial activity. Typically, in construction, 'plant' refers to heavy machinery and equipment used during construction works. Many construction companies fail to manage plant efficiently, despite the fact that it represents one of their biggest costs. Construction plant is generally re-useable, and so, as well as being purchased new, it may be purchased second hand or hired. Rented vehicles tend to be newer, and so better maintained, more reliable, and equipped with more up-to-date features. By renting plant, companies are also able to scale their fleet size up or down relatively flexibly. This can enable plant to be assigned efficiently, by listing plant and their relevant details, including availability. Relevant staff are then able to determine the availability of plant at any given time. This is particularly useful for larger companies who may have several projects in progress simultaneously and

need to be able to maximize their fleet’s utility. The actual costs of each contract can be easier to understand if plant costs are automatically associated with the relevant works in the accounts system. Rising costs are also easier to detect and monitor, and can help a company make informed decisions about managing the fleet, i.e. replacing an older vehicle that has had large repair bills.

Maintaining plant effectively and safely is a legal requirement, but it is also beneficial in terms of reducing costs. Management of plant involves identifying hazards for each item and having a plan for how they can be avoided through maintenance and regular inspections.

Accounting software can assist with highlighting the most appropriate time, i.e. during downtime, that an item of plant could undergo maintenance. This is useful in terms of forward planning projects that may need to use the item on-site, and scheduling specialist contractors that may be required for maintenance purposes.

Some of the plant management benefits of using include:

- Accurate measurement of engine load, fluid temperature and pressure, idle time, fuel consumption, etc.
- Identifying operators who may be using plant incorrectly and require retraining, e.g. using excessive fuel.
- Generating data relating to machine performance and efficiency, allowing managers to reduce energy consumption and increase productivity.
- Giving a more accurate picture of when and how plant is used..
- Better predictability of when the plant is likely to require maintenance.
- Plant performance can be tracked in real time, highlighting areas not running to their full capacity.
- Plant can be tracked, helping to prevent theft and misuse.
- Alerts relating to the location of plant can be sent to workers on-site, improving their awareness and so safety.
- Automatic ordering of replacement parts as and when required. Accurate monitoring of site noise and vibration compliance.

### **2.5.2. Positioning Mechanical equipment/plant in operating locations**

Positioning equipment is used to handle material at a single location so that the material is in the correct position for subsequent handling, machining, transport, or storage. Unlike transport equipment, positioning equipment is usually used for handling at a single workplace. A mechanical room or a boiler room is a room or space in a building dedicated to the mechanical equipment and its associated electrical equipment, as opposed to rooms intended for human occupancy or storage. Unless a building is served by a centralized heating plant, the size of the mechanical room is usually proportional to the size of the building. A small building or home may have at most a utility room but in large buildings mechanical rooms can be of considerable size, often requiring multiple rooms throughout the building, or even occupying one or more complete floors

A plant room, (sometimes referred to as a mechanical room or boiler room), is a dedicated space containing the equipment required to provide or supply building services such as; ventilation, electrical distribution, water and so on. The size of a plant room is generally proportional to the size and type of building. Large buildings may have several plant rooms, or spaces that occupy one or more stories and some plant rooms may have specific functions, such as; battery rooms, transformer rooms boiler rooms and so on. Depending on the size of the building and the nature and complexity of the building services

**Self-Check 2**

**Multiple choice**

***Instruction: Select the best answer and encircle the letter***

1. What is the role of supervisor
  - A/ He must define the project with perfect clarification
  - B/The consultant not only must develop the project design
  - C/The client carries out the contract administration.
  - D/ All of the above are correct**
  
2. What is plant on a construction site?
  - A/ It is a machinery
  - B/It is equipment
  - C/It is an apparatus used for an industrial activity
  - D/ All of the above are correct**
  
3. Which one of the following is not true about conducting audit of Property/Dilapidation Survey
  - A/ A dilapidation survey done by a Professional Building Surveyor
  - B/ It is an activities of inspection of the existing structural condition of the surrounding buildings

C/ It is an activities of inspection of the existing structures before the start of a demolition

D/ None of the above

**Note:**

- **Satisfactory rating – above 3 points**
- **Unsatisfactory - below 3 points**

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.

1. How to remove anchor?
2. How to construction Hazardous material handling?
3. Who is the responsible person for inspection of the existing structural condition of the buildings?



## Operation sheet 2

Operation Title	Applying handling of Hazardous material
<p><b>Purpose:</b> - To apply protection workers from injury or accident.</p> <p><b>Instruction:</b> - Using the right tools to perform your task within the given time. You have given 20min for the task.</p> <p>Equipment and Tools</p> <ul style="list-style-type: none"> <li>➤ Brooms</li> <li>➤ Wheel borrow</li> <li>➤ Cleaning Materials</li> </ul> <p><b>precaution:-</b></p> <ul style="list-style-type: none"> <li>✓ Safe working area environment</li> <li>✓ Ensure the work area hazard free</li> <li>✓ Avoid horse play</li> <li>✓ Availability of proper tools and equipment</li> </ul> <p><b>PROCEDURE,</b></p> <p><b>Step 1.</b> Identify the kind of protective equipment PPE needed for protecting hazard</p> <p><b>Step 2.</b> Wear personal protective equipment,</p> <p><b>Step 3.</b> Identify and provide appropriate PPE</p> <p><b>Step 4.</b> Use protective equipment properly</p> <p><b>Step 5.</b> Understand the limitations of personal protective equipment in protecting workers from injury or accident</p> <p><b>Step 6.</b> Secure workshop manuals, Specifications, tools and equipment.</p> <p><b>Step 7.</b> Be aware of the hazardous materials you come in contact with</p> <p><b>Step 8.</b> Carefully read the ingredient list of any product or chemical you use</p> <p><b>Step 9.</b> Follow safe procedures when you handle hazardous material</p> <p><b>Step 10.</b> Observe the proper application of Occupational Health and Safety requirements.</p> <p><b>Quality Criteria:</b> Assured to follow the hazard materials handling principle</p>	

LAP Test 2	Practical Demonst
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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time started: \_\_\_\_\_

Time finished: \_\_\_\_\_

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks within 20 min.

Task 1: Apply handling of Hazardous material

### **Unit Three: Burst and crush reinforced concrete**

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

- Operation of Mechanical equipment.
- Direction and assistance of equipment operators

- Measures to reduce dangerous and hazards

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:

- Operate mechanical equipment.
- Provide direction and assistance of equipment operators
- Use measures to reduce dangerous and hazards.

### 3.1. Operation of Mechanical equipment

A crusher is a machine designed to reduce large rocks into smaller rocks, gravel, or rock dust. Crushers may be used to reduce the size, or change the form, of waste materials so they can be more easily disposed of or recycled, or to reduce the size of a solid mix of raw materials (as in rock ore), so that pieces of different composition can be differentiated.

Crushing is the process of transferring a force amplified by mechanical advantage through a material made of molecules that bond together more strongly, and resist deformation more, than those in the material being crushed do. Crushing devices hold material between two parallel or tangent solid surfaces, and apply sufficient force to bring the surfaces together to generate enough energy within the material being crushed so that its molecules separate from (fracturing), or change alignment in relation to (deformation), each other.

### 3.1.1. Types of Crushers:

#### I. Jaw crusher

A jaw crusher is generally used as a primary crusher in a crushing circuit. Product is fed into the top of the jaw crusher by an vibrating grizzly feeder. The eccentric rotating drive shaft causes the movable jaw to oscillate crushing the aggregate against a fixed jaw. Jaw crushers are run on belt drives driven by an electric motor or diesel engine. Jaw crushers are used extensively throughout the aggregate and mineral processing industry.



Fig.3.1. jaw crusher



*Fig.3.2 deferent type of jaw crusher*

### ❖ Operating principle:

Jaw crushers operate according to the principle of pressure crushing. The crushing material is crushed in the wedge-shaped pit between the fixed crusher jaw and the crusher jaw articulated on an eccentric shaft.

The material is crushed by the elliptic course of movement and transported downwards. This occurs until the material is smaller than the set crushing size. The feed cavity of the Jaw Crusher consist of moveable jaw and fixed jaw, which imitate the movement of the animal's two jaws to complete the materials' crushing .

Jaw Crushers have found their extensive application for the mid crushing of the various ores and large-size materials block in the field of mining, smelting, building material, highway, railway, water conservancy and chemical industry, etc

## II. Gyratory crusher

A gyratory crusher is similar in basic concept to a jaw crusher, consisting of a concave surface and a conical head; both surfaces are typically lined with manganese steel surfaces. The inner cone has a slight circular movement, but does not rotate; the movement is generated by an eccentric arrangement.

As with the jaw crusher, material travels downward between the two surfaces being progressively crushed until it is small enough to fall out through the gap between the two

surfaces. The gyratory crushers are robust crushers with modern features. They are designed to give optimal capacity in primary crushing, increasing the total capacity in the mining crushing process. These crushers have a large feed opening and a grooved mantle, making them suitable for crushing large boulders

(<https://z4y6y3m2.rocketcdn.me/blog/wp-content/uploads/2016/02/gyratory-crusher-animation.gif>)

### III. Cone crusher

With the rapid development of mining technology, the cone crusher can be divided into four types: These are compound cone crusher, spring cone crusher, hydraulic cone crusher and gyratory crusher. According to different models, the cone crusher is divided into VSC series cone crusher(compound cone crusher), Symons cone crusher, PY cone crusher, single cylinder hydraulic cone crusher, multi-cylinder hydraulic cone crusher, gyratory crusher, etc. A cone crusher is similar in operation to a gyratory crusher, with less steepness in the crushing chamber and more of a parallel zone between crushing zones.

Gyratory crusher, with less steepness in the crushing chamber and more of a parallel zone between crushing zones.

The working principle of the spring cone crusher is driven by a motor and the articulation of the gears causes the drive shaft and the transmission gear to drive the eccentric sleeve to rotate. The mobile cone of the spring-loaded cone crusher rotates under the action of the eccentric sleeve. The mobile cone and the fixed cone close or dissociate, impacting and crushing the material continuously. The structure of the spring cone crusher is mainly composed of frame, fixed cone, movable cone assembly, spring mechanism, bowl and transmission shaft frame.





*Fig3.3. Cone crusher*

Concrete is a man-made (artificial) stone or Concrete is a construction material composed of cement and other cementations materials such as fly ash and slag cement, aggregate (generally a coarse aggregate made of gravels or crushed rocks such as limestone, or granite, plus a fine aggregate such as sand), water, and chemical admixtures.

### ❖ Concrete Bursting

**Concrete bursting**, also known as hydraulic **bursting**, is a controlled method of demolition to separate large **concrete** structures into more manageable pieces



*Fig3.4.. Burst machine*



*Fig.3.5. Crushing machine*

The selection and use of the appropriate size and type of construction equipment affect the needed effort and time of a project. It also highly affects jobsite productivity. Consequently, it's not only important to select the right construction equipment, it's also crucial to use it in the right way. Whether your construction project is paving, drilling, compaction and grading, excavation and loading etc doesn't matter. You must use the equipment in the way that it's supposed to.



Construction equipment can be classified into four main categories. The groups are based on use and purpose. They are:

- Construction vehicles
- Earth moving equipment
- Construction equipment
- Material handling equipment

Heavy equipment operators usually specialize in one of three areas. Construction equipment operators also called operating engineers, handle loading and excavation machines. They use these machines to dig and lift sand, gravel, or earth. Paving and surface equipment operators use machines to spread concrete and asphalt during the construction of roadways. Pile-driver operators control equipment to hammer heavy beams of wood, concrete, and steel, called piles, into the ground.

### **3.1.2. Heavy Equipment Operator Duties & Responsibilities**

Exact duties can depend on a heavy equipment operator's specialization. Some common responsibilities include:

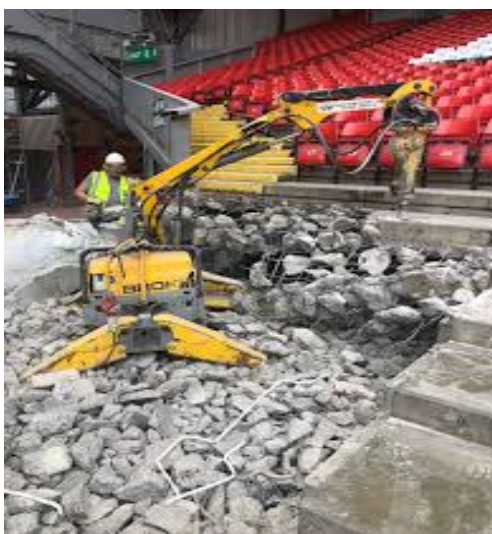
- Operate heavy equipment in compliance with the company's operating safety policies and procedures.
- Provide recommendations for maintaining and improving environmental performance.
- Load and unload equipment from vehicles and trailers.
- Ensure company equipment, material, and the work site are maintained, kept clean, and stored in a safe manner. Collect and dispose of scrap, excess materials, and refuse.
- Observe distribution of paving material to adjust machine settings or material flow, and indicate low spots for workers to add material.
- Complete required paperwork, reporting, and other documentation

### **3.1.3. The Use and Maintenance of Construction Safety Equipment**

Equipment maintenance is any process used to keep a business's equipment in reliable working order. It may include routine upkeep as well as corrective repair work. Equipment may include mechanical assets, tools, heavy off-road vehicles, and computer systems.

Here are five top tips for machinery maintenance:

1. Stay on top of large machinery operator training.
2. Add and test lubricants frequently.
3. Check for signs of wear.
4. Keep large machinery clean, and maintain a clean environment.
5. Have maintenance and repair schedule, and keep good records.



*Fig.6.1. Bursting concrete*



*Fig.6.2. Bursting concrete*

### 3.2. Direction and assistance of equipment operators

A heavy equipment operator drives or controls construction equipment, including bulldozers, forklifts, backhoes, dump trucks, cargo trucks, and hydraulic truck cranes. They operate this equipment to assist in the construction of structures, including bridges, roads, and buildings. The clarification was issued to improve the training of operators. By improving the regulations, it is hoped that there will be a reduction in the number of injuries and deaths that occur as a result of inadequate operator training. The changes apply to both general industry and the construction industry.

The training should be based upon:

1. The operator's prior knowledge and skill
2. The types of powered industrial trucks the operator will operate in the workplace
3. The hazards present in the workplace
4. The operator's demonstrated ability to operate a powered industrial truck safely



*Fig.3.7 crushing machine*

### **3.2.1. The duty of equipment operator**

- Provide support to successful completion of construction and engineering work
- Operate all heavy equipment like cranes, earth movers, bulldozers, front-end loaders, and other related equipment.
- Operate the equipment in the right direction and angles to prevent accidents and damage of property.
- Ensure and manage the machines or equipment in a safe and secure way.
- Perform periodical safety, maintenance or servicing checks to ensure proper functioning of the equipment.
- Drive and control the equipment
- Perform road work, excavation work, lifting work, etc.
- Operate the equipment manually and also through the use of electronic or technical methods of operation.
- Work in adherence to safe practices, procedures, and work site or traffic
- Conducting preventive maintenance on all equipment, reporting any malfunction to the Construction Manager:
- Performing daily safety and maintenance checks, keeping equipment clean and in excellent conditions.
- Using heavy equipment to load, move, or spread different materials (e.g. earth and rock) or to help erect or demolish structures:
- Locating underground pipes and wires, prior to beginning any excavation work;
- Assembling equipment and joining attachments on machinery; and



- Ensuring that all heavy equipment is used in accordance with all safety standards and legal regulations.
- Starting up and shutting down all equipment safely, following start-up and shutdown procedures at all times:
- Practicing workplace safety at all times and respecting all traffic regulations while driving any heavy equipment;
- Knowing how to use the equipment in advance in order to prevent any situation that could threaten a person’s safety or that could affect the current work; and
- Ensuring that all equipment is safely and securely stored at the end of each work day.
- Clearing construction areas from debris and other hazardous materials before starting a project.
- Performing maintenance and construction activities when not operating vehicles:
  - Installing and repairing guide rails and fences;
  - Ensuring construction sites are well-maintained (e.g. litter cleaning, grass cutting, and weed trimming)
  - Assisting coworkers in various functions (e.g. loading and unloading of materials and pushing other equipment when extra traction/assistance is required).
  - Advising the Construction Manager on any requirements for maintenance

### 3.3. Measures to reduce dangerous and hazards

Heavy equipment operation can be a dangerous job. Construction sites are full of hazards, and heavy equipment can cause injuries to yourself or others at the jobsite. Communicating effectively with everyone in the area can reduce the number of accidents and injuries. While communication is necessary for everyone’s safety, there are additional steps that heavy equipment operators must take. These are some safety tips heavy equipment operators use before, during and after using heavy equipment at a construction site

#### 3.3.1. Safety Equipment

Generally, safety equipment is the protection that is used by workers to avoid injuries, casualties, life threatening situations etc. Different types of safety equipment are used by workers depending upon the nature of risk involved in the work. For example, in a welding

operation the dark welding helmets are used as a piece of safety equipment. In construction operations, hard hats, foot gear and coveralls are considered safety equipment.

### 3.3.2. Type of safety

#### ❖ *Personal Protective Equipment (PPE)*

Properly wearing the right personal protective equipment when operating heavy equipment helps protect your body on the job use PPE always and anywhere where necessary. Observe the instructions for use, maintain them well and check regularly if they still offer sufficient protection.

These 7 tips will help you on your way.

1. Safety for the head: Wearing a helmet offers protection and can prevent head injuries.
2. Protect your eyes: The eyes are the most complex and fragile parts of our body. Each day, more than 600 people worldwide sustain eye injuries during their work.
3. Hearing protection: Ear plugs are very comfortable, but earmuffs are convenient on the work floor as you can quickly put these on or take them off.
4. Maintain a good respiration: Dust masks offer protection against fine dust and other dangerous particles to protect the nose and mouth against harmful pollution
5. Protect your hands with the right gloves: Hands and fingers are often injured, so it is vital to protect them properly. Depending on the sector you work in, you can choose from gloves for different applications:
  - protection against vibrations
  - protection against cuts by sharp materials
  - protection against cold or heat
  - protection against bacteriological risks
  - Protection against splashes from diluted chemicals.
6. Protection for the feet: Safety shoes and boots are the ideal solution to protect the feet against heavy weight
7. Wear the correct work clothing: Preventing accidents is crucial in a crowded workshop

#### ❖ **Barricading and safety signage shall be used**

Barricading is one of the risk control measures used to protect personnel from hazard such as: being struck by falling objects, material movements or plant; fall from height, including falling into open excavations or penetrations; fall from unprotected edges (e.g. removed flooring, walkways, stairs and handrails) exposure to hazardous substances, process or activities; unauthorized entry into a confined space or other restricted work areas; and any potentially hazardous work processes, such as hot works, demolition work, scaffolding, radiation work and work involving asbestos.

### Self-Check 3

### Multiple choice

***Instruction: Select the best answer and encircle the letter***

1. -----is a machine designed to reduce large rocks into smaller rocks, gravel, or rock dust.  
A/ Crusher  
B/Bulldozer  
C/Grader

D/Mixer

Operation Title	Carrying out Machinery Maintenance
<p><b>Purpose:</b> - To apply protection workers from injury or accident.</p> <p><b>Instruction:</b> - Using the right tools to perform your task within the given time. You have given 20min for the task.</p> <p>Equipment, Tools and Materials</p> <ul style="list-style-type: none"> <li>➤ Oil</li> <li>➤ Fuel</li> <li>➤ Brooms</li> </ul>	

2. One of the following is not the advantage of glove

- A/ protection against vibrations
- B/Protection against cuts by sharp materials
- C/ Protection against cold or heat
- D/Protection against bacteriological risks
- E/None of the above

3. -----is used as a primary crusher in a crushing circuit

- A/ Cone crusher
- B/ Jaw crusher
- C/ Concrete Bursting Machine
- D/ None of the above

**Note:**

- Satisfactory rating – above 3 points

- Unsatisfactory below 3 points

**Operation sheet 3**

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.

1. How to reduce dangerous and hazards in construction work site?
  1. Mention at least four points about the duty of crushing machine operator
  2. Write the division of cone crusher machine?



- Wheel borrow
- Cleaning Materials

**precaution:-**

- ✓ Safe working area environment
- ✓ Ensure the work area hazard free
- ✓ Avoid horse play
- ✓ Availability of proper tools and equipment

**PROCEDURE,**

**Step 1.** Identify the kind of protective equipment PPE needed for the task

**Step 2.** Wear personal protective equipment

**Step 3.** Use protective equipment properly

**Step 4.** Understand the limitations of personal protective equipment in protecting workers from injury or accident

**Step 5.** Secure machine manuals and Specifications

**Step 6.** Stay on top of large machinery operator training.

**Step 7.** Add and test lubricants frequently

**Step 8.** Check for signs of wear

**Step 9.** Keep large machinery clean, and maintain a clean environment.

**Step 10.** Have maintenance and repair schedule

**Step 11.** keep good records of schedule

**Quality Criteria:** Assured to follow the maintenance and repair schedule

<b>LAP Test 3</b>	<b>Practical Demonst</b>
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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time started: \_\_\_\_\_

Time finished: \_\_\_\_\_

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks within 3 hrs.

Task 1: Carry out Machinery Maintenance

## Unit Four: Clean up

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

- Clearing construction work area
- Disposing, reusing or recycling material
- 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:

- Clear construction work area
- Dispose, reuse or recycle material
- Clean, check, maintain and store tools and equipment

## Clearing construction work area

### 4.1.1. Clearing work area

A clean, well-ordered, attractive work environment sets the tone of your establishment. It encourages tidy work habits in employees. It helps reduce fatigue. It promotes good worker-management relations. It also gives a lift to morale, which is reflected in the quality of production and overall efficiency. Good housekeeping is also a good advertisement for your company. Customers and clients have more confidence in an organization when they see work being carried out efficiently in clean, pleasant, well ordered surroundings. There's an even more important reason why good housekeeping matters — it makes the undertaking a safer place to work in

### 4.1.2. Keep Floors Clean

Every year thousands of work injuries are caused by people falling. Floor conditions are responsible for many of these accidents. When floors are given the right treatment they are much easier to keep clean and hygienic.

Spilt oil and other liquids should be cleaned up at once. Chips, shavings, dust, and similar wastes should never be allowed to accumulate. They should be removed frequently, or better still, be suitably trapped before they reach the floor

## 4.2. Disposing, reusing or recycling material

### 4.2.1. Material disposal

**Dispose of Scrap and Prevent Spillage:** It's a common practice to let the floor catch all the waste and then spend time and energy cleaning it up. It is obviously better to provide convenient containers for scrap and waste and educate employees to use them. Safety will benefit, expense will be saved, and the working area and learning classes will be a better place in which to work & learn. Oily floors are a common accident and fire hazard. Splash guards and drip pans should be installed wherever oil spills or drips may occur. Prevent accidents by keeping oil and grease off the floor

### 4.2.2. Material Reuse or Recycle

Reusing and recycling construction products avoid or reduce waste and saves primary resources. By recycling, we contribute to more sustainable development by eliminating or reducing waste and by saving primary resources. Also, recycling some materials, like metals, saves energy (and reduces carbon emissions) since it requires less energy to re-melt scrap than it does to produce new metal from primary resources.

The benefits of recycling are well understood and include:

- Reducing waste, i.e. diverting waste from landfill
- Saving primary resources, i.e. substituting primary production
- Saving energy and associated greenhouse gas emissions through less energy intensive reprocessing

## 4.3. Cleaning, checking, maintaining and storing tools and equipment

### 4.3.1. Cleaning of Tools and Equipment

Tools and equipment used at the construction site undergo rigorous handling. From initial foundation development, to the final construction of the exterior trim, these tools are exposed to large amounts of dirt and abuse. Proper maintenance of construction tools and equipment is critical to preserving them for future construction jobs. Failure to maintain the tools properly results in unnecessary expense.

Clean the construction tools and equipment after each day's work. While a thorough cleaning is not required each day, a general wipe-down and removal of the heaviest

construction dirt is key to extending the life of the tools.

### 4.3.2. Checking Hand tools

➤ Mechanical failure or loss of control when using a tool with defective parts.

Examples of unsafe tools are hammers with loose or damaged heads, screwdrivers with broken handles or blunt edges, chisels with mushroomed heads, and blunt saws.

### 4.3.3. Checking Power tools:

- Malfunctioning of safety devices such as emergency button (red button), protective covers, guards, etc. In case of emergency these devices will not work properly or will provide limited protection to the worker, which in some cases can be worse than no protection at all because it gives a false sense of security.
- Risks of electrocution, shock or burns due to electrical malfunctions, torn cables and lack of proper insulation or proper earthing.
- Cracked or broken grinding wheels or cracked blades can cause injuries. E.g. cracked abrasive wheels could fly apart in operation, which could lead to serious injury or death.
- Emissions of chemical substances such as toxic fumes or dust, etc.
- Noise and vibration emitted by almost all portable tools that can lead to hearing loss and hand–arm vibration syndrome respectively. Vibration can cause “white-finger” disease, which arises from damage to the muscles and nerves that control the blood flow. Poorly maintained tools can cause a significant increase in noise and vibration emissions (e.g. a cutting tool that is not sharp emits higher levels of vibration). Also, damaged anti-vibration mountings in a tool can increase transmission of vibration to the worker.

### 4.3.4. Maintaining and storing of tools and equipment

Lubricate air tools and pneumatic equipment before each day's use. Condensation in the airline creates an environment for corrosion inside pneumatic tools. Coating the internal components of these tools with air-tool oil will displace the moisture and prevent tool corrosion.

Inspect and repair all construction equipment and tools at the completion of each job. Make all repairs to the equipment that are necessary for future construction work. This

will prevent time being wasted repairing faulty equipment at future construction job sites.

**Self-Check 4**

**Multiple choice**

***Instruction: Select the best answer and encircle the letter***

1. What is the advantage of reusing and recycling construction products
  - A/ Avoids waste
  - B/Reduces waste
  - C/Saves primary resources
  - D/ All of the above are correct**
2. -----is contribute to more sustainable development by eliminating or reducing waste
  - A/ Recycling**
  - B/ Technology
  - C/ Learning
  - D/ All of the above
3. What is the dis advantage if someone left Keeping Floors Clean?
  - A/ It will be attractive
  - B/ It will be good for working
  - C/ It will be caused of people falling**
  - D/ All of the above
4. Which one is true about clear area?
  - A/ It will be benefit by providing safe working area
  - B/ Expense will be saved
  - C/The working area and learning classes will be a better place in which to work
  - D/ All of the above**
5. What is the advantage of maintaining construction tools and equipment?

- A/ Increase the service life of the equipment
- B/ The performance of the equipment
- C/ Decrease the price of the equipment
- D/ A & B are correct**

6. Why we maintain construction tools and equipment?

- .A/ Because it make tools and equipment good performance
- B/ Because tools and equipment suffer a lot of wear and tear
- C/ Because working with broken tools and equipment lead to injure
- D/ All of the above**

**Note:**

- **Satisfactory rating – above 3 points**
- **Unsatisfactory - below 3 points**

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.

1. why we dispose waste materials?
1. Mention at least two points about the advantage of cleaning of tools and equipment
2. Write the benefits of recycling of waste materials



## List of Reference Materials

- A Worker’s Sourcebook: Spanish Language Health and Safety Materials for Workers, University of California, Los Angeles, Labor and Occupational Safety and Health.
- Criteria for Accepted Practices in Safety, Health, and Environmental Training, American National Standards Institute, Inc. (ANSI)/American Society of Safety Engineers (ASSE), Z490.1-2009.
- Delp, L. et al, Teaching for Change: Popular Education and the Labor Movement, UCLA Center for Labor Research and Education, 2002.
- Immigrant Worker Safety and Health Report, from a conference on research needs, draft NIOSH scientific information disseminated for peer review, NIOSH and University of Massachusetts Lowell, April 2010.
- Minimum Health and Safety Training Criteria: Guidance for Hazardous Waste Operations and Emergency Response (HAZWOPER), HAZWOPER-Supporting and All-Hazards Disaster Prevention, Preparedness and Response, National Institute of Environmental Health Sciences (NIEHS) Worker Education and Training Program (WETP), January 2006.
- ODP Blended Learning Approach, version 1.0, ODP/DHS, November 27, 2003.
- OSHA Outreach Training Program Guidelines, U.S. Department of Labor, Occupational Safety and Health Administration, February 2009
- <https://z4y6y3m2.rocketcdn.me/blog/wp-content/uploads/2016/02/gyratory-crusher-animation.gif>

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