Masonry level II

Learning Guide-35

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 01-LG-35**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO-1: Prepare for work

Instruction Sheet	Learning Guide #35

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

- obtaining, confirming and applying work instructions
- Following *Safety requirements*
- Identifying and implementing Signage or marks requirements
- Selecting *Tools and equipment* to carry out tasks
- Calculating material quantity requirements
- Identifying, obtaining and preparing materials
- Identifying and applying environmental protection requirements

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

- obtain, confirm and apply work instructions
- Follow *Safety requirements*
- Identify and implement Signage or marks requirements
- Select *Tools and equipment* to carry out tasks
- Calculate material quantity requirements
- Identify, obtain and prepare materials
- Identify and apply environmental protection requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.

5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**

Information Sheet-1	**Obtaining, confirming and applying work instructions**

I.INTRODUCTION

A work instruction describes how a task will performed within a process **(**Process – any activity or set of activities that uses resources to transform inputs into outputs). Work instructions includes Plan/ Drawing, specification and quality.

1.1Following procedures:

Procedures are a form of communication set out by a company to inform its employees of a Particular way the organization wants a task or tasks to be performed.

Procedures may include:

- Safety procedures
- Environmental procedures
- Quality procedures
- Maintenance procedures

An example why following procedure is advantageous.

A company has a procedure in place to inspect and lubricate a concrete mixer daily when in use following the manufactures recommendations.

They are procedure is followed and regular inspections are made and the mixer is lubricated to prevent parts ceasing up and wearing.

If this procedure is not followed the parts in the mixer can wear or cease and the equipment could break down in the middle of a project, when it is required to be used impacting on time to complete a job.

1.2 WORKS PROCEDURE

Before any work commences on the job, the supervisor should prepare a ‘Works Procedure’. This is a written document that considers many aspects of the task and is based on a risk assessment and should include the following:

1. The name of the competent person in regard to the concreting job.
2. A list of supervisory staff available on site and instructions as how they are to ensure strict compliance with the procedure and daily inspections of the work site.

3. An emergency response plan, this plan must include:
   Details of a communication system (either telephone or two-way radio) that will provide assistance in the event of an accident in the shortest possible time.
   All personnel must familiarize themselves with the communication system and who to Involve.
4. Provision for additional equipment to be kept on site in case of an emergency.
5. Provision for temporary protection for workers who are required to enter the site before long-term protection is installed.
6. A direction that no one enters the site unless authorised.
7. Methods and procedures to ensure scaffolding and associated work systems are installed with the minimum possible delay.
8. Instructions for all scaffolding and equipment be regularly inspected by workplace management directly in charge of the work.
9. The type of machinery that will be required for the job.
10. Access arrangements for machinery and equipment.
11. Traffic control requirements these may include:
    - On-site traffic control and management
    - Traffic control of public roads to provide entry and exit to the site.
12. Transportation of workers to and from the site.
13. Amenities for the workers, these may include:
    - Change room
    - Lunch/tea room
    - Toilets
14. Availability of services, which may include:
    - Power
    - Water

The Work Procedure may also include a code of conduct for the workers.

It should be stressed that the Work Procedure described is the minimum requirement. Many Work Procedures may cover greater detail and cover more items relevant to the site location

1.3 SPECIFICATION (technical standard)

A **specification** often refers to a set of documented requirements to be satisfied by a material, design, product, or service. A specification is often a type of technical standard.

There are different types of technical or engineering specifications (specs), and the term is used differently in different technical contexts. They often refer to particular documents, and/or particular information within them. The word *specification* is broadly defined as "to state explicitly or in detail" or "to be specific".

Using the term "specification" without a clear indication of what kind is confusing and considered bad practice.

A **requirement specification** is a documented requirement, or set of documented requirements, to be satisfied by a given material, design, product, service, etc. It is a common early part of engineering design and product development processes, in many fields.

A **functional specification** is a kind of requirement specification, and may show functional block diagrams.

A **design or product specification** describes the features of the *solutions* for the Requirement Specification, referring to either a designed solution **or** final produced solution. It is often used to guide fabrication/production. Sometimes the term *specification* is here used in connection with a data sheet (or *spec sheet*), which may be confusing. A data sheet describes the technical characteristics of an item or product, often published by a manufacturer to help people choose or use the products. A data sheet is not a technical specification in the sense of informing how to produce.

1.4 Quality requirements

Quality control (QC) is the part of quality management that ensures products and service comply with requirements. It is a work method that facilitates the measurement of the quality characteristics of a unit, compares them with the established standards, and analyses the differences between the results obtained and the desired results in order to make decisions which will correct any differences.

1.4.1 PRODUCT DESCRIPTION: CONCRETE BLOCKS AND BRICKS

Now days, hollow concrete blocks and bricks are becoming very popular. These blocks are being widely used in construction of residential buildings, factories and multi-storied buildings. These hollow blocks are commonly used in compound walls due to its low cost. These hollow blocks are more useful due to its lightweight and ease of ventilation. Concrete

blocks are wall constructing material made up of sand, cement, gravel, pumice and water with different kinds and types of mix ratio. Depending upon the required strength and purposes of the block, these ingredients may vary with mix ratio. It is sometimes called a concrete masonry unit (CMU). Most concrete blocks have one or more hollow cavities, and their sides may be cast smooth or with a design. In use, concrete blocks are stacked one at a time and held together with fresh concrete mortar to form the desired length and height of the wall.

Type of Concrete Block

Concrete blocks can be classified and divided in many ways, for example depending on their size, material of production, compressive strength and purpose.

Depending on their weight and shape: Concrete block is divided into solid and hollow concrete blocks based on its surface shape and size.

Hollow concrete block (HCB): this type of concrete block is the most common type and widely used type that have one or two hollow cores. They are light weight, economical and needs semiskilled laborers. Hollow concrete blocks are weak against lateral loads. The advantages of using HCB is that they are readily available product, sound and thermal resistance, high fire resistance, can be increased the lateral load resistance by reinforcement and has a 20+ years lifespan.

Figure 1.1 Hollow Block

Solid concrete block: Solid concrete blocks are heavier than hollow concrete blocks. Mostly manufactured solid block size is 400mmx200mmx150 mm size. These blocks are mostly used for load bearing wall construction.

Fig.1.2. Solid Block

Depending on their size or thickness

Concrete blocks mostly hollow concrete blocks have usually three different dimensions depending on their thickness according to EBCS (Ethiopian Building Code Standard).

I. 10 cm x 20 cm x 40 cm

II. 15 cm x 20 cm x 40cm

III. 20 cm x 20 cm x 40 cm

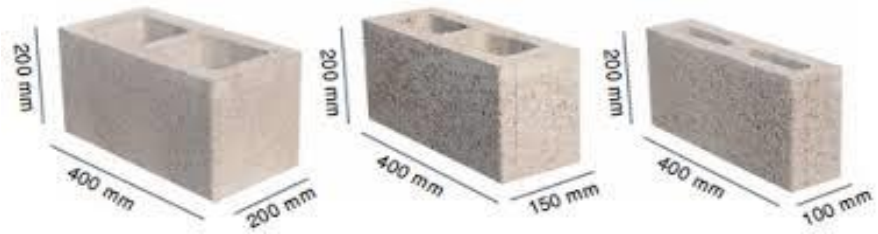

Fig.1.3 size of HCB

Depending on their Classification:

Hollow concrete blocks are classified into the following classes:

- Class A and B are load bearing HCB units and suitable for
  - ✓ External walls pointed, rendered and plastered
  - ✓ The inner leaf of cavity walls or stone masonry
  - ✓ Internal walls or partitions
  - ✓ Panels in steel framed and reinforced steel framed buildings
- Class C and D are non- load bearing HCB units and suitable for
  - ✓ Non- load bearing internal panels in steel framed and reinforced concrete buildings

BRICK

A **brick** is building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote rectangular units made of clay-bearing soil, sand, and lime, or concrete materials. Bricks can be joined together using mortar, adhesives or by interlocking them. Bricks are produced in numerous classes, types, materials, and sizes which vary with region and time period, and are produced in bulk quantities. Two basic categories of bricks are *fired* and *non-fired* bricks.

Block is a similar term referring to a rectangular building unit composed of similar materials, but is usually larger than a brick. Lightweight bricks (also called lightweight blocks) are made from expanded clay aggregate.

Fired bricks are one of the longest-lasting and strongest building materials, sometimes referred to as artificial stone, and have been used since circa 4000 BC. Air-dried bricks, also known as mud bricks, have a history older than fired bricks, and have an additional ingredient of a mechanical binder such as straw.

Bricks are laid in *courses* and numerous patterns known as *bonds*, collectively known as brickwork, and may be laid in various kinds of mortar to hold the bricks together to make a durable structure.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. _____often refers to a set of documented requirements to be satisfied by a material, design, product, or service. (3 points)

   A Plan B Specification C Schedule D all

2. Hollow concrete blocks are classified into the following classes(3points)

   A Class 1,2,3 &4 B Type I,II,II C Class A,B,C&D D A&C

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

You can ask you teacher for the copy of the correct answers.

Name: _____ **Date:** _____

Information Sheet- 2	Following *Safety requirements*

2.1 INTRODUCTION

Safety is the first essential requirement and every personnel must learn the safety measures even before he/she starts working on a machine or on equipments. Safety is an attitude, a form of mind of worker. If the attitude of worker towards safety is good and he/she is safety conscious, then he/she him/her self will develop the safe working habits. Before you can use equipment and tools or attempt practical work in a workshop you must understand basic safety rules. These rules will help keep you and others safe in the workshop.

Classification of safety

1. Personal safety(PPE & HSE)
2. Safety hand tools & equipments
3. Safety working area
4. Safety rules & regulation of in the construction site.
5. First aid.(plaster, destinficant, bandage , ointment).

2.2 DEFINITION OF HAZARDS AND RISK

Hazards and risks are terms used on a daily basis, however, because their true meaning is not realized, by many we will look at the definition of each.

Hazard

The term hazard may be defined by any, or all of the following

- An energy source over which control has been lost
- The potential for harm
- A source of potential damaging

Risk

The term risk can be defined as:

- The potential for the realization of unwanted negative consequences of an event
- The probability of an event occurring and the maximum reasonable consequences should it occur
- The combination of the likelihood that an event will occur and the consequences if it does.

WORK HAZARDS

The exact nature of the hazards may vary from site to site, so it is important to assess each

new task that you are about to undertake for hazards and the risks that may result from exposure to these hazards. If a hazard is identified and the risk is assessed at being high to yourself or others, you should take steps to eliminate it, or adjust your operation to reduce the risk to an acceptable level.

Some of the more common hazards that you are likely to encounter on site include:

- Falling objects
- Slip/trip hazards
- Fall hazards
- Laser radiation
- Suspended loads
- Power tools/equipment
- Hand tools
- Mobile equipment
- Hazardous substances.

2.3 SAFETY RULES AND REGULATIONS

General Safety Rule

General safety rule is very important to reduce the accident while you working in workshop. Some of them are listed below,

- **Follow directions:-**understanding the procedures ofusing by hand tools & machines.
- **Stay alert:-** Watch what you are doing, and use common sense when operating a power tool. Do not use a power tool while tired or under the influence of drugs,
    - ✓ alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.
- **Use safety equipment:-** Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.
- **Always dress properly:-** Dress properly for your work. While you must wear your aprons are provided so that you can work on the machines. Remove any jeweler, neckties, chains, bracelets, and rings. Roll up your sleeves and tie any hair back in a ponytail before beginning any work
- **Keep the shop clean: -** Put your tools back where they belong when you finished.

- **Keep the floor clear of debris and sawdust:-** the floor should be clear of scrap blocks, excessive material, and sawdust. Keep projects, sawhorses, and other equipment and materials you are using out of travel lanes. Wipe up any spilled liquids immediately.
- **Learn to use the tools correctly**
- Understanding using of hand tools in proper ways.
- **Avoid house play**
- **Report all accidents**
- **Practice lending a cheerful helping hand when requested by someone**

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Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page.

1. It will help keep you and others safe in the workshop

A Personal safety (PPE & HSE)

B Safety hand tools & equipments

C Safety working area

D Safety rules & regulation of in the construction site

E All the above

2. The term hazard may be defined by the following; **except**

A An energy source over which control has been lost

B The potential for harm

C A source of potential damaging

D The potential for the realization of unwanted negative consequences of an event

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ **Date:** _____

Information Sheet-3	Identifying and implementing Signage or marks for the fence requirements

3.1 Safety Signage

This section provides information on the signs that you can encounter on the work site. Most signs are self-explanatory, but if you encounter a sign where the meaning is not clear, seek advice before you commence work in the area covered by the sign.

Why Do We Need Safety Signage?

Safety signs draw your attention to objects and situations affecting your health and safety. Safety signs are placed in strategic locations as close as possible to hazardous areas. If they become damaged or unreadable, please report this to your supervisor so that the sign/s can be replaced. If a sign displays a distinct safety message, it will carry the same authority as a direct instruction from your Supervisor.

What are the different types of signs?

We all see many signs everyday but how many signs do we take notice of? The answer is most likely many, however we do not admit to this. Signs are put in place to assist people. It is not the intention of this note to attempt to teach all about all signs and the category they fit under. However some knowledge of signs and how to use them is essential.

Identify signs and respond as necessary and appropriately

Signs may be:

1. Picture (symbol)
2. Written (words)
3. Picture and written

Picture signs are universal in language

Written signs may have a language barrier

Picture and written where the writing has the ability to clarify the picture.

There are many categories of signs that the Australian Standards have developed. The correct titles for these signs are:

1. Prohibition signs (don’t do)
2. Mandatory signs (must do)
3. Restriction signs (limiting)
4. Hazard signs (warning signs)
5. Danger hazard signs (life threatening)

6. Emergency signs (medical, exit etc.)
7. Fire signs (fire fighting)

Safety signs

Safety Signs are generally either screen-printed or poly vinyl applied to aluminum, PVC or Corflute. Some are reflective or glow in the dark.

Must do Signs

Are WHITE with a BLUE circle

Restriction Signs

Are RED circle with BLACK writing

Fig. 3.1 Must do Signs & Restriction Signs

What is important is that you appreciate and know how to respond to signs. It is just as important that you follow the meaning of the signs. People who do not respond to signs are a risk to themselves and others

Hazard Warning Signs

Are Triangular YELLOW with BLACK writing

Fig.3.2 Hazard Warning Signs

Signs should be placed where they will be effective and at a height that is readily visible. This usually means that they need to be close, but before, to where the danger is and it

should be fixed to a stable object. Consider the effectiveness of placing a number of signs at the entrance of a large commercial job. This means that everyone has the opportunity to read the signs before entering the site, but what happens an hour later when they actually come across the danger? Will they remember the details of the sign or will it be too late. Signs are best located near to the danger but not that close that it is too late. The following sign is typical of a cluster of signs that may be found on large commercial building sites.

3.2 Signs and barricades to control access to a site

Control of access and egress to and from the worksite is imperative for the operational actives and for of all safety concerned. Signage and barriers are available in numerous, types, sizes and colour. To select the most appropriate signage and barriers for the task consultation should be carried out with the supervisor. In addition, there will be various acts, regulations, and code of practice that will need to be adhered to. Furthermore, there may be various permits and or licences required to perform at the site.

Fig. 3.1 safety sign

Above is a typical safety sign seen at QLD residential construction sites that advise people of certain conditions and restrictions onsite and who to contact for entry.

Temporary fencing is used on construction sites to restrict the entry of the general public. At the site entry signage like the safety sign shown above is displayed to advise of site conditions and who to contact for entry to the site and what PPE is required to be worn.

Barricading can also be on construction sites to restrict the entry of the general public. Note the signage at the site entry to give safety and entry conditions for the site.

Fig.3.2 Signs and barricades to control access to a site

Emergency Signs

Wherever 'lifesaving' equipment exists, it is critical to ensure that it is ready to perform in the event of an emergency.

For those responsible for workplaces, there are strict requirements for the maintenance of essential services such as fire safety equipment. Responsibilities can include maintaining equipment to specific standards, keeping maintenance records and completing necessary compliance reports. One of the very important signs for every one is the emergency assembly area on the next page.

Fire.3.3 Fighting Signs

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1._____ are universal in language

2. _____Signs are triangular YELLOW with BLACK writing

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ **Date:** _____

Short Answer Questions

1. _____

2._____

_____

Information Sheet-4	Selecting *Tools and equipment* to carry out tasks

4.1 Concrete block producing equipment

In small-scale backyard block making no special equipment is generally needed for making concrete blocks, if the concrete is mixed by hand and simple wooded or steel moulds are used. But with certain equipment the production process can be facilitated and the quality of blocks improved considerably.

Mixers

The quality of concrete blocks depends largely on the type of mixer and period of mixing. The free fall, revolving drum type mixers are not suitable, because of the semi-dry nature of the mix. Pan mixers have a quick moving action and are thus recommended. Trough mixers are also suitable.

Block making Machines

Several types of machines are available, ranging from simple hand-operated ones to complex stationary or mobile plants. The simpler machines are generally mechanically operated using electric, petrol or diesel power, while the larger machines are usually electrically operated. In most of the block making machines, the concrete is compacted by vibration.

1. Hand-operated molding equipment

These are relatively inexpensive, simple and robust devices, which are especially suited for on-site production of concrete blocks. Output rates for 40 x 20 x 20 cm blocks can range from 10 to 80 blocks per hour, depending on the efficiency of the machine, rate of supply of concrete and number of workers involved. There are basically three types:

- Steel moulds that can be carried around by one person and used on a raised working surface (eg table) or on the ground; the mix is tamped with the help of special tampers that fit on the mould, but is more usually compacted by means of a vibrator fixed to the mould or to the working surface (vibrating table).

- Stationary machines with the block mould (into which a wooden pallet is inserted) at about table height; the mix is usually compacted by the tamper lid-plate, which is brought down with a few sharp blows; after compacting, the sides of the mould fold back to release the block, or it is ejected by means of a lever, which pushes the base plate upwards, so that the fresh block can be taken away on the pallet for drying. Some of these machines are equipped with a tray above the mould for preparing the mix and filling it directly into the mould.
- Stationary machines that are similar to the previous type, but have an engine operated jolting mechanism or vibrator for more efficient compaction.

Advantages of hand-operated equipment:

- Low capital and operational costs.
- Quick delivery (possibly available locally).
- Low weight and small size, thus easy to transport, requires little storage space.
- Simple to use with a little training.
- Low maintenance needs, apart from regular cleaning and lubrication of moving parts.
- Possibility of repairs in local workshops, no special parts required.

Problems of hand-operated equipment:

- Low rate of production.
- In case of manual tamping, possibility of non-uniform compaction of concrete; since production rate is low and the use of fresh concrete mixes is limited to the setting time, relatively few blocks are produced per mix, which can differ in quality each time.
- Tiring operation, which can lead to a drop in the quality of blocks, if the work is carried out by a single person for too long.

Manual Block Machine (OUTPUT : 400 Blocks / 8Hrs.)

Type of Machine	Manual
Output Per Shift	400 Blocks
Cycle Hour	25
Ramming Compaction	Manual
Block Ejection	Blocks Are Stationary Moulds Slide Down
Weight (Approx)	225 Kgs

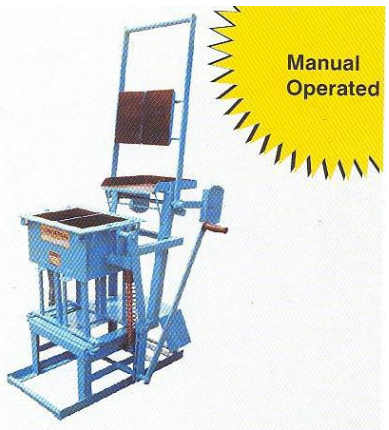


Fig. 4.1

Hand-operated tools and equipments

Spade;-is used to mix small Amount of mortar & concrete

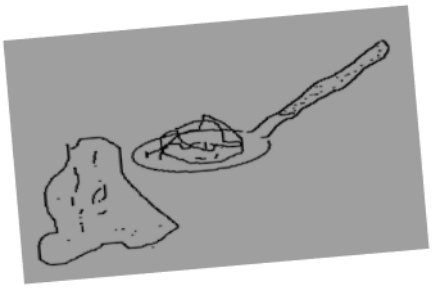


fig.4.2.spade

Bucket

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

fig.4.3 bucket

Brush

to clean hand tools before and after use and to clean dust on surfaces of tools and equipments.

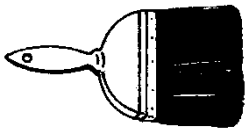
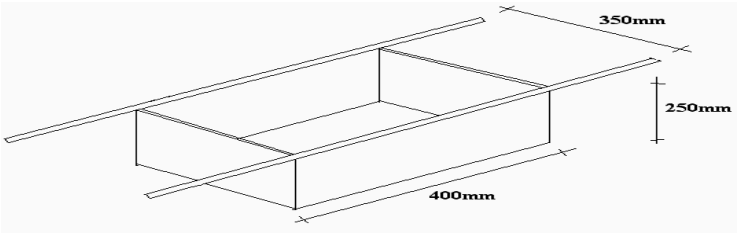


fig.4.4.brush

Wheelbarrow is used to services material and to take the tools after work.

fig.4.5 wheel barrow



Mixing box is used to measure ingridients

fig.4.6 mixing box

Block producing machine is used to produce HCB.

fig.4.7 wheel barrow

MIXER;- are used to mix more amount of mortar and to save the time

fig.4.8 mixer

Meter- are used to take measurement.

fig.4.9 meter

Sprit level- used to check whether the surfaces are level (horizontal) or plumb (vertical).

fig.4.10 sprit level

- Avalaible in various length with either traditional bubble gauges or electronic display.

Trowel - uses for lifting and fillingmortar in the mold.

fig.4.11 trower

2. "Egg-laying" mobile machines

These are machines designed for medium-scale production, either on-site or in a factory. The name was given to these machines, because they leave the blocks to dry where they are produced on a flat production surface and move a short distance away to produce the next batch of blocks, and so on. The machines, which can be manually operated or fully automatic, have output rates for 40 x 20 x 20 cm blocks ranging from 60 to 400 blocks per hour, depending on the size of machine, the degree of automation, availability of continuous supplies of concrete and production site organization.

Advantages of egg-laying machines:

- Relatively high output of blocks.
- Uniform quality of blocks, since more blocks are made from each concrete mix and most of the operations are mechanized.
- Fairly easy to operate with a little training.
- Suitability for use on-site or in a factory.

Problems of egg-laying machines:

- Rarely available locally, usually imported.
- Higher capital and operational costs than those of hand-operated equipment.
- Requirement of large flat production area.
- Dependency on the weather, if not under a roof: in dry regions, if the blocks are not covered with plastic sheets, premature drying and cracking are inevitable; if it rains,production must cease, otherwise the green blocks will disintegrate.
- The higher the degree of automation, the greater the dependency on energy supplies.
- Repairs not likely to be possible in local workshops, if spare parts are not available.

3. Fully mechanized, stationary machines

These are automatic and very versatile machines used for the medium- and large-scale production of superior quality concrete components. They can be of various sizes, but are generally far more expensive than egg-laying machines of comparable sizes. The filling of the moulds, the compaction (vibration) and ejection of the blocks is done automatically, and

output rates for 40 x 20 x 20 cm blocks can range from 200 to 800 blocks per hour. These high output rates are only possible with sophisticated ancillary equipment for transportation, handling, stacking, etc, a well-trained staff, efficient management and sound financial base. Space is saved by stacking the green blocks in shelves, where they are usually steam cured for better product quality and quicker turnover.

Advantages of fully mechanized machines:

- Very high output rates.
- Superior and uniform quality of products.
- Greater adaptability to the production of special concrete products.

Problems of fully mechanized machines:

- Not available locally, have to be imported.
- Very high capital and operational costs.
- Dependency on uninterrupted energy suplies, high standard of ancillary equipment, skilled labour, good management and, above all, continuous high demand for the products.
- Limited mobility.
- Need for specialists for maintenance and repairs; spare parts usually expensive and difficult to get, or only after long delivery time.

Fig.4.12 fully mechanized machines

Autoramming Block M/C (Output: 800 Blocks/8 Hrs.)

Type of Machine	Autoramming
Output Per Shift	800 Blocks
Cycle Hour	50
Vibrator	In Built 1 Hp , 1 Ph/3Ph Motor
Ramming Compaction	Automatic 140 Strokes/min In 2 HP , 1 Ph
Block Ejection	Blocks are Stationary Moulds Slide Down
Weight (Approx)	375 Kgs

Fig.4.13

Vibro Block Machine (OUTPUT : 640 Blocks / 8Hrs.)

Type of Machine	Vibro
Output Per Shift	640 Blocks
Cycle Hour	40
Ramming Compaction	Manual
Block Ejection	Blocks Are Stationary Moulds Slide Down
Weight (Approx)	250 Kgs
Vibrator	Inbuilt 1 HP, 1 Ph

Fig 4.14

Self-Check - 4	Written Test

***Instructions**:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. list down the necessary tools required for HCB productions?(5 pts)
2. Mention all the equipments required for HCB productions? (5 pts)

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-5	Calculating material quantity requirements

5.1. Introduction

Measurements are the size of something to be measured or simply pertaining to its size, quantity, length, or rate of something that has been measured. It is very important to know how to measure and calculate the particular object, with a particular measuring instruments needed in the job requirements.

The most common measurement of block production is measure by volume unless other ways area & length.

- Volume: is measured in meter cube(m3)
- Area: is measured in meter square(m2)
- Length : is measured in meter (m)

Units of Materials available in market

1. stone----------m3
2. aggregate----------m3
3. sand----------m3
4. cement----------kg or bag
5. oil----------lit
6. water----------lit
7. brick----------pcs
8. HCB----------pcs

Before anything else, you should learn what are the four fundamental basic mathematical operations; addition, subtraction, multiplication and division.

Addition(+) is the process of calculating the sum of two or more numbers or amounts.

Example: a. 10+15= 25

b. *15 Birr + 5 Birr= 20 Birr*

Subtraction(-) is the process or act of deducting one number or quantity of another and withdrawal from a larger whole..

Example:- a. 25 – 10= 15

b. 20 Birr – 10 Birr = 10 Birr

Multiplication(*,x) is a mathematical operation symbolized by an integer " * " ,"x" and its equivalent to adding a number to itself a particular number of times and it is extended to expressions such as functions or matrices that are not numbers.

*Example: a. 6*3 = 18*

b. 5 Birr x 4 Birr = 20 Birr

Division(/,÷) is one of the mathematical operation also that an act of separating or splitting something into parts or an any instances, or an operation used to calculate the number of times one number is contained in another (dividing one number by another).

Example: a. 30 /6 = 5

b. 10÷5 = 2

c. 10Birr ÷2 Birr = 5 Birr

AREA Area is a quantity that expresses the extent of a two dimensional surface or shape in the plane and can be understood as the amount of material with a given thickness

Formula

Shape	**Formula**	**Variables**
circle	$2\pi r$	Where$\prod$ is pi, *r* is the radius.
triangle	$a + b + c$	Where *a*, *b* and *c* are the lengths of the sides of the triangle.
square	4*l*	where *l* is the side length
rectangle	2*l* + 2*w*	where *l* is the length and *w* is the width.

Perimeter is about the distance around all of a shape (sum).

Volume is the quantity of three-dimensional space enclosed by some closed boundary, for example, the space that a substance (solid, liquid, gas) or shape occupies or contains. Any unit of length gives a corresponding unit of volume namely the volume of a cube whose side has the given length.

Calculation of Materials used for conventional Block

Let us assume that you have decided to mould your own blocks, and you have been faced with the challenge of estimating the quantity of cement and sand to sale that will satisfy the construction requirement. Here will give you a guide on how to make such estimate. This is steps, so that you will be able to make calculations just in case you are using standard size of blocks.

Example-1

Assume Number of blocks required = 3000pieces

To produce class B ratio (1:4)

Recommended quantity production = 1 bag of cement to produce- 17pcs blocks

Step 1: Calculate the volume of the block

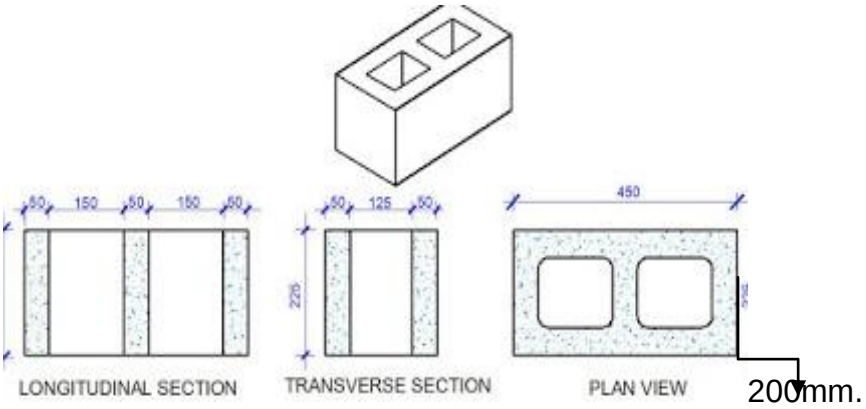


Fig.5.4. sectional view shows sizes of HCB thickness, width, length and Height

For the block size shown above;

Volume of block without holes = (0.4m × 0.2m × 0.2m) = 0.016 m^3

Volume of holes = 2(0.200 × 0.125 × 0.15) = 0.0075 m^3

Therefore volume of the block = 0.016-0.0075= 0.0085 m^3

Step 2: Calculate the volume of the 17 blocks

If the volume of 1 block is 0.0143, the volume of 17 blocks = (0.0085m^3× 17pcs) = 0.1445m^3

Step 3: Calculate the volume sand required for the 17 blocks

The volume of 1 bag of cement is 34.72 litres = 0.03472m^3.

This is obtained by knowing that the mass of 1 bag of cement = 50kg, and the density = 1440 kg/m^3

The volume of a standard builder's wheel barrow is 0.065 m^3 (unheaped). We assume that approximately 2 bags of cement will fill one builder's wheel barrow.

Now, we can estimate the number of wheel barrow trips of sand that the molder should provide in order to make 17 blocks from one bag of cement.

Total volume of 17 blocks required = 0.1445 m^3

Let the number of wheel barrow trips of sand be x

Hence, (volume of 1 bag of cement) + (Total volume of sand) = Volume of 17 blocks

Hence, 0.03472 + x(0.065) = 0.1445m^3

On solving, x = 1.6889 un heaped wheelbarrow trips of sand

The volume of sand required to make 17blocks = 1.6889 × 0.065 = 0.10978 m^3

Step 4: Calculate the total volume of materials required

We can therefore estimate the quantity of materials to be purchased;

If 1 bag of cement is needed for 17 blocks, therefore 176.47 bags of cement is needed to mould 3000 blocks (gotten by 3000/17)

If 0.10978 m^3 of sand is required to make 17 blocks, therefore, 41 m^3 of sand (about 67.60 tones assuming density of dry sand = 1600 kg/m^3) is needed to make 3000 blocks.

For a 5 tone tipper of 3.8 m^3 capacity, we have to order for 11 trips of sharp sand.

Therefore summarily, we need 176.47 bags of cement and 11 trips of sand to mould about 3000 pieces of (20*20*40)cm blocks with holes (for 1 bag = 17 blocks) B-Class blocks.

Self-Check -5	Written Test

Instructions*:* Answer all the questions listed below.

1. The most common measurement of block production is measure by_____(5 points)

2 _____is about the distance around all of a shape (sum) (5 points)

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet- 6	Identifying, obtaining, preparing, Handling and storing materials

6.1 Materials for Concrete Blocks

A. Cement

The following cements are commonly used in concrete block making:

- **Ordinary Portland cement (OPC).** Cheapest and most common type used.
- **Rapid hardening Portland cement (RHPC):** more finely ground cement, which hardens much faster than OPC. It is especially useful:
  - ✓ where storage space is limited,
  - ✓ when rapid production is important, and
  - ✓ To produce good strength blocks despite poor gradation of aggregate.

- **Block mix cement:** marketed especially for block making, but can vary from one manufacturer to another. It has the high early strength qualities of RHPC, but is lower in price.
- **Special cements**: such as Portland blast furnace cement, sulphate-resisting Portland cement and others, used where special properties are of importance. The partial replacement of cement by a pozzolana, eg rice husk ash, fly ash, may be acceptable in certain cases, but should not be implemented without prior laboratory testing.

B. Aggregates

The maximum particle size of coarser aggregates is 13 mm (or 10 mm for hollow blocks). Rounded stones produce a concrete that flows more easily than angular (broken) particles, but the latter give higher 'green strength' to the newly demoulded block, because the particles interlock. This is very important for concrete block production.

Suitable aggregates are usually obtained from natural sources (eg river beds, gravel pits, stone quarries, volcanic deposits) or from industrial by-processes (eg expanded clay, air cooled, granulated or foamed blast furnace slag, sintered fly ash, etc). All aggregates, whether fine or coarse, must be free from silt, clay, dust, organic matter, salts or other chemical impurities, that could interfere with the bond between cement and aggregate or cause deleterious chemical reactions.

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.

Materials shall be stored and placed so as not to endanger the public, the workers or the adjoining property. Materials shall be stacked on well-drained, 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 equipments with proper access and proper maneuverability of the vehicles carrying the material. While planning the layout, the requirements of various materials, components and equipments 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.

STORAGE REQUIREMENT BY CLASSIFICATION OF MATERIALS

Stored materials shall be separately stored under following classifications, with appropriate care necessary precautions to each Classification:

a. Climatically Sensitive Materials
b. Durable Materials
c. Materials Vulnerable to Rough Handling
d. Inflammable and/or Fire Sensitive Materials
e. Hazardous Materials

Cement. Cement should be stored in a dry place, moisture free.

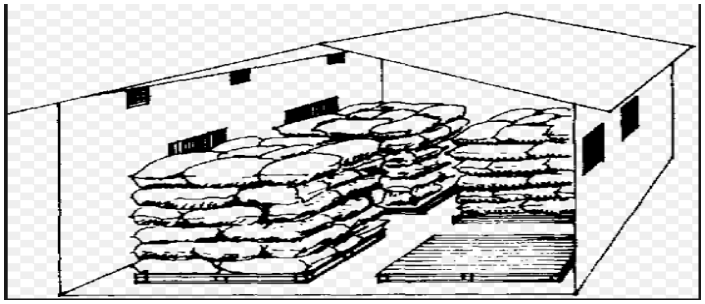


Fig.6.1 cement stacking

Fig.6.2 Aggregate handling system

Self-Check -6	Written Test

***Instructions**:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. Stored materials shall be separately stored under following classifications; **except?** (10 points)

A. Climatically Sensitive Materials
B. Durable Materials
C. Materials Vulnerable to Rough Handling
D. Hazardous Materials
E. All are correct answer

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Answer Sheet

1._____

Information Sheet-7	Identifying and applying environmental protection requirements

Environmental protection

Environmental protection is the practice of protecting the natural environment by individuals, organizations and governments. Its objectives are to conserve natural resources and the existing natural environment and, where possible, to repair damage and reverse trends.

Due to the pressures of overconsumption, population growth and technology, the biophysical environment is being degraded, sometimes permanently. This has been recognized, and governments have begun placing restraints on activities that cause environmental degradation. Since the 1960s, environmental movements have created more awareness of the various environmental problems. There is disagreement on the extent of the environmental impact of human activity and even scientific dishonesty occurs, so protection measures are occasionally debated.

ENVIRONMENTAL GUIDELINE ON BLOCK MAKING PLANT MANUFACTURING

A **block making plant** is involved in the manufacture of concrete blocks. This guideline applies for block making plants manufacturing up to 10,000 blocks per day.

The basic processes comprise:-

- Mixing the right proportions of cement, water and aggregates, namely rock sand and gravel.
- Conveying the mixed aggregates into a block making machine, where they are compressed and moulded to give the blocks, the desired shape.
- Curing of the blocks for a reasonable period of time to gain the desired strength and durability. The curing process is designed primarily to keep the concrete block moist by controlling the loss of moisture normally by the use of water sprayers or accelerated curing can also be carried out by the use of steam in curing chambers.

The block making plant layout usually comprises the:-

- Block production and curing platform
- Batching plant
- Feeding cement silos

- Raw material storage area

The construction and operation of a block making plant is associated with several environmental issues, namely:-

- Site selection
- Dust and air emissions
- Noise
- Wastewater and storm water run-off
- Solid wastes
- Waste Oil, hydrocarbon and oil spills from vehicles and equipment
- Energy and water consumption

Objectives of the guideline

This guideline is meant to ensure that prospective developers:-

- adopt appropriate mitigating measures to safeguard the environment.
- comply with provisions of relevant laws/ regulations/standards.
- adopt eco-friendly practices to optimize use of resources.

Applicable Legislation

A block making plant manufacturing up to 10,000 blocks per day does not warrant a Preliminary Environmental Report (PER) Approval or an Environmental Impact Assessment (EIA) Licence. It requires a Building and Land Use Permit under the Local Government Act 2011. The construction and operation of a block making plant has to be carried out in accordance with the provisions under the Planning Policy Guidance and Outline Planning Scheme.

Location and Siting

i. The site should be located in industrial areas or at a suitable site outside the defined settlement boundary/residential areas or within the buffer of bad neighbourhood activities/ development.
ii. The existing development context of the site should be compatible with the activity.
iii. At the design stage of new block making plants, consideration should be given to the site lay-out, with a view to avoiding disturbances to the surrounding environment. In particular, attention should be paid to the location of entrances, exits, car parks, access roads and amenities.
iv. The site should not be located within any Environmentally Sensitive Area (ESA) and its prescribed buffer zone as per ESA Study 2009 such as wetland, steep slope and in

areas that are likely to be affected by hazards such as inland flooding, landslide and storm surges, amongst others.

v. On-site wastewater disposal facility such as septic tanks and absorption pits/leaching fields shall be located not less than 30 m from any water course as per Rivers and Canals Act 1863.

vi. Existing natural drains and watercourses on or in the vicinity of the site shall not be tampered with.

Mitigation of Environmental Impacts

Dust nuisances and air pollution

The main sources of dust nuisances are:-

- fugitive dust from cement storage silo
- Dust from vehicular movement within the premises

Air emissions are from operation of the equipment and exhaust of vehicles.

Necessary abatement measures should be taken such that all emissions from the plant comply with the Environment Protection (Standards for Air) Regulations 1998.

Mitigating measures include:-

- Fitting the silo with dust-restraining bag filters
- Sprinkling of the premises with water, preferably harvested rain water
- The premises and access roads should be kept clean and free of dust at all times.

Noise abatement

Noise from the block making plant arises from:-

- Use of mechanical equipment and electric motors (compressor, vibrator, hammer)
- Compaction / compression of cement mortar within the block moulds in the block laying machine

Mitigating measures include:-

- All operations should be carried out during normal working hours as determined by the respective Local Authority.
- Noise generating equipment should be provided with appropriate noise attenuating materials/ structures.
- Proper and regular maintenance of equipment and use of exhaust silencers
- Provision of protective equipment and regular medical screening for staff to the satisfaction of Ministry of Labour, Industrial Relations, Employment and Training.

Noise monitoring using calibrated noise meter should be carried out on a regular basis.

Wastewater management

- Wastewater generated on-site is of both domestic and industrial nature.
- Domestic wastewater is generated by staff employed at the plant

Industrial wastewater comprises effluents from cleaning of equipment and sprinkling of water for dust abatement

Mitigating measures include:

- Provision of appropriate domestic wastewater treatment and disposal facility to the satisfaction of the Wastewater Management Authority.
- Installation of grease traps or oil water separators for removal of floatable solids from water.

Note:- *Maintenance of the grease trap or oil water separator is to be carried out by the owner / promoter.*

- Wash water should be channeled into a sedimentation tank. The effluent from the sedimentation tank should be treated and reused for dust abatement and the settled solids be reused.

Solid wastes

Solid wastes are mainly domestic wastes generated by the staff as well as cracked/ broken blocks.

Mitigating measures include:-

- Domestic solid wastes to be regularly collected in bins or waste handling receptacles and disposed of to the satisfaction of the Local Authority.
- No waste of any type to be disposed of in any watercourse including drains, canals and the surrounding environment.
- The cracked/ broken blocks to be reused for backfilling purposes.

Waste Oil, hydrocarbon and oil spills from vehicles and equipment

Where fuelling is proposed on site, a dedicated platform/ bay must be provided. Necessary measures need to be taken to prevent any hydrocarbon and oil spill at the fuelling bay or from storage tanks.

Where servicing is proposed on site, a dedicated workshop must be provided for such activity.

Mitigating measures include:-

- Waste oil shall be collected and disposed of as per the provisions of the Environment Protection (Collection, Storage, Treatment, Use and Disposal of Waste Oil) Regulations 2006.

- Proper disposal of waste oil at approved oil recycling companies
- Hazardous wastes shall be collected and disposed as per the provisions of the Environment Protection (Standards for hazardous wastes) Regulations 2001.
- Necessary bunded wall to be provided around any fuel storage tank
- Provision of a separate collector drain with an oil interceptor to properly manage wastewater from washing of any workshop area
- Contingency plans should be developed for any accidental spillage of petroleum products or any other unforeseen circumstances.

Other mitigating measures

- Necessary precautions should be taken to avoid disturbance to the neighbourhood by way of mud, traffic or other nuisances during construction and operation phase.
- Provision to be made for adequate parking, loading and unloading facilities.
- Safe storage of materials on site and stored materials not unduly visible or intrusive in the street scene.
- Provision for a proper drainage scheme for evacuation of stormwater to avoid any risks of flooding/water-logging of site and adjoining areas to the satisfaction of the Local Authority.
- Installation of bait stations/ traps to control pests and rodents.

Eco-friendly Measures and Sustainability

Best environment friendly practices and initiatives need to be adopted such as rain water harvesting for washing of premises, energy efficient appliances and energy-saving devices (LED lamps); sensor lights.

Note:

a. Relevant organizations need be consulted with regard to traffic implications, amongst others prior to embarking on the project to ensure compliance with their respective laws/regulations/standards.
b. Non-compliance with environmental laws namely standards for air and noise is an offence under the EPA.

Self-Check -7	Written Test

Instructions*:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. The construction and operation of a block making plant is associated with several environmental issues, namely:-

A. Dust and air emissions
B. Noise
C. Solid wastes
D. Waste Oil, hydrocarbon and oil spills from vehicles and equipment
E. A &C
F. All the above

Note: **Satisfactory rating – above 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

1_____

Operation Sheet-5	Calculate quantity of materials

The following procedures should be taken into account to Calculate quantity of materials:

1. Determine the sizes of box.
2. Calculate Volume of block without holes
3. Calculate Volume of holes
4. Obtain the volume of the block to be moulded (the solid part by reducing the holes)
5. Know the standard quantities of block can be produced for class A- B- C ratio .
6. Calculate the volume of the 24 blocks (class-c ratio(1:6)).
7. Calculate the volume sand required for the 24 blocks
8. Calculate the total volume of materials required

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 8-12 hours.

Task 1: Identify key information about local resources including in government and non-Governmental organizations

Task 2: List information as part of directory/community asset map

Task 3: Renew and update gathering information in regular base

List of Reference Materials

1. Beall. (2000). *New masonry products,materials.progress in structural engineering and materials.*
2. Environment Protection Guidelines for Construction and Land Development in the ACT retrieved from https://ginninderry.com/wp-content/uploads/2017/03/EPA-Guidelines-for-Construction-and-Land-Development-ACCESS.pdf. accessed on Oct 30/2017.
3. Eshetu, A. (2005). Concrete Production and Quality Control in Building Construction industry of Ethiopia. Addis Ababa University press.
4. Formoso, C.T., Isatto, E.L., and Hirota, E.H. (1999). Method for waste Control in theBuilding Industry, IGLC-7 proceedings, University of California, Berkeley, CA, USA276.

Masonry level II

Learning Guide-36

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 02-LG-36**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO 2: Mix aggregates and cement

Instruction Sheet	Learning Guide #36

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

- Inspecting and selecting aggregates
- Determining Quantities of cement, aggregate and water
- Setting up and Operating Mixing equipment
- Mixing Cement, aggregate and water
- Monitoring Water content of mixture to prevent slumping
- Using Ancillary/extra equipment

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

- Inspect and select aggregates
- Determine quantities of cement, aggregate and water
- Set up and Operate Mixing equipment
- Mix cement, aggregate and water
- Monitor water content of mixture to prevent slumping
- Use ancillary/extra equipment

Learning Instructions:

6. Read the specific objectives of this Learning Guide.
7. Follow the instructions described below 3 to 6.

8. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
9. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
10. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
11. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	**Inspecting and selecting aggregates**

DEFINITIONS

An aggregate is a produced product having specific physical and gradational properties and is created by manipulation of material through a processing operation. The material may be from natural sand and/or gravel deposits, quarried bedrock, slag from steel mills or copper refineries, debris from mining operations, or crushed Portland cement concrete.

Acceptance Tests – Tests conducted on produced material for acceptance or rejection. These tests may be conducted any time including incorporation into the finished work. These tests include MDOT’s quality assurance testing.

Aggregates (Crushed Stone) – These aggregates are derived from the crushing of quarried bedrock.

Aggregates (Natural Gravel) – These aggregates occur in natural, unconsolidated deposits of granular material which are derived from rock fragments such as boulders, cobbles, pebbles and granules and may be rounded, crushed or a combination of both. These deposits may be found either above or below the water table. Natural gravel aggregates consist predominantly of particles larger than the No. 4 sieve (4.75 mm).

***Natural Gravel Aggregates and Crushed Stone Aggregates are both included in the Standard Specifications for Construction under the definition of Natural Aggregates.**

Fig.1.1 Aggregate Sampling

Selecting and Inspecting Materials

Assuming that the ingredients and workmanship are of average quality, the main characteristics of the most common types of concrete are:

- Resistance to weathering, impact and abrasion;
- Capability of being moulded into components of any shape and size;
- Good fire resistance.

The main problems, particularly with regard to developing countries, are:

- the need for a relatively large amount of clean water for mixing and curing, which can be a serious problem in dry regions;
- The need for special knowledge and experience in the production process;
- The risk of deterioration through sulphates in the soil or water to which the concrete is exposed.

Entrepreneurs(short term trainees) wishing to start the production of concrete blocks will not only have to consider all these technical and economic aspects, but also a number of environmental, social and administrative factors, in comparison to other alternative building materials, before undertaking further steps towards the establishment of a manufacturing plant

Self-Check -1	Written Test

Directions: Answer all the questions listed below.

1.One is **not** true of the main characteristics of the most common types of concrete? (6 points)

A. Resistance to weathering, impact and abrasion;
B. Capability of being moulded into components of any shape and size;
C. Good fire resistance.
D. Cracking

Note: **Satisfactory rating - 3 and above points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

Information Sheet- 2	Determining Quantities of cement, aggregate and water

Determine Quantity of materials

Since the ingredients of concrete can be of very different types and qualities, not only depending on their local availability, but also on the desired properties of block, equipment and production method, it is not possible to give detailed recommendations on materials and mix proportions, other than very general guidelines. It is up to the manufacturer to select the most suitable materials and design of mixes by trial and error, and making tests with the available equipment under the conditions of full-scale production.

Batching

Aggregates can be batched by volume or by weight, but the latter is more accurate. For this reason, cement should only be batched by weight, or preferably by using only whole bags of 50 kg. In backyard block production, with less stringent quality standards, batching by volume using buckets, tins, wooden boxes or wheelbarrows is quite acceptable, if done with care to ensure uniform proportions of mix.

Fig.2. 1 Batching box fig 2.2 mixing sample

Aggregate-Cement Ratio

After determining the correct blend of aggregates, the proportion of aggregate to cement must be found by trials with different ratios, eg 6:1, 8:1,10:1, up to 16:1 by weight, end testing the qualities of blocks produced.

The proportion of fine aggregate to cement is of special importance: if the ratio is too high, the mortar will lack the cohesiveness needed for green strength and will be too weak to impart enough strength to the matured blocks; if the proportion is too low, the mortar will be very cohesive and the mix may not flow easily in handling and filling the mould.


Fig. 2.3 Aggregate-Cement Ratio

Water-Cement Ratio

Only water that is fit for drinking should be used to mix the concrete. The correct amount of water to be added to the mix depends on the types and mix proportions of aggregates and cement, the required strength of the block, and the production method and equipment used. The concrete must contain just enough water to facilitate production without any slumping of blocks occurring after de-moulding. If the aggregates are dry, they may absorb some of the water (lightweight aggregates may absorb up to 20 % by weight), but if the aggregates are wet, the blocks will take longer to dry out

Mixing proportions for HCB production:

The following mixing proportions for the production of hollow concrete blocks are used in accordance to ESC D3.301:

Table 1

Class	Proportions by volume of				
	Sand	Gravel 00	Gravel 01	Red ash or	Cement

				pumice	
A	2	1	1		1
	2	1		1	1
B	2	1	2		1
	2	1		2	1
C	3	1	2		1
	3	1		2	1

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. mixing proportions for the production of hollow concrete blocks Class A?(6 points)

   A Sand (2) Gravel 00(1) Gravel 01(1) Red ash or pumice(0) Cement(1)

   B Sand (3) Gravel 00(1) Gravel 01(2) Red ash or pumice (0) Cement(1)

   C Sand (4) Gravel 00 (3) Gravel 01 (2) Red ash or pumice(1) Cement(1)

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Setting up and Operating Mixing equipment

Equipment

Mixing equipment is set up and operated in line with manufacturers' instructions.

Mixing Equipments of the materials has to be set up operated as close as mixing place.

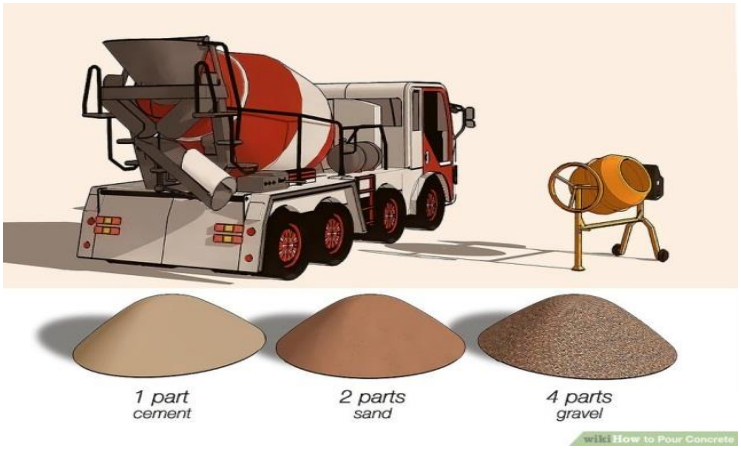


Fig.3.1mixing equipment

Self-Check -3	Written Test

Directions: Write True or False for the following question.

1.Mixing Equipments of the materials has to be set up operated as close as mixing place?(4 points)

Note: **Satisfactory rating – 2and above points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-4	Mixing Cement, aggregate and water

INTRODDUCTION

The production of concrete blocks consists of four basic processes: mixing, molding, curing, and cubing. Some manufacturing plants produce only concrete blocks, while others may produce a wide variety of precast concrete products including blocks, flat paver stones, and decorative landscaping pieces such as lawn edging. Some plants are capable of producing 2,000 or more blocks per hour.

Mixing

In case of hand-molded block where compaction is done manually, concrete mix should be sufficiently consistent to enable remolding immediately after casting. The consistency of the mix should be such that it may cohere when compressed in the hand without free water being visible. Too little water causes the mix to be friable, while too much water causes difficulty in the immediate withdrawal of the mould. It shall be carried out on a water-tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. Ten percent extra cement may be added if hand-mixing is an alternative according to Indian standard.

In case of machine-molded blocks, the web markings on the units as they come from the machine give a good indication as to whether the proper consistency of concrete has been used. In addition to the grading of the aggregate and the quantity of cement, the amount of water required for mix will depend to an extent on the type of machine on which blocks are produced. It is possible to judge the proper consistency by squeezing a handful of concrete mixture.

The following steps are commonly used to manufacture concrete blocks.

Mixing

- The sand and gravel are stored outside in piles and are transferred into storage bins in the plant by a conveyor belt as they are needed. The Portland cement is stored outside in large vertical silos to protect it from moisture.

- As a production run starts, the required amounts of sand, gravel, and cement are transferred by gravity or by mechanical means to a weigh batcher which measures the proper amounts of each material.
- The dry materials then flow into a stationary mixer where they are blended together for several minutes. There are two types of mixers commonly used. One type, called a planetary or pan mixer, resembles a shallow pan with a lid. Mixing blades are attached to a vertical rotating shaft inside the mixer. The other type is called a horizontal drum mixer. It resembles a coffee can turned on its side and has mixing blades attached to a horizontal rotating shaft inside the mixer.
- After the dry materials are blended, a small amount of water is added to the mixer. If the plant is located in a climate subject to temperature extremes, the water may first pass through a heater or chiller to regulate its temperature. Admixture chemicals and coloring pigments may also be added at this time. The concrete is then mixed for six to eight minutes.

Production:

Before production can commence, all materials have to be approved by an official concrete lab. The mixing and batching will be strictly done on the mix ratio provided by the official concrete lab.

The mixing (best results are with a compulsory mixer) should be done thoroughly, until a uniform consistence of the mortar is achieved

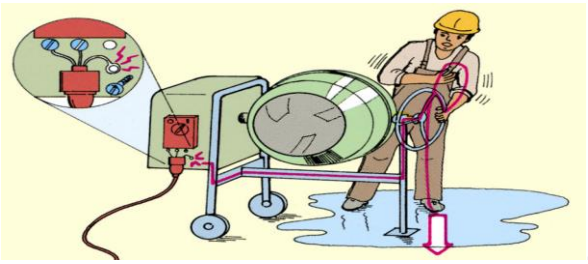


Fig.4.1.checking mixing ratio

Self-Check -4	Written Test

Directions: Answer all the question listed below.

1.What are ingredients of hollow concrete block making? (10 points)

Note: **Satisfactory rating – 5 and above points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-5	Monitoring Water content of mixture to prevent slumping

Water Content:

Water content is critical. The mixture must be wet enough to bind together when Compacted, but should not be so wet that the blocks slump or sag when the mould is removed. A common mistake is the use of mixes that are too dry, resulting in incomplete compaction. Moisture content is approximately right when ripple marks form on a steel rod or the back of a shovel when it is rubbed against some of the mixture. The water content is just optimum when ripple marks start appearing on blocks when they are removed from the mould.

Monitoring Moisture Content of Mixture

Since concretes begin to set within 30 to 60 minutes, depending on the type of cement and ambient temperature, only so much concrete must be prepared as can be used up before that happens. In hot climates, the fresh mix must be shaded from the sun to avoid premature setting.

As a simple test for cohesiveness, no excess water should be visible when a slump of concrete is squeezed in the hand, but if the sample is rubbed quickly on a smooth round metal bar or tube (2 to 4 cm in diameter) a slight film or paste should be brought to the surface.

Self-Check -5	Written Test

Directions: Write True or False for the following question.

1. In hot climates, the fresh mix must be shaded from the sun to avoid premature setting (2 points)

Note: **Satisfactory rating - 2 and above points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

Information Sheet- 6	Using Ancillary/extra equipment

Ancillary/extra Plant and Machinery

- ✓ Brick/block making machine,
- ✓ Batching containers,
- ✓ Concrete mixer
- ✓ Batching plant
- ✓ Brick/block-making machines include stationary and portable machines
- ✓ Curing plant

Self-Check -6	Written Test

Directions: Answer all the question listed below.

1. Write at least three ancillary/extra equipment?(6 points)

Note: **Satisfactory rating - 3 and above points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Operation Sheet 1	Mixing Procedures of materials

The following Mixing Procedures of materials should be taken into account:

1. Wear PPE.
2. Check availability of resources for mix
3. Select and inspect materials
4. Determine Quantity of materials
5. Spread the measured quantity of sand in a layer of about 10cm on the mixing platform.
6. Place the cement on top of the sand and mix the two thoroughly together until they form an even color.
7. Add now the correct amount of aggregate and mix until every aggregate is properly coated.
8. Pile the mixture into a heap and makea hollow in the middle
9. Pour in water slowly in small quantities and mix until a smooth pasties formed
10. Handle fresh mixtures
11. Clean the concrete mixer thoroughly on completion.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within a hours.

Task 1: Wear Personal Protective Equipment

Task 2: Check availability of resources

Task 3: Select and inspect materials

Task 4: Determine Quantity of materials

Task 5: Select mixing area, tools and equipments

Task 6: Set up and Operate mixing equipment

Task 7: Mix materials until even in color.

Task 9: Clean the tools, equipments and working area

Task 9: Handle the fresh mix

List of Reference Materials

1. Beall. (2000). New masonry products,materials.progress in structural engineering and materials.
2. Eshetu, A. (2005). Concrete Production and Quality Control in Building Construction industry of Ethiopia. Addis Ababa University press.
3. Heini Müller 2004;Basic Construction Training Manual for Trainers; module 2

Masonry level II

Learning Guide-37

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 03-LG-37**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO 03: Cast of concrete into molds

Instruction Sheet	Learning Guide #37

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

- Selecting and inspecting block making machine
- Pouring and compacting Concrete
- completing De-molding or removing of molds
- Assessing density, strength and surface of concrete:
- Installing shade for freshly cast block protection

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

- Select and inspect block making machine
- Pour and compact Concrete
- complete De-mold or remove of molds
- Assess density, strength and surface of concrete:
- Install shade for freshly cast block protection

Learning Instructions:

12. Read the specific objectives of this Learning Guide.
13. Follow the instructions described below 3 to 6.
14. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.

15. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
16. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
17. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	**Selecting and inspecting block making machine**

1.Selecting and Inspecting Moulding Machines.

Brick/block making machine is selected, inspected for damage or wear and operated according to manufacturers’ instructions**.**

Self-Check 1	Written Test

Directions: Write True or False for the following question.

1. Operated block making machine according to manufacturers' instructions is recommended?(4 points)

Note: **Satisfactory rating -2 and above points Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet- 2	Pouring and compacting Concrete

Definition

Pouring is a manufacturing process by which a liquid material is usually Casted into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. the solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process.

Tools and Materials needed for Pouring

- ✓ Mold
- ✓ Cement
- ✓ Aggregate
- ✓ Water
- ✓ Concrete mixer or wheelbarrow and shovel
- ✓ Float
- ✓ Trowel
- ✓ Planks
- ✓ Broom

The general procedure for mixing and pouring is as follows;

1. Measure sand and cement onto a concrete platform on the ground.Based on customer's needs and different qualities of products, the mix ratio for block concrete can be varied.
2. Mix with shovel up to the ingredient finely mixed.
3. Add water then turn the whole mix till to required moist will be obtained.
4. Pallet was fixed at the bottom of the mould.
5. Prior to the placement of the mixture, the inner part of the pallet is lubricated to ease the removal of the block.

6. The mixture is placed into the mould and the top is covered with adequate compaction effort to produce block with high density and compressive strength.
7. The ejector is lower to eject the fresh stabilized ingredient blocks molded which are kept to set and harden.
8. The blocks are allowed to dry under the shade, then they gain strength and at the same time protect shrinkage takes place.
9. When produced by vibrating machine higher compaction and strength are achieved.

In general, the required quality depends on material used and its availability. the more cement used in mix the higher the quality we will achieve.

Most of the time we use:-

- 1 x 50kg Cement
- 3 x batching box of Sand
- 3 x batching box of fine aggregates
- Add enough water to make mix. This is only dependent on your grade of sand

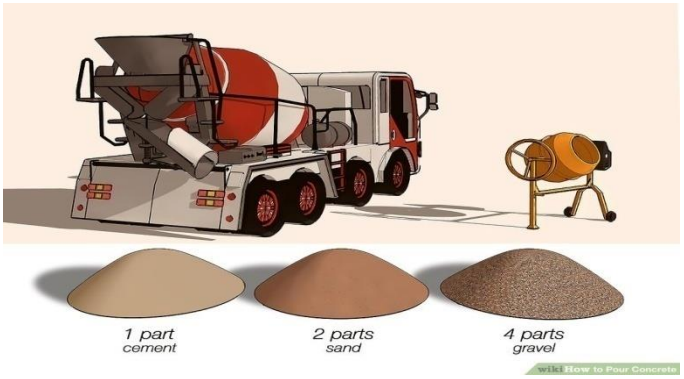


Fig. 2.1 pouring system

fig.2.2.mixing materials and mixer

Compaction and placing

According to Indian standard IS: manual compaction, the mixture shall be placed into the mould in layers of about 50 to 75 mm and each layer thoroughly tamped with suitable tampers until the whole mould is filled up and struck off level with a trowel.

In the case of mechanical compaction, the mould shall be filled up to overflow, vibrated or Mechanically tamped and struck off level. After remolding the blocks shall be protected against sun and wind by placing on the shade until they are sufficiently hardened to permit

handling without damage. On the other hand, GTZ low cost housing manual Volume I specify to vibrate the mixture for 60 second before extruded as hollow concrete block and transported and remains for 24 hours on wooden pallet then it is be cured covered by plastic sheet to enhance the curing process and preventing the water from evaporation.

Adequate care must be taken when compacting the concrete in the moulds of the block making machine. Too little or poor compaction will result in greatly reduced strengths.

Self-Check -2	**Written Test**

Instructions*:* Answer all the question listed below.

1. Define Pouring? (10 points)

Note: **Satisfactory rating – 5 and above points** **Unsatisfactory - below 5**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-3	Completing De-molding or removing of molds

De-molding or removing of molds:

The moulds should be removed carefully so that the fresh blocks are not damaged.

Fig.3.1 De-molding

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1.

Note: **Satisfactory rating – 1 and above points** **Unsatisfactory - below 1 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-4	Assessing density, strength and surface of concrete

NEED FOR INSPECTION OF CONCRETE STRUCTURES:

Inspection is the first step towards any maintenance program. The purpose of structural inspection can be classified as under:

i. To provide assurance that the concrete structure is structurally safe and fit for it's designed use.
ii. To identify actual and potential sources of trouble at the earliest possible stage.
iii. To record systematically and periodically the state of the structure. This enables one to know the time when defects occurred and to identify any significant structural changes like deformation, loss of camber, et c.
iv. To provide necessary information on which decision will be made for carrying repairs, strengthening, replacement in the concrete structure.

TYPES OF INSPECTION OF CONCRETE STRUCTURE:

There should be three types i.e. Routine inspection, detailed inspection and Special inspection

1. Routine Inspection: It is the periodic examination of the general conditions of the structure competent and qualified engineers. Each inspection is to be recorded in the register. It will be primarily a visual inspection supplemented by simple instrumental aids. The inspection should be such as to discover all indications of deterioration/damage such as texture or colour of concrete, exudation, cracks, spalling, delamination, leaching, rust streaks, deformation, loss of camber, etc.

2. Detailed Inspection: This is a more intensive and thorough inspection than the routine inspection. All parts are closely examined, and if necessary, special equipments are used for this inspection. Specially trained engineers conduct detailed inspection.

3. Special Inspection: Special inspections of concrete structures are done in the event of unusual occurrences such as:

i. When signs of weaknesses discovered during routine or detailed inspection or by any other observation.
ii. When the structure loading is to be increased due to revised or increased loading standard.
iii. Distressed concrete structures.
iv. When subsidence occurs in areas of mineral or coal extraction.
v. When settlement of foundation takes place.
vi. When seismic activity takes place.
vii. In case of exceptional event s e.g. Flood, storm, fire, accidents, etc.

As described above, special inspection is need-based and will be carried as and when required. However, special inspection may require supplementary testing and structural analysis and may require detailed involvement of a structural engineer.

Visual inspection

A visual inspection is an examination of concrete to identify and define many of the various conditions **concrete** may exhibit during its service life. The **visual inspection** is typically limited to the surfaces of the **concrete** structure that are **visually** accessible.

Fig.4.1 visual inspection

Self-Check -4	Written Test

Directions: Write True or False for the following question

1. Inspection is the first step towards any maintenance program?(4 points)

Note: **Satisfactory rating – 2 and above points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-5	Installing shade for freshly cast block protection

1. **Installing shade for freshly cast block protection**

Protection of freshly cast bricks/blocks is installed to minimize damage from rain and the drying impact of sun and wind.


Fig. shade for freshly cast block protection

Self-Check -5	Written Test

Directions: Answer all the questions listed below.

1.Why freshly cast bricks/blocks is installed under shade?(6 points)

Note: **Satisfactory rating - 3 and above points** **Unsatisfactory - below 3 point**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Operation Sheet- 1	Pour and compact of Concrete

The following procedures should be taken into account to Pour and compact of Concrete materials:

1. Check availability of materials, tools and equipments
2. Select mix area
3. Mix your concrete
4. Pour the mixed concrete into mould
5. Float surfaces
6. Compact
7. Carefully remove the molded materials
8. Cure and seal

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 4 hours.

To pour the mixture of concrete to mould, perform the following tasks:

Task 1. Wear Personal Protective Equipment

Task 2. Set up equipment, tools and material

Task 3. Perform Sieving (sand), in order to separate bigger rocks. The sand must be clean from dirt, garbage, and mud.

Task 4. Sieve the aggregates required to a size of 0.1cm.

Task 5. Setting-up the workplace before starting to work;

Task 6. Dry mix cement, sand, and aggregate, (mixing by hand, or using a mixing machine) till the ingredient come uniform color.

Task 7. Open the hill and make hole to Add water,

Task 8.mix cement, sand, aggregate, and water (mixing by hand, or Using a mixing machine) till the ingredient come uniform color.

Task 9. Put wooden or steel palate under moulding machine.

Task 10.put mixed ingredient into the prepared mould (metal moulds) and

Task 11. Make sure that the mix is measured spread and leveled then compact.

Task 12. Take the poured products out of the mould and placing it in the temporary storage.

Task 13. Cleaning the materials, tools, equipments and workplace used at the end of the workday

Fig 2.3 seiving

Fig.2.4 Open hill and add water ready for mix

Fig.2.5 While she is mixing by hand.

Fig.2.6 pouring systems.

List of Reference Materials

1. Beall. (2000). New masonry products,materials.progress in structural engineering and materials.
2. Eshetu, A. (2005). Concrete Production and Quality Control in Building Construction industry of Ethiopia. Addis Ababa University press.
3. Heini Müller 2004;Basic Construction Training Manual for Trainers; module 2

Masonry level II

Learning Guide-38

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 04-LG-38**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO4: Cure and stack of bricks/blocks

Instruction Sheet	Learning Guide #38

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

- Removing, Stacking and waiting Bricks/blocks in preparation for curing
- Stacking bricks/blocks
- Covering bricks/blocks

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

- Remove, Stack and wait bricks/blocks in preparation for curing
- Stack bricks/blocks
- Cover bricks/blocks

Learning Instructions:

18. Read the specific objectives of this Learning Guide.
19. Follow the instructions described below 3 to 6.
20. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
21. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
22. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
23. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Removing, Stacking and waiting Bricks/blocks in preparation for curing

Removing and Stacking

The blocks are either left to set and harden where they were moulded, or carried away on pallets to the curing place. In all cases it is important to keep the concrete moist, for example, by regularly spraying with water, until the concrete has obtained sufficient strength.

Concrete blocks can be demoulded by several methods, manually concrete on wooden or steel palliate to large-scale production with 'egg-laying' mobile machines by chain systems

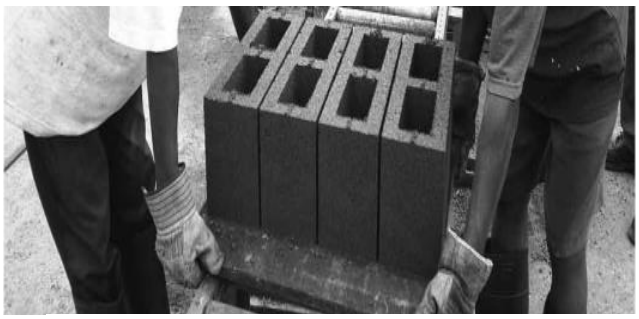



Fig. carefully removing compacted HCB

Purpose

The blocks are demoulded immediately after compaction, so that they have to maintain their shape even before the concrete hardens and Transported to stacking area to cure.

Fig 1.2 BlockTransported to stacking area to cure

Curing

Curing of concrete is defined as the process of maintaining the moisture and temperature conditions of concrete for hydration reaction to normally so that concrete develops hardened properties over time.

Curing techniques and style

- Curing is one of the most important activities in the production process.

- Also the hydration process, a chemical reaction, needs water to set / harden the mortar.
- Once the HCB`s are dropped on the floor, they must be protected from sun and kept constantly moist.
- The day after production the HCB are removed from the production floor, placed in two layers on pallets and are again watered till saturation.
- The pallets are then covered with waterproof sheets, watered, cured until the seventh day, at least twice a day.

After that, put the blocks in five layers on the designated storage place and apply water twice a day.

Types of curing

There are generally 3 main type of curing used in the construction sector, namely:

- Water curing
- Vapor curing
- Steam curing

a) Water curing

Water curing is the most commonly used practice. It is the system that is most appropriate for house construction and does not require any special infrastructure or skill. However, water curing requires a lot of water, which is not always easy at hand and might be even expensive.

Fig 3.1.curing techniques

In order to economize on water it is important that all measures are taken to prevent water evaporation of cement products. E.g. concrete must be protected from direct sunshine and winds to prevent rapid water evaporation. Methods such as covering the concrete with wet, earth, sand, sawdust, grass and leaves are inexpensive, still quite effective. Further, plastic, jute bags, hessian clothes too are common used material to prevent rapid water evaporation

of cement products. Wood forms left in place also furnish good protection if they are loosened and flooded with water at frequent intervals.

It is of paramount importance that the entire cement product (concrete blocks, pavement tiles, stone masonry, brick masonry, plaster work, cement flooring work etc.) is kept wet and that it does never fully dry out, otherwise the final strength of the cement product will suffer. If the hydration process has prematurely ended due to overheating (no curing), sprinkling water onto the fully dried out cement product will not reactivate the hydration process, the loss in strength will be permanent. In water curing, the cement product must be kept fully wet (e.g. by covering the products with plastic canvas) for at least 7 days.

b) Vapor curing

Vapor curing is done where water is scare and cement based prefabricated elements such as toilet slabs, tiles, stairs, beams etc are mass-produced. Vapor curing reduces the curing time compared with simple water curing of about 50 to 60%. The principle of vapor curing is to keep the cement product in a humid and hot environment that allows the cement to gain strength in a much quicker way then with simple water curing. To create this humid and hot environment a simple chamber with water retaining walls and floor needs to be constructed which is covered with plastic to allow the sunshine to heat the chamber up and prevents the water from evaporating. A floor water level of about 5 to 7 cm is to be maintained all the times to keep the vapor system principle working.

c) Steam curing

Steam curing is normally used in only very sophisticated industrial plants that produce mass cement based produces. A steam curing system is expensive and requires a lot of energy to generate the required heat required for the steam. However, steam cured products can be used after approx. 24 to 36 hrs. after production, providing a distinctive advantage over all other curing systems.

Self-Check 1	Written Test

***Instructions**:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. Write types of curing?(10 points)

Note: **Satisfactory rating – 5 and above points** **Unsatisfactory - below 5**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet- 2	Stacking bricks/blocks

2.1. Definition

A very basic form of storage, in which objects are placed on a surface (usually a flat floor) and stacked on top of one another in blocks, is known as block stacking.

Fig.2.1.stacking systems

2.2. Purpose

- Once the block is removed from production area, it must stack well at prepared stacking site to provide required quality and Strength.
- To assess Easley and manage.
- To make environment clear and conducive.

Self-Check -2	Written Test

Directions: Answer all the question listed below.

1. What is Purpose of stacking?(6 points)

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-3	Covering bricks/blocks

Covering

Fresh blocks should be protected from the rain and from the drying effects of the sun and wind during the first day with plastic sheets or any suitable covering.

In some cases, it may be necessary to protect blocks from frost damage. Covering with plastic sheeting with the edges held down is normally sufficient.

To minimize breakages in cold weather, increase the cement content of the mix or the curing period before moving blocks.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Operation Sheet 1	The most effective technique for curing HCB production by watering

The most effective technique for curing HCB production by watering are**:**

1. Observe the existing water
2. Identify equipments for curing
3. spray on surface uniformly
4. cover by jute bag, grass/plastic,etc

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 30 minutes per day for 7 days.

Task 1. Observe the existing water

Task 2. Identify equipments for cure

Task 3.Stack bricks/blocks to avoid chipping of edges and corners.

Task 4.Cure Bricks/blocks stacked

Task 5.Keep continuously damp by spraying with water

Task 6. Cover Bricks/blocks with plastic sheeting

Task 7.Ensure hydration and maximum strength.

List of Reference Materials

1. Environment Protection Guidelines for Construction and Land Development in the ACT retrieved from https://ginninderry.com/wp-content/uploads/2017/03/EPA-Guidelines-for-Construction-and-Land-Development-ACCESS.pdf. Accessed on Oct 30/2017.
2. Project profile on cement concrete hollow block-dc msme from
3. www.dcmsme.gov.in/reports/glass/hollowconcreteblocks.pdf
4. Storing, stacking and handling practice from
5. https://law.resource.org/pub/bd/bnbc.2012/gov.bd.bnbc.2012.07.02.pdf

Masonry level II

Learning Guide-39

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 05-LG-39**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO- 05: Assess quality of bricks/blocks

Instruction Sheet	Learning Guide #39

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

- Inspecting bricks/blocks for strength, dimension and shrinkage

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

- Inspect bricks/blocks for strength, dimension and shrinkage

Learning Instructions:

24. Read the specific objectives of this Learning Guide.
25. Follow the instructions described below 3 to 6.
26. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
27. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
28. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
29. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Inspecting bricks/blocks for strength, dimension and shrinkage

Quality Control

The manufacture of concrete blocks requires constant monitoring to produce blocks that have the required properties. The raw materials are weighed electronically before they are placed in the mixer. The trapped water content in the sand and gravel may be measured with ultrasonic sensors, and the amount of water to be added to the mix is automatically adjusted to compensate. In areas with harsh temperature extremes, the water may pass through a chiller or heater before it is used.

As the blocks emerge from the block machine, their height may be checked with laser beam sensors. In the curing kiln, the temperatures, pressures, and cycle times are all controlled and recorded automatically to ensure that the blocks are cured properly, in order to achieve their required strength.

Strength:

The quality of blocks should be controlled so that the strengths are adequate to avoid breakages or rejection by customers and the mixes are as economical as possible. Ideally, blocks should be regularly tested for strength and mixes, and production processes modified if necessary. If testing is not practical or unaffordable, block strength should be continually assessed by looking to see if the corners and edges, or even the whole bricks, tend to break in handling. Knocking two bricks together can also be used to assess strength.

Dimensions:

The length and width of the units are determined by the mould and will not vary greatly. However, the height can vary and should be monitored using a simple gauge. Units of inconsistent height will lead to difficulties during building and possibly cause rain penetration.

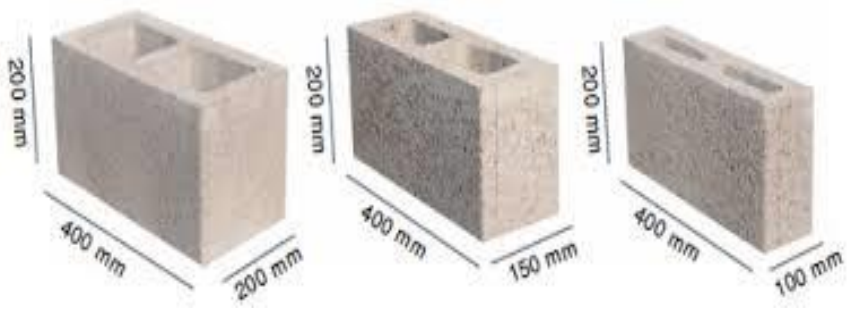


fig 5.1 standard dimension of hollow concrete block

Shrinkage:

Concrete masonry units shrink slightly after manufacture. In order to avoid this from happening in the wall, cured blocks should be allowed to dry out for at least seven days before being used for construction.

Compressive Strength

According to Ethiopian standards hollow concrete block shall conform four classes depends on their strength, as Class A, B, C and D and their requirements are defined below and their minimum comprehensive strength listed in Table 5.1. On the other hand Indian standard recommended classes of hollow concrete blocks as A, B, and C but class D manufactured as solid block used for the purpose of load bearing wall having a minimum density of 1800 kg/m3.

- **Class A** used for load bearing wall construction above or below ground level in damp proof course, in exterior walls that may or may not be treated with weather- protective coating and for interior walls and density of Class A blocks must conform between the range of 900 – 1200 kg/m3 on the other hand Indian standard recommended minimum density 1500 kg/m3.
- **Class B and C** are used for load bearing wall construction above ground level in damp proof course in exterior walls that are treated with suitable weather- protective coating and their density should be between 900 – 1200 kg/m3 on the other hand Indian standard recommended minimum density within the range of 1000-1500 kg/m3 but class C is recommended for non load bearing wall.
- **Class D** are used for non load bearing interior walls and exterior panels walls in steel or reinforced concrete framed construction when protected from weather by rendering or by some other efficient treatment and their density should be between 600 - 900 kg/m3.

Table 5.1. Comprehensive strength of hollow concrete blocks at 28 days ES.

Type of hollow concrete block	Class	Minimum comprehensive strength (N/mm2)	
		Average of 6 units	Individual units
Load bearing	A	5.5	5.0
	B	4.5	4.0
	C	3.5	3..0
Non load bearing	D	20	1.8

Block Density

For hollow concrete, low density is probably the most characteristic feature. This is due to the holes. In addition, it depend primary on the aggregate density and the proportions of aggregate because the particle density of individual grading fraction can differ considerably and thus will affect the density of concrete. This property also influenced by the cement, water and air contents.

The density of a block can only be obtained after the casting process by taking three blocks taken randomly from the selected samples and then dried to constant mass in a suitable oven heated to approximately 105°C. After cooling the blocks to room temperature, the dimensions of each block shall be measured in centimeters (to the nearest millimeter) and the overall volume computed in cubic centimeters. According to Ethiopian standard and Indian standard three blocks shall be taken for average density and it should conform to the requirements specified in Table 5.2 below. The blocks shall then be weighed in kilograms (to the nearest 10 g) and the density of each block calculated as follows:

Table 5.2.density classification of concrete masonry units [ES] and [IS]

Class of Hollow concrete block	Ethiopian standard ES 596:2001 (kg/m3)	Indian standard IS: 2185-1979 (kg/m3)
A	900-1200	1500
B	900-1200	1000-1500
C	900-1200	1000-1500
D	600-900	1800

Note- According to Ethiopian standard Class A, B, C are load bearing units but class D is non

load bearing unit but in case of Indian standard class A and B are load bearing units but Class C is for non load bearing units

Self-Check 1	**Written Test**

Instructions*:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What is the quality that has to be monitored to control for HCB production? (6 points)

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory - below 3**

Name: _____ Date: _____

List of Reference Materials

1. Compressive Strength Test on Concrete Core – Calculation and Results
2. Methods of Testing Compressive Strength of Masonry
3. http://www.afrisam.co.za/uploads/documents/p8132_your_guide_to_concrete_brick_and_block_making_r.pdf
4. Mid rand, 2013. How to make concrete bricks and blocks.Published by the concrete institute.
5. Testing of Concrete Masonry Blocks for Compressive Strength and Density from
6. https://theconstructor.org › How to Guide.1 Nov 2016.

Masonry level II

Learning Guide-40

Unit of Competence: Produce Bricks and Blocks

Module Title: Producing Bricks and Blocks

LG Code: EIS MAS2 M08 **LO 06-LG-40**

TTLM Code: EIS MAS2 M08 **TTLM 0919v1**

LO-6: Clean up

Instruction Sheet	Learning Guide #40

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

- Clearing Work area
- Reusing, recycling and dispose waste materials
- Maintaining plant, tools and equipment
- Performing good housekeeping

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

- Clear work area
- Reuse, recycle and disposing waste materials
- Maintain plant, tools and equipment

Learning Instructions:

30. Read the specific objectives of this Learning Guide.
31. Follow the instructions described below 3 to 6.
32. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
33. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
34. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
35. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Clearing Work area

1. **Safety of Working Area**

Working place or area is whole building/construction/ site including tools,equipment, machines, storerooms, etc. Within the general working place there is a personal working area /space/, where someone is building up a wall or other related activities. Working space is essentially required for all construction workers, to accommodate materials and equipments for the process; therefore, it is a crucial and necessary to keep them all in proper manner.

A neat and tidy site safes time, eases the work and avoids accidents. If things like tools, battens, boards, stones, cables, steel bars etc. are not used or kept improperly they are obstacles for the construction process and can be the cause for accident.

Relevant legislation, regulations and job specifications

The Producer (she/he) shall, during the production period maintain and clean up both permanent and temporary facilities. He/she shall provide temporary site drainage to leave the facilities free of standing water, accumulation of scrap, debris, waste material, and maintain good standards of hygiene.

Inspection shall be carried out daily to ensure that sufficient workmen/women, tools and facilities are provided to maintain the standard of hygiene.

Final cleaning of the site and removal of all temporary facilities shall be carried out to approval at completion of works.

Self-Check 1	Written Test

Instructions: *True or False*

1. Final cleaning of the site and removal of all temporary facilities shall be carried out to approval at completion of works? 4 points

Note: **Satisfactory rating – 2 and above points** **Unsatisfactory - below 2**

Name: _____ **Date:** _____

Information Sheet- 2	Reusing, recycling and disposing waste materials

2.1 Definition

Disposing Removing and destroying or storing damaged, used or other unwanted domestic, agricultural or industrial products and *substances*

Recycling means turning an item into raw materials which can be used again, usually for a completely new product. This is an energy consuming procedure.

Reusing refers to using an object as it is without treatment. This reduces pollution and waste, thus making it a more sustainable process.

Purpose

When looking into environmental sustainability, cutting consumption or reducing rubbish during a house clearance, it's more than likely that you'll come across the following 3Rs: reduce, reuse and recycle.

Reusing (R), and recycling (R) can help you, your community, and the environment by saving money, energy, and natural resources.

Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products. Recycling can benefit your community and the environment.

Recycling reduces waste disposal by transforming useful materials such as plastic, glass and paper into new products

The reusing process is not just about re-purposing materials, but the object as it is. This includes buying and selling used goods and repairing items rather than discarding them. Reusing is better than recycling because it saves the energy that comes with having to dismantle and re-manufacture products. It also significantly reduces waste and pollution because it reduces the need for raw materials, saving both forests and water supplies.

Waste that cannot be *reused* or *recycled* in some form eventually finds its way to *disposal*. This *disposal* includes landfills, but an increasing number of municipalities have elected to

divert *waste* into resource recovery. These recovery methods use the *waste* to generate electricity or produce raw *materials* for industry.

Self-Check -2	**Written Test**

Instructions*:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. What is the 3R Define? 6 points

Name: _____ **Date:** _____

Information Sheet-3	Maintaining plant, tools and equipment

3.1 Maintenance

Maintenance on plant and equipment is carried out to prevent problems arising, to put faults right, and to ensure equipment is working effectively.

Maintenance may be part of a planned programme or may have to be carried out at short notice after a breakdown.

3.2 Important of maintenance plant and equipment

An effective maintenance programme will make plant and equipment more reliable. Fewer breakdowns will mean less dangerous contact with machinery is required, as well as having the cost benefits of better productivity and efficiency.

Additional hazards can occur when machinery becomes unreliable and develops faults. Maintenance allows these faults to be diagnosed early to manage any risks. However, maintenance needs to be correctly planned and carried out. Unsafe maintenance has caused many fatalities and serious injuries either during themaintenance or to those using the badly maintained or wrongly maintained/repaired equipment.

3.3 Necessary consideration

If you are an employer and you provide equipment for use, from hand tools and ladders to electrical power tools and larger plant, you need to demonstrate that you have arrangements in place to make sure they are maintained in a safe condition.

Think about what hazards can occur:

- if tools break during use
- machinery starts up unexpectedly
- there is contact with materials that are normally enclosed within the machine, ie caused by leaks/breakage/ejection etc

Failing to correctly plan and communicate clear instructions and information before starting maintenance can lead to confusion and can cause accidents.

Establishing a planned maintenance programme may be a useful step towards reducing risk, as well as having a reporting procedure for workers who may notice problems while working on machinery.

Some items of plant and equipment may have safety-critical features where deterioration would cause a risk. You must have arrangements in place to make sure the necessary inspections take place.

3.4. Clean and Check

- Release any stored energy, such as compressed air or hydraulic pressure that could cause the machine to move or cycle
- Support parts of plant that could fall, eg support the blades of down-stroking bale cutters and guillotines with blocks
- Allow components that operate at high temperatures time to cool
- Place mobile plant in neutral gear, apply the brake and chock the wheels
- Safely clean out vessels containing flammable solids, liquids, gases or dusts, and check them before hot work is carried out to prevent explosions. You may need specialist help and advice to do this safely
- Avoid entering tanks and vessels where possible. This can be very high-risk work. If required, get specialist help to ensure adequate precautions are taken
- Clean and check vessels containing toxic materials before work starts

3.5 Dos and don’ts of plant and equipment maintenance

Do…

- Ensure maintenance is carried out by a competent person (someone who has the necessary skills, knowledge and experience to carry out the work safely)
- Maintain plant and equipment regularly – use the manufacturer’s maintenance instructions as a guide, particularly if there are safety-critical features
- Have a procedure that allows workers to report damaged or faulty equipment
- Provide the proper tools for the maintenance person
- Schedule maintenance to minimise the risk to other workers and the maintenance person wherever possible
- make sure maintenance is done safely, that machines and moving parts are isolated or locked and that flammable/explosive/toxic materials are dealt with properly

Don’t…

- Ignore maintenance
- Ignore reports of damaged or unsafe equipment
- Use faulty or damaged equipment

3.6 Dos and don’ts of machinery safety for workers

Do…

- Check the machine is well maintained and fit to be used, ie appropriate for the job and working properly and that all the safety measures are in place – guards, isolators, locking mechanisms, emergency off switches etc
- Use the machine properly and in accordance with the manufacturer’s instructions
- Make sure you are wearing the appropriate protective clothing and equipment required for that machine, such as safety glasses, hearing protection and safety shoes

Don’t…

- Use a machine or appliance that has a danger sign or tag attached to it. Danger signs should only be removed by an authorized person who is satisfied that the machine or process is now safe
- Wear dangling chains, loose clothing, rings or have loose, long hair that could get caught up in moving parts
- Distract people who are using machines
- Remove any safeguards, even if their presence seems to make the job more difficult

Self-Check -3	Written Test

Instructions*: True or False*

1. Maintenance on plant and equipment is carried out to prevent problems arising, to put faults right, and to ensure equipment is working effectively

Note: **Satisfactory rating – 3 and above points Unsatisfactory - below 3 points**

Name: _____ **Date:** _____

List of Reference Materials

1. *C. R. C. Mohanty, UNCRD ;9 May 2011,*
2. *REDUCE,REUSE AND RECYCLE(3R) AND RESOURCE EFFICIENCY AS THE BASIS FOR Sustainable Waste Management. New York.*
3. *Environment Protection Guidelines for Construction and Land Development in the ACT retrieved from https://ginninderry.com/wp-content/uploads/2017/03/EPA-Guidelines-for-Construction-and-Land-Development-ACCESS.pdf. accessed on Oct 30/2017.*
4. *Workplace Housekeeping - Basic Guide; Document confirmed current on June 6, 2014.*

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