



Masonry

Level II

Learning Guide 101

Unit of Competence: - Produce Cement concrete Castings

Module Title: - Producing Cement concrete Castings

LG Code: EIS MAS2 M20 LO1-LG101

TTLM Code: EIS MAS2 M20 0919v1

LO 1: plan and prepare work



Instruction Sheet 1

Learning Guide 101

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*,
- Selecting Tools and equipment's
- Calculating Material quantity requirements
- Identifying ,Obtaining *preparing and handling materials*
- Identifying 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 confirming and Applying work instructions
- Follow *Safety requirements*,
- Select Tools and equipment's
- Calculate Material quantity requirements
- Identify ,Obtaining *preparing and handling materials*
- Identify Environmental protection requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Utilize properly each information sheets
4. Accomplish the given “Self-checks.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation sheet.
6. Do the “LAP test” (if you are ready).



Information Sheet-1	Obtaining confirming and Applying work instructions
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1.1. Applying Work instruction

Instructions are directions or orders that you receive either verbally or in written form. Depending on your role on a construction site, Work Instructions are documents that clearly and precisely describe the correct way to perform certain tasks that may cause inconvenience or damage if not done in the established manner. That is, describe, dictate or stipulate the steps that must be followed to correctly perform any specific activity or work. A document describing specific activities and tasks within the organization. It contains the greatest amount of detail. As a component of a process, “defines how one or more activities in a procedure should be executed in detail, using technology or other resources.

Here are some examples of documented work instructions which may be found on a typical construction site:

- ✓ Working Drawings issued for construction such as Plans, elevations, sections etc.
- ✓ Specifications/Contract specifications
- ✓ Construction method statements
- ✓ Quality requirements
- ✓ Operational details
- ✓ Maintenance manuals

1.1.1 Plans and specifications

Plans and specifications are the written documents used to communicate the design and technical details of a construction project to the builder and the tradespeople involved. Plans are the drawings created by a specialist like an architect, designer or Engineer sometimes in consultation with the client. There are many types of plans including site plans, electrical plans, elevations and floor plans. Specifications are documents that outline specific information that can't be shown or described in detail on the plans or drawings. When you plan a task, you use the information provided on the plans and specifications to identify what you're building, the dimensions of the various elements, where the building will be built and the materials you must use. This information is essential for scheduling tasks, obtaining or preparing tools and equipment, and ordering materials



1.1.2. Purposes of specification

- A Specification is a written document describing in detail the
 - ✓ Scope of work,
 - ✓ Materials and finishes to be used,
 - ✓ Method of installation or fabrication, and
 - ✓ Quality of workmanship for a parcel of work to be placed under Contract

1.1.2 Clarifying and confirming Work instruction

When you receive instructions, you must make sure you've interpreted them correctly.

There are serious and costly consequences when misunderstandings occur in the construction industry.

Clarifying means literally 'to make clear' and when you clarify information, you're attempting to obtain the complete meaning of that information. If you're asked to paint a room, you would need to clarify which parts of the room you're meant to paint – the walls, ceiling, skirting boards or cup boards. You can clarify your understanding of what you're meant to do on a construction task by using some or all of the following techniques:

- asking for more information
- asking the speaker to repeat what they said
- reading plans, specifications and instructions, and making notes
- researching in trade publications or on the internet
- asking a more experienced workmate checking documentation like legislation, standards, policies and procedures and manufacturers' specification



Self-Check -1	Written Test
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Directions the following question are true or false items write if the statement is

True and write false if the statement is false

1- *Uses of document is describing specific activities and tasks within the organization.*
(3point)

2-work Instructions are directions or orders that you receive either verbally or in written form (2point)

Give short answer

3 write definitions of clarifying (1point) ?

4 write the Purposes of specification (1point)?

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____

Information Sheet-2	Following <i>Safety requirements</i>
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2.1 **Safety requirements**

For uses of protected health information, the covered entity's policies and procedures must identify the persons or classes of persons within the covered entity who need access to the information to carry out their job duties, the categories or types of protected health information needed, and conditions appropriate to such access. For example, hospitals may implement policies that permit doctors, nurses, or others involved in treatment to have access to the entire medical record, as needed.

2.1,1 **Personal Safety, Working Clothes and shoes**

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

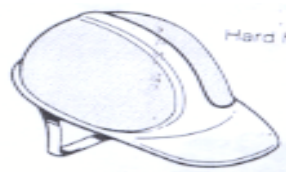


Fig 2.1 Hard hat

Overall:-Protects the normal clothes from dust, grease and other spilling materials.

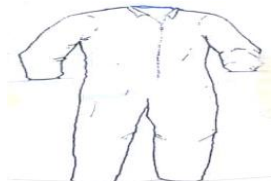


Fig 2.2 Overall cloths

Safety shoes (boot):-Protects the worker from nail, sharp objects and heavy falling objects by hard-rolled leather shoes with metal toe caps.



Fig 2.3 Safety shoes

Rubber boot:- Protects the workers feet from colds, chemical, and mud in the working area.



Fig 2.4 Rubber boot

Mask: - Protects eyes of the worker from other endangering object and dust during construction



2,5 Mask

Goggle: - Protects eyes of the workers during welding of metal works and when placing reinforce



2.6 Goggles

Glove:-Protects the workers from oils, chemicals, and dust and other dangerous material that affect the skin.



2.7 Glove

Safety Belt:- Secures laborers working in a plane where the construction is done at high level



fig 2.8 Safety Belt

Note: - Keep the working clothes in safe place so that you can change it easily. A locker should be used so that you can store your personal material safely while you are performing your works. The first task before you start any construction activity is following safety rules and always dress in safety clothes as shown Figure 2.7. *Fig. 2.7 Safety protection*



Job Safety Board

The general contractor/construction manager shall post and maintain a job safety board at the project site in a conspicuous location that is accessible to the subcontractors/trade contractors, workers and other personnel arriving at or entering the project site. The general contractor/construction manager shall notify all persons working on the project site of the location of the job safety board.

At a minimum, the Board shall provide the following information and items:



- Basic project information
- MIOSHA poster
- General contractor/construction manager names and contact numbers for key personnel and subcontractors/trade contractors
- Emergency procedures and contact numbers
- Location where project-specific plan can be found
- Location of project-related material safety data sheets
- Shutdown notices and posting of other activities requiring coordination
- Notices for upcoming job and safety meetings
- Location of accident report forms
- Monthly summary of recordable injuries/illnesses, lost-time and total recordable rates, near miss incidents
- Hot Work permit kit
- Location of first aid station

First aid box

A simple first aid box

A building site should have a first aid kit which as minimum containers:-

- Plaster
- Bandage
- Ointment
- Disinfectant
- Someone on the site should be in charge of
- the kit and know how to deal with broken
- Bones, bowls and effective strikes.
- First aid kit should be placed at convenient location
- At the site so that worker can pick it Up



Self-Check -2	Written Test
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Directions the following question are true or false items write if the statement is

True and write false if the statement is false

1- *Mask is Protects eyes of the worker from other endangering object (3point)*

2- Overall is Protects the normal clothes from dust, grease and other spilling materials.

Site (2point)

Give short answer

4 write at list 3 *A simple first aid box*

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-3	Selecting Tools and equipment's
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3.1 Tools and equipment's

Tools are particularly important in construction work. They are primarily used to put things together (e.g., hammers and nail guns) or to take them apart (e.g., jackhammers and saws). Tools are often classified as *hand tools* and *power tools*. Hand tools include all non-powered tools, such as hammers and pliers

Hand tools include a wide range of tools, from axes to wrenches. The primary hazard from hand tools is being struck by the tool or by a piece of the material being worked on. Eye injuries are very common from the use of hand tools, as a piece of wood or metal can fly off and lodge in the eye. Some of the major problems are using the wrong tool for the job or a tool that has not been properly maintained. The size of the tool is important: some women and men with relatively small hands have difficulty with large tools. Dull tools can make the work much harder, require more force and result in more injuries

Spirit level

It is used to control the horizontal and vertical alignment of wall surface and edges. The length is at least 80 to 120cm long. It is made of metal, synthetic material or wood. It has two measuring bubbles: one is located at mid length is used to check horizontal positions. While the second one, at the end, is used to check vertical position. This tool requires always to be handled with care and needs to be checked from time to time whether it is still working accurate or not.



Fig 3.1 Spirit level

Plumb bob

A plumb bob is made of metal. When suspended from a vertically attached string, it is employed to check the vertical alignment of corners and surface of walls. A freely hanging plumb bob gives exactly the vertical alignment, because any undisturbed freely hanging mass points to the centre of the earth.



fig 3.2 Plumb bob for vertical marking & leveling

Alignment string /masons' line/

Alignment string /mason line/, sometimes called, Fish line, is a rope used to transfer horizontal & vertical alignments or lines, i.e., use to mark base line on the floor or vertical point alignments of wall. In other words, it is used to align the walling blocks, (stone, bricks, concrete blocks, hydra form etc). It is available in different thickness & sizes in the market.



Fig 3.3 Mason line/alignment

Hose level

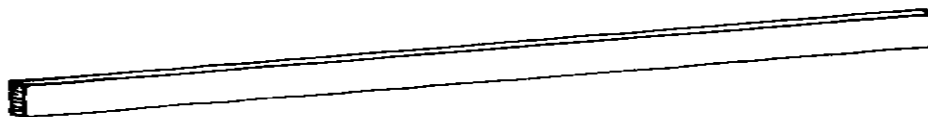
It is a transparent PVC hose. It is used to transfer or mark vertical levels on surface of wall when it is filled with water, but without any air bubbles. The water level in each end of the hose is equal. It is an instrument to mark equal levels on site. It is very accurate but not easy to handle.



Fig 3.4 Hose level

Straight edge

This is a perfectly straight metal/aluminium/ with all long and short edges parallel to its centreline. It is employed to check straight alignments of walls. Its length ranges from 2m up to 4m. Together with the spirit level, it can be used to bridge over the point to be checked. A straight edge/Level/ can also be made from a wooden plank with perfectly parallel edges.



3.4 Straight edge

Angle / Try square

It is used to measure a right angle (90°) of a corner. Used in laying masonry units or blocks at corners of masonry wall.



Fig 3.5 Angle / Try square

Measuring tape

Tape is used to measure dimensions of building parts and distances in site. It is manufactured from steel, plastic or fibre in lengths of 1m, 2m, 3m, 5m, 30m, etc. and 50m. In using tapes for measurements, the two points should be aligned perfectly. In addition, when long horizontal measurements are needed, care should be taken to avoid sag on the tape meters.

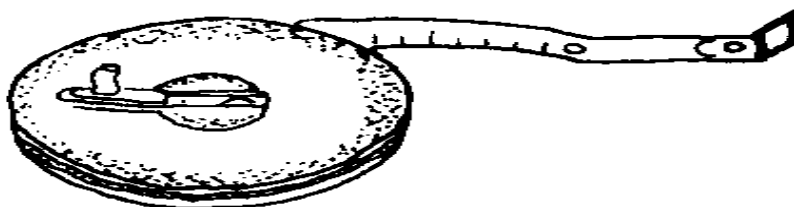


Fig 3.6 Measuring tape

Mortar barrel/ drum

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

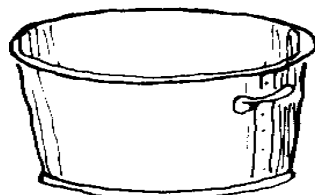


Fig3.7 Mortar drum

Bucket

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

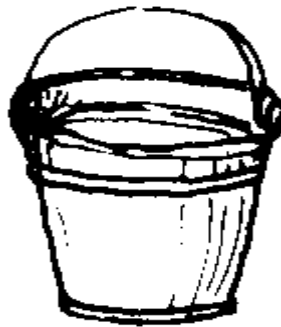


Fig 3.8 Bucket

Graphite Pencil

This is used for marking in wall construction. It is specially produced for this purpose in such a way that it will not wear out fast.

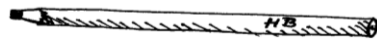


Fig 3.9 Graphite pencil

Trowel

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



Fig 4.1 Trowel

Mixing Tools

Spade: - Used to mix concrete materials manually in the construction site. The blasé should be made

Fig 4.2 spade



Equipment/Machinery

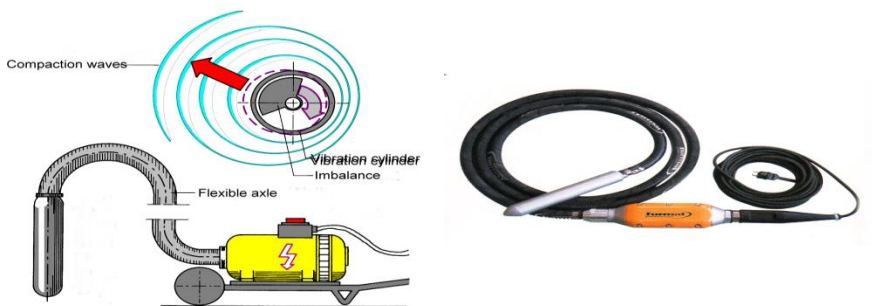
Concrete/ Mortar Mixer

Concrete mixers are available in from of different capacities. Small mixers can produce 250Lit of mortar or concrete and the big ones produces more and more, up to 6000Lit. Widely used, small mixers up to a capacity of 1000Lit. Mixers are driven with diesel, benzene engine or electrical power.



Fig 4.3 Mixer 250 lit

Vibrator is used to compact the fresh concrete in the formwork



System of Function of a Vibrator

ElectricalVibrator

Fig 4.3 Vibrator

Wheelbarrow

Wheelbarrow is used to dispose disposal materials from working place, to transport or serve materials and tools during construction activities in the site.

It is the most efficient way in transporting materials or items. ; In comparison to a barilla, (commonly used in the country), a wheelbarrow is much more efficient.

For this reason, it is operated by one person and can be carried up to 100 kg at once. So that it saves operation cost; it is time effective and therefore in general.



fig 4.4 Wheelbarrow /85L



Self-Check -3	Written Test
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Directions the following question are true or false items write if the statement is

True and write false if the statement is false

1- Vibrator is used to compact the fresh concrete in the formwork

(3point)

2 Spade Used to mix concrete materials manually in the construction site (2point)

Choose the best answer

3 ----- used to dispose disposal materials from working place, to transport (1point)

A spade B Vibrator C Wheel barrow D all

4----- Used to serve small amount of water or material and to take the tools after work

(1point)

A spade B Vibrator C Bucket D Trowel

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

Answer Sheet

Score = _____
Rating: _____



Information Sheet-4	Calculating Material quantity requirements
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4.1 Calculating estimating material

An estimate is probable cost of a building before construction. This estimate should not be far away from the actual cost of the building after completion of the project. It is done by mathematical calculation based on working trainings. First of all the quantity of the work is calculated based on standard unit of measurement for each work. This unit of measurement can be pieces (No), meter linear, meter square and meter cube. The unit of measurement for concrete is meter cube for thick surfaces such as ground floor slab. The data given below can be used to calculate materials required for making concrete, the materials needed depends on the grade of concrete as given on the data.

General formula for calculating material list of concrete

Basic data

Density of cement - - - - 1400 kg/m³

Density of Sand - - - - 1840 kg./m³

Density of Stone Aggregate - - - - 2250 kg/m³

Density of Lime - - - - 1900 kg/m³

Density of Cement Mortar - - - - 2300 kg/m³

Density of Compo Mortar - - - - 1200 kg/m³

Density of Tracheae - - - - 2600 kg/m³

Assume 30% Shrinkage and 5% wastage.

1) Concrete Mix = 1:3:6

Let volume of concrete = Zm³



$$\begin{aligned} \text{then a) Cement} &= \frac{1}{10} \times Zm^3 \times 1400 \text{ kg / m}^3 \times 1.30 \text{ shrinkage} \times 1.05 \text{ wastage} \\ &= 191 \text{ kg Z} \\ &= 0.41m^3 Z \end{aligned}$$

$$\begin{aligned} \text{b) Sand} &= \frac{3}{10} \times Zm^3 \times 1840 \text{ kg / m}^3 \times 1.30 \text{ shrinkage} \times 1.05 \text{ Wastage} \\ &= 754 \text{ kg Z} \\ &= 0.41 m^3 \end{aligned}$$

$$\begin{aligned} \text{c) Aggregate} &= \frac{6}{10} \times Zm^3 \times 2250 \text{ kg / m}^3 \times 1.30 \text{ Shrinkage} \times 1.05 \text{ Wastage} \\ &= 1843 \text{ kg} \times Zm^3 \\ &= 0.82 \times Zm^3 \end{aligned}$$

C/ Material list Calculation

I Concrete

Assuming 30% Shrinkage

5% Wastage

For: Mechanical mix Water = 0.4-0.5

Cement

Hand mix Water = 0.4-0.65

Cement

Note: Hand mix shall only be allowed for class II concrete, and shall not be allowed for Concrete of class c-20 above



Item	Type of work	Material required to produce 1m ³ Concrete
1	Concrete c-7 Mechanical mix Mix ratio 1:4:8	Cement = 150 kg (3 bags) Sand = 773 kg (0.42 m ³) Gravel = 1890 kg (0.84 m ³) Water = 60 liters
2	Concrete c-15 Mechanical mix Mix ratio 1:3:6	Cement = 200 kg (4 bags) Sand = 754 kg (0.41 m ³) Gravel = 1843 kg (0.82 m ³) Water = 80 liters
3	Concrete c-20 Mechanical mix Mix ratio 1:2:4	Cement = 275 kg (5.5 bags) Sand = 718 kg (0.39 m ³) Gravel = 1755 kg (0.78 m ³) Water = 110 liters
4	Concrete c-30 Mechanical mix Mix ratio 1:2:3	Cement = 325 kg (6.5 bags) Sand = 837 kg (0.45 m ³) Gravel = 1536 kg (0.68 m ³) Water = 130 liters
5	Concrete c-7 Mechanical mix Mix ratio 1:3:9:8	Cement = 153 kg (3.06 bags) Sand = 704 kg (0.38 m ³) Gravel = 1966 kg (0.87 m ³) Water = 92 liters
6	Concrete c-15 Mechanical mix Mix ratio 1:2:5:6	Cement = 202 kg (4.04 bags) Sand = 661 kg (0.36 m ³) Gravel = 1940 kg (0.82 m ³) Water = 121 liters



Self-Check 4	Written Test
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Directions the following question are true or false items write if the statement is True and write false if the statement is false

1- The unit of measurement for concrete is meter cube (3point)

2- Density of cement 1900 kg/m^3 (2point)

Choose the best answer

3- which one the following density of sand

A 2300 kg/m^3 B 1900 kg/m^3 C 1400 kg/m^3 D 1840 kg./m^3

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

Answer Sheet

Score = _____

Rating: _____



Information Sheet-5	Identifying ,Obtaining <i>preparing and handling materials</i>
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5.1 Concrete Materials

Each ingredient in concrete has definite function and characteristics. Cement is the active ingredients that combine with water to form a paste .We rely up on the cement manufacture to produce the reliable product.

Cement

The job to be done will determine the type of cement to select. Cement binds the concrete mix together. There are a number of types of cement. The most common, used for general construction, is called Type I Normal Portland cement.

Another variation used in construction is white Portland cement. It is light-colored and used chiefly for architectural effects. White Portland cement is made from carefully selected raw materials and develops the same strength as the normal gray colored Portland cement.

Types of cement include:

- ✚ **Type I**, Normal Cement (most common)
- ✚ **Type II**, Moderate Sulfate Resistance (slow-reacting)
- ✚ **Type III**, High Early Strength (fast-setting)
- ✚ **Type IV**, Low Heat of Hydration (low heat generation)
- ✚ **Type V**, High Sulfate Resistance These other types of cements, along with aggregates and admixtures, is available to produce special types of concrete.
- ✚ **Type IV** is low heat generation for large construction building foundation projects, such as dams. Others have high early strength to produce concrete that sets faster than normal, permitting earlier form removal and thus speeding construction.



Aggregates

Aggregates used in concrete are obtained from either natural gravel deposits or are manufactured by crushing quarried rock. Natural deposits of sand and gravel may contain large amounts of deleterious aggregates such as shale and iron oxides. Therefore, some of these deposits do not meet concrete aggregate specifications. Beneficiating equipment can sometimes remove these undesirable materials during production. During processing, oversized material is either eliminated or reduced to usable size by crushing. Crushed rock is generally obtained from quarried granite, quartzite, limestone, or trap rock.

Aggregate size

Aggregates are divided into two general group sizes, fine and coarse. In many instances more than two actual sizes of material are used, due to a further subdivision by size of material within one or both of the groups.

A .Fine aggregate is normally considered material that will pass through a sieve having 4.75 mm (No.4) mesh. Specifications require washed, natural sand, unless otherwise provided by the Special Provisions. In some instances, fine aggregate of two or three different sizes or from more than one deposit are used.

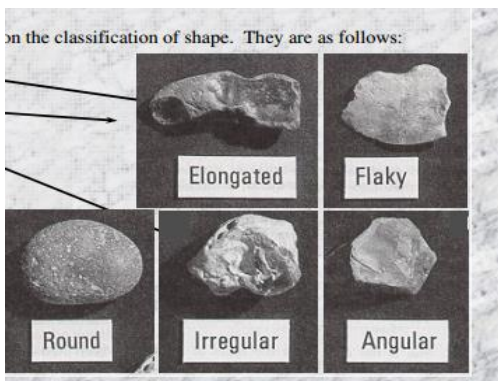
B .Coarse Aggregates coarse aggregate is considered the material that is retained a 4.75 mm (No.4) sieve. Two sizes of coarse aggregate are required whenever the maximum size of the aggregate is 25 mm (1 in.) or larger.

Aggregate Shape

Shape of aggregate has an important influence upon the workability of fresh concrete.

Provides guidance on the classification of shape. They are as follows:

- flaky
- elongated
- angular
- irregular
- round



5.1.1 Aggregate Shape

Water

In a correctly proportioned concrete mix, only about half of the mixing water is needed to hydrate the cement. The remainder acts as a lubricant to produce workability. When more water than is actually needed for workability is added, the concrete is diluted, its density is reduced, and it is weakened. If the water is fit to drink, it is satisfactory to use in concrete. This is not to say that water to be used in concrete must be completely pure. Impurities in water may cause efflorescence, surface discolorations, corrosion of steel as well as affecting setting time and strength.

Chemical Additives (Admixtures)

Sometimes a fourth ingredient is used in addition to three basic ingredients (i.e. cement, aggregate, and water) to improve upon certain characteristic of concrete. This additional ingredient is called admixtures (also called additive). The admixtures are added to concrete mix immediately before or during mixing operation to modify certain specific characteristic of concrete in fresh or hardened state.

The purposes for which admixtures are commonly used in concrete are:

- to improve workability of fresh concrete.
- Accelerate setting and/or hardening.
- Retarding setting and/or hardening.
- to reduce the heat evolution.
- to improve durability of hardened concrete.
- Import water proofing properties of concrete.
- to reduce shrinkage during setting, etc.



Self-Check 5	Written Test
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Directions the following question are true or false items write if the statement is True and write true false if the statement is false

- 1- Aggregates are divided into two general group sizes, fine and coarse (3point)
- 2- The purpose of admixtures to increase the heat evolution (2point)
- 3- Cement is a binding material (1point)

Give short answer

- 4 write at list 4 purposes of admixtures are commonly used in concrete

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____



Information Sheet-6	Identifying Environmental protection requirements
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6.1 Identifying Environmental protection requirements

Environmental protection is a practice of protecting the Natural environment on individual, organizational or governmental levels, for the benefit of both the natural environment and humans. Due to the pressures of population and technology

It is a necessary effort for all contractors to develop an environmental policy. Depending on the project, environmental protection can translate into time, money or both—as well as failure—to uphold a moral obligation to the community.

Failure to conduct an environmental review during the pre-construction phase of a project can lead to severe delays and work stop pages. The environmental policy should contain a basic commitment to the environment and to environmental compliance.

Organizational tool a company can use to manage environmental responsibilities throughout the company or on a jobsite. Even if an environmental review has been completed, project changes can affect environmental compliance. No matter how rigorous the planning and monitoring, it is likely that something will not occur as planned. Foresight into the following common changes can improve outcomes:

1. site conditions other than expected (e.g., soils are found to be more erosive or have a higher silt content than described in the technical studies);
2. discoveries of hazardous materials, or other features that cause a change in construction plans;
3. safety compromised due to environmental compliance (e.g., the permitted storm water conveyance system causes inadvertent flooding of the roadway);
4. access (e.g., the need to get equipment into a sensitive area due to restricted space);
5. changes in construction activities, location or sequencing (e.g., cannot complete in-water work by close of work window, need to change location of permanent or temporary storm water facility, etc.); and
6. Environmental commitments shown to be inappropriate or impractical.



Self-Check -6	Written Test
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Directions the following question are true or false items write if the statement is

True and write false if the statement is false

1 Environmental protection is a practice of protecting the Natural environment_{3 points)

2- One of the best mechanisms to reduced air pollution is environmental protection (2points)

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

Answer Sheet

Score = _____

Rating: _____



Operation Sheet 1	Obtaining, confirming and applying Work instructions
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Obtaining, confirming and applying Work instructions

Step 1- Interpreting Plans, drawings and specifications

Step 2 _ Applying workplace and equipment safety, and Quality requirements

Step 3- list out specific resources and tasks (material, equipment, man power, resources)

Step 4- Submit your report to your teacher/ instructor after the data is complete

Operation Sheet 2	Selecting Tools and equipment's
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Selecting Tools and equipment's

Step 1 were ppe

Step 2 prepare tools and equipment

Step3 identify tools and equipment

Step4 to produce cement concrete casting



LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour.

Task1. Obtaining, confirming and applying Work instructions

Task selecting tools and equipment



Masonry

Level II

Learning Guide 102

Unit of Competence: Produce Cement concrete Castings

Module Title: Produce Cement concrete Castings

LG Code: EIS MAS2 M20 LO2-LG102

TTLM Code: EIS MAS2 M20 0919v1

LO 2: Fabricate cement-concrete castings



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

- preparing formwork and reinforcements
- mixing, placing and compaction Material to make castings
- removing and curing casting

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 –

- prepare formwork and reinforcements
- mix, placing and compacting Material to make castings
- remove and curing casting

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Utilize properly each information sheets
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5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation sheet.
6. Do the “LAP test” (if you are ready).



1.1 preparing formwork and reinforcements

Formwork; - The most commonly employed materials are timber, plywood, steel and aluminum. Formwork in construction is the use of an ancillary support structures and molds to create structures out of concrete which is poured into the molds to harden subsequently. • The construction of formwork takes time and involves expenditure up to 20 to 25% of the cost of the structure or even more. The operation of removing the formwork is known as stripping. Stripped formwork can be reused

- If the material is to be used only a few times timber is more economical than steel or aluminum.
- Steel or aluminum is preferred when the form panels are to be used for considerably more number of time

The time between pouring and formwork stripping depends on the job specifications, the cure required, and whether the form is supporting any weight, but is usually at least 24 hours after the pour is completed. For example, if the structure is vertical member like pier, column forms to be in place for 1–7 days after pouring, while if structure is slab it may need 28 day after pouring.

Types of Formwork materials

- There are mainly three types of formwork :-
 - Timber formwork
 - Engineered Formwork Systems
 - Re-usable plastic formwork

Timber formwork: - The formwork is built on site out of timber and plywood or moisture-resistant particleboard.



Fig 1.1.1 timber formwork

Advantage of wood /timber formwork

- it is adaptable
- It is more economical than steel where work is non-repetitive

Disadvantage of wood formwork

- It is susceptible to insect and fungi attack
- It warps. Swell and shrinkage, especially when it is not well seasoned.
- It is not good for repetitive work.

Engineering Formwork Systems :- This formwork is built out of prefabricated modules with a metal frame (usually steel or aluminum) and covered on the application (concrete) side with material having the wanted surface structure (steel, aluminum, timber, etc.).

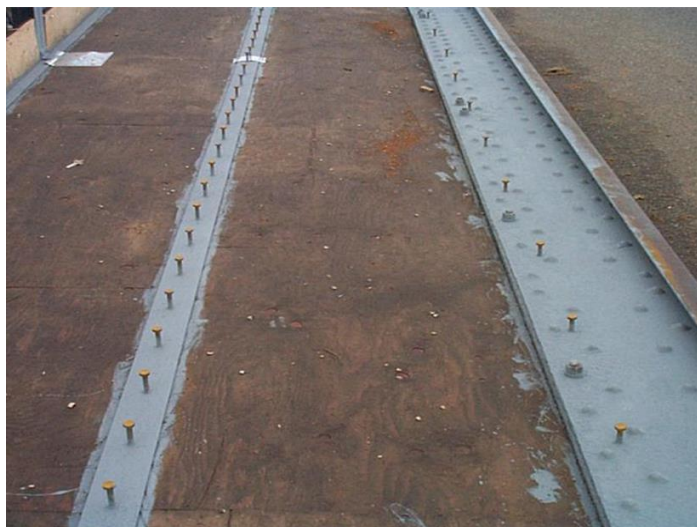


fig 1.2 Engineering Formwork

The two major advantages of formwork systems, compared to timber formwork, are

1. speed of construction (modular systems pin, clip, or screw together quickly)
2. Lower life cycle cost

Re-usable plastic formwork

They have impervious surfaces that usually create a smooth finish to the concrete. Plastic formwork could be reinforced or un-reinforced.

Plastic is reinforced by glass fibers. Reinforced plastics are specially produced for a specific formwork type. Un-reinforced plastics are produced in sheet form with smooth or textured surfaces. Plastic formwork is lighter but less durable than metal formwork.



Fig 1.3 plastic formwork



Advantage of plastic formwork

- Plastic formwork for construction
- Hollow corrugated sheet
- Reusable 80 Times Hollow Plastic Building Formwork In Construction
- Good Building slab formwork Construction for Concrete
- Light Weight Reusable Formwork
- Gray Color Waterproof Hollow Plastic Formwork Panels

Reinforcement is the process of providing steel bars in concrete structures to make the strong enough to resist tensile forces. The main function of reinforcement is to provide tensile strength to the concrete structure formwork

Advantages of reinforced concrete:-

- High compressive strength
- Adequate tensile strength
- Fire and weather resistance
- Durability
- Economy to mold any shape
- Low maintenance cost
- Economy as construction material
- Less deflection
- Use as precast structural component
- Less skilled labor

Dis Advantages of reinforced concrete:-

- Tensile strength to compressive strength ratio
- Uncertainty of final strength
- High form cost
- Larger column section
- Shrinkage



Self-Check -1	Written Test
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Directions the following question are true or false items write if the statement is

True and write true false if the statement is false

1 -uses Reinforcement is the process of providing steel bars in concrete structures to make the strong enough to resist tensile forces (3point)

2 :- The operation of removing the formwork is known as stripping. (2point)

Choose the best answer

1 which one the following Advantages of reinforced concrete

A High form cost B Shrinkage C Durability D Larger column section

2 The two major advantages Engineering Formwork?

A. Lower life cycle cost B speed of construction C It is not susceptible to insect and fungi attack D all

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-2	mixing, placing and compacting Material to castings
---------------------	---

2.1 Batching of concrete ingredients

Batching is the process of measurement of cement, coarse aggregate, fine aggregate and water for each operation of Concrete making

Method of batching

Batching is done in two ways By volume (volume batching) and. By weight (weight batching)

I. Volume batching

A) **Batching of cement.** Cement is always measured by weight. Mostly it is used in terms of bags. One bag of cement weights 50 Kg as a volume of 35 liters. (0.035m^3) Cement should not be batch by volume because its weight per unit volume varies according to the way the container is filled.

B) **Batching of aggregate by volume** a gauge box is used for batching of fine and coarse aggregate by volumes is shown in the figure below. The box should not be too shallow. It should be completely filled with the aggregate s. The top of the materials should be struck of level with a straight edge. The ratio of materials of concrete decides the capacity of the box generally capacity equal to the volume of one bag of cement. Convenient sizes of gauge boxes to suite different proportion given in the table below

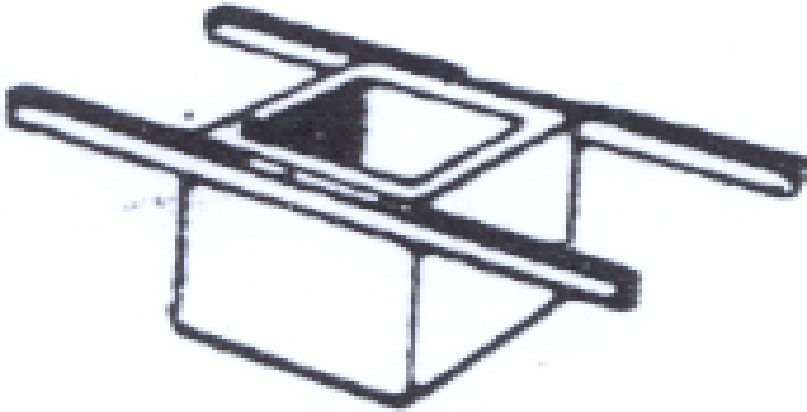


Fig 2.1 gauge box

Capacity in liter	Inside measurement in cm		
	Length	Breadth	Depth
25	25	25	40
30	25	25	48
35	27	27	48
40	29	29	48
45	30	30	50
50	31	31	52



II. Weight batching: -

In weight batching the ingredient of concrete are measured by weight. Generally, weight batching is in practice for constructions where high quality concrete is required. Weight batching is much more accurate than volume batching. Different types of weight batching is available the particular type to be used depends up on the nature of the job. Large weight batching plants have automatic weighting equipment. These are supervised by a qualified and experienced engineer. Batches of concrete are based either on one bag of cement or its multiples unless bulk cement is used and weighed separately. In this type of batching, no correction is needed to allow for the bulking of sand, but an allowance should be made for weight of water contained by the weight aggregate. For comparatively smaller works weight batch can be done by:-

1. Simple spring balance es
2. Plate form weighing machines
3. Automatic weighing machines

2.1.1 Mixing and discharging of concrete

Hand mixing

For hand mixing, a water – tight platform at least 2m and 3.5 m long or hard concrete surface should be provided. Since a platform should preferably be made of boards 3 to 5 can thick, tongued and grooved so that joints are tight and the platfo4rm is rigid.

Working procedure

Following is the stepwise procedure for mixing concrete by hand.(mixing procedure)

- a) Spread out a measured quantity of sand evenly on the mixing platform
- b) Spread to cement uniformly on this sand and mix it till the color of the mixture is uniform
- c) Spread this mixture evenly again on the platform.
- d) Spread on the platform the course aggregate evenly on the surface.
- e) Mix the material dry by turning with should until the stones have been uniformly distributed throughout the mixture of cement and sand.
- f) Spread this day mixture again and make a hollow in the middle of the mixed pile and pour water slowly into it half to three quarters of the total quantity required and start remixing taking care to see that no water escapes the mixture.
- g) Normally mixing time should not exceed 3 minutes
- h) At the end of the day do not forget to wash the mixing platform or surface and hand tools clean of all concrete so that it is sandy for re – use next morning.-

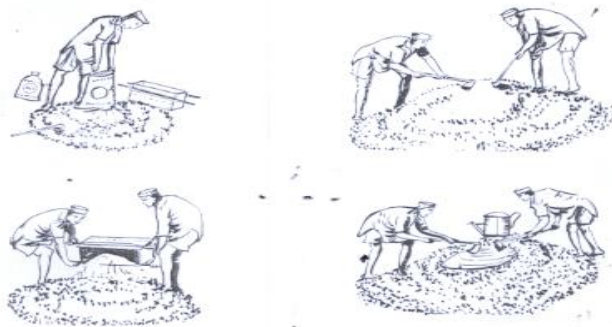


Fig 2.2 Hand mixing

Machine mixing

If you are casting large quantity of concrete, hand mixing is laborious and tiresome work. A mechanical mixer will save you a lot of work. Depending on the magnitude of the work choose the correct capacity of mixer that fits your work

Installing mixer, feeding materials into mixer, mixing operation, discharging and closing down of the mixer after use are important steps in operating a mixer.

A) Installation of mixer

- i) The mixer should be placed as near to place of concreting as possible.
- ii) It should be placed on a firm ground and should be leveled.
- iii) Examine the mixer and its blade.
- iv) Inspect engine, oil, cooling water and petrol, etc.

B) Charging operation

When the ingredients are fed into to drum directly, the following sequence of feeding the material may be tried

- i) First put some portion of water
- ii) Next put in half the quantity of the coarse aggregate.
- iii) Put cement followed by sand
- iv) Feed the remaining part of the coarse aggregate
- v) While feeding these dry materials, the water in parts must be constantly fed into the drum simultaneously and remaining water being fed in to drum after all solid materials are part into the drum

C) Mixing operation

For good mixing about 20 revolutions of the drum are generally sufficient. But since there is an optimum speed recommended by the maker of the mixers, the mixing time and revolutions are

Interdependent generally the speed of a mixer drum varies. The mixing time varies between 1 and 12 minutes.

Mixing time less than one minute reduces the quality of the concrete. Normally the mixing time specified is 12 minutes. The time is measured from the moment all the materials are fed into the drum.

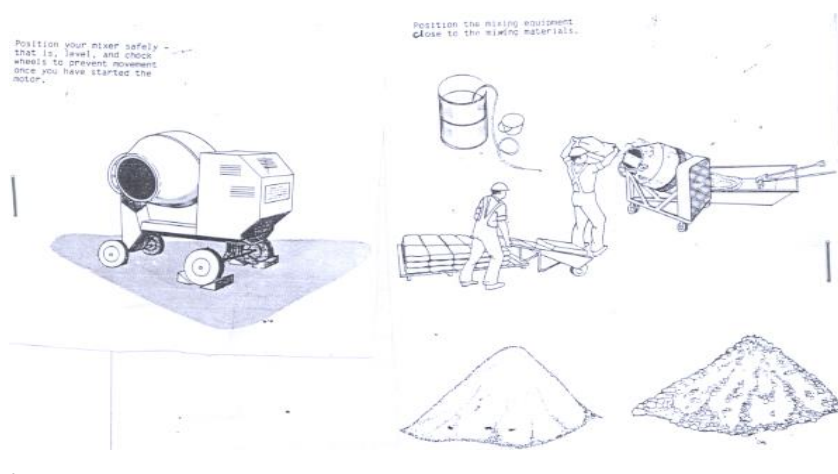


Fig 2.2 **Concrete mix by mixer**

Before you can place your concrete, you need

- Formwork ready and checked
- Batches of mixed concrete arriving quickly and regularly
- All the material and equipment ready.

Basic Requirements for Placing Concrete

- Preserve concrete quality
 - Water-cement ratio
 - Slump
 - Air-content
 - Homogeneity
- Avoid separation of aggregate and mortar
- Avoid excessive horizontal movement
- Consolidate adequately
- Maintain sufficient placement capacity
- Choose the right equipment for the concrete

Transporting of concrete

The precaution to be taken while transporting concrete is that the homogeneity obtained at the time of mixing should be maintained while being transported to the final place of deposition.

There are different ways of handling concrete, and the choice will depend mostly on:

- a) The amount of concrete involved
- b) The size and type of construction
- c) The topography of the job site
- d) The location of the batch plant
- e) The relative cost



Fig 2.3 Transporting of concrete

Placing It is of at most importance that the concrete must be placed in a systematic manner to yield optimum results. The main objective is to deposit the concrete as close as possible to its final position so that the segregation is avoided and the concrete can be fully compacted. To achieve this objective, the following rules should be borne in mind. The concrete should be placed in uniform layers, not in large heaps or sloping layers; the rates of placing and compacting should be equal

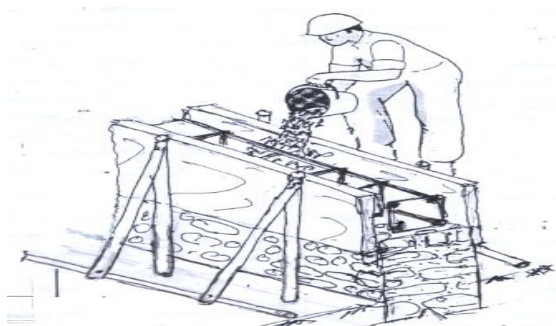
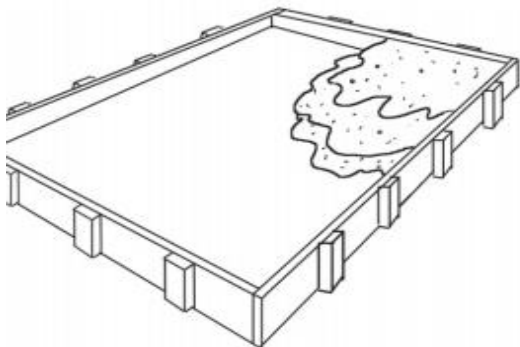


fig2.4 Placing concrete

- ❖ **Note:** Start placing loads from a corner at one end of the slab

like this



not this

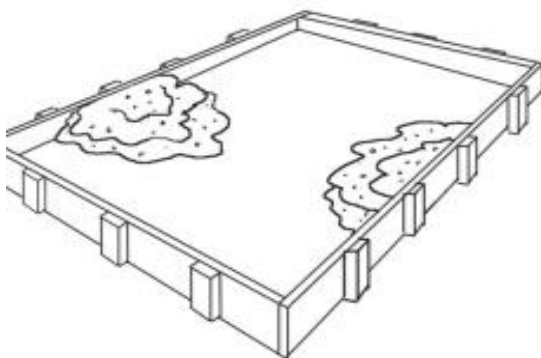


fig 2.5 style of Placing concrete

Compaction is one of the most important steps. The durability of the concrete depends so much on it. In concrete making, because the density, strength and compaction of concrete is the process adopted for expelling the entrapped air from the concrete. If this entrapped air is not removed fully, the concrete loses strength considerably. 1% entrapped air causes a 5-6% reduction in concrete strength.

The following methods are adopted for compacting the concrete:

- A. Hand compaction
- B. Compaction by vibration
- C. Compaction by pressure and jolting
- D. Compaction by spinning

- i. Internal vibrator (needle vibrator)
- ii. Formwork vibrator (external vibrator)
- iii. Table vibrator
- iv. Platform vibrator
- v. Surface vibrator (screed vibrator)
- vi. Vibratory roller

✚ **The duration of vibration is dependent on:-**

- The height of the layer,
- The size and characteristic of the vibrator, and
- The workability of the concrete mix.

Placing Concrete method

Start placing at bottom of slope so that compaction is increased by weight of newly added concrete. Vibration consolidates the concrete.

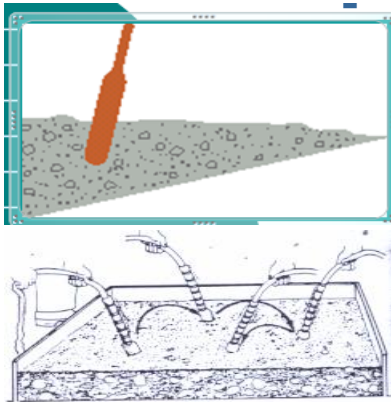


Fig 2.6 Correct use of vibrator

When placing is begun at top of slope the upper concrete tends to pull apart especially when vibrated below as this starts flow and removes from concrete above.

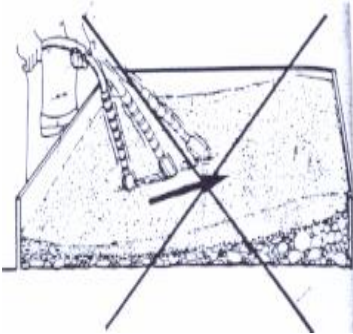
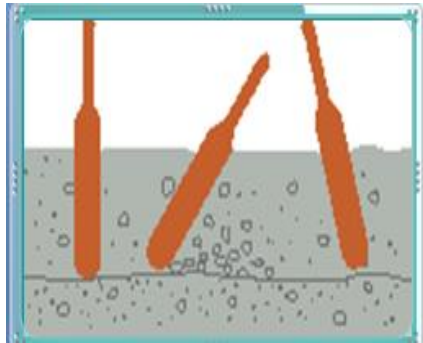


Fig 2.7 Wrong use of vibrator



Self-Check -2	Written Test
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Directions the following question are true or false items write if the statement is True and write true false if the statement is false

- 1 *weight batching the ingredient of concrete are measured by weight* (3 points)
- 2 *Machine mixing are casting large quantity of concrete* (2point)

Choose the best answer

3 which one the following Basic Requirements for Placing Concrete (2point)

A Water-cement ratio B Slump C Air-content D Homogeneity E all

4 *write method of compacting the concrete*

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

3.1 Removing formwork materials.

The removal of concrete formwork also called as strike-off or stripping of formwork should be carried out only after the time when concrete has gained sufficient strength, at least twice the stress to which the concrete may be subjected to when the formworks are removed. It is also necessary to ensure the stability of the remaining formwork during formwork removal.

Requirement of removing formwork

- Once concrete is set, remove the bolts , carefully tilt the baluster flat to the ground taking care not to rest heavy casting on edges of mold (best to remove on grass area, carpet, cardboard for softer surface).
- Now unmold the castings by pulling and lifting on the ends of the mold.
- The concrete will continue to set up for 5 more days so be gentle with handling until it is fully cured.
- Clean the mold immediately after use and store molds out of the sun.
- It is normal to have some air bubbles in the surface of your baluster which you can patch easily by mixing a small batch of one part cement and one part sand and enough water to moisten. Apply with a damp sponge to smooth over the area.



Fig 3.1 Remove the mold



3.1.1 Curing

Curing is the name given to procedures for promoting the hydration of cement. It may be defined as the act of maintaining controlled condition for freshly placed concrete for some definite period following the depositing and finishing operations to assume the proper hydration of cement and proper hardening of concrete.

3.1.2 Advantage of Curing

- i) Improves wearing quality of the concrete
- ii) Improves the strength of the concrete
- iii) Improves the impermeability of the concrete depending on the grade of the concrete.
- vi) Improves the durability of the concrete
- vii) If chemicals are used it shortens the removing time of the form work

3.1.3 Methods of curing

When making provision for the two extremes, frost and heat, the factors to consider are those which influence the gain of strength, i.e. cement and water. Water is needed to provide workability and commence the hardening process, and the proportion used, known as water / cement ratio (W/C), must be sufficient for these two tasks. The ratio will need to be varied to suit climatic variations.

In cold weather the water / cement ratio needs to be kept to the minimum necessary to provide the desired workability. Since cement and water react more rapidly as the temperature increases, it is an advantage to use warm water to assist early setting as a precaution against frost damage. In hot weather the water will have a tendency to evaporate more rapidly because the speeded up hardening process produce more heat. To increase the water / cement without taking additional precautions would only create problems of cracking and loss of strength. To overcome these problems there are different methods of curing and are mentioned few of them below.

- A. Shading of concrete work
- B. Covering concrete surface with wet material
- C. Continuous sprinkling of exposed surfaces
- D. Ponding method

A) Shading of concrete work

This method consists of curing surfaces by canvas stretched on frames in initial stages of hardening even prior to setting when the concrete is mechanically weak. In very hot and dry climates, it is necessary to prevent the evaporation of water. In cold climates, it is necessary to preserve the heat of hydration.

This method has a limited application. Firstly, it is hard to handle in strong winds. Wherever possible, the canvas or burlap should be placed directly on the surface of the concrete unless

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a very smooth finish is required. This method is inefficient when w/c ratios are low. In the case of slabs where smooth finish is important, the suspension of canvas on the frames is an expensive affair.

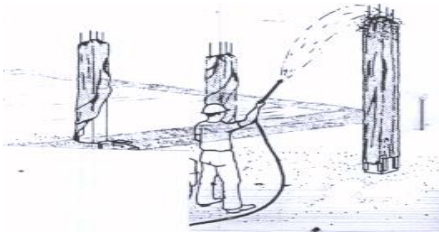


Fig 3.2 Shading of concrete work

B) Covering concrete surfaces with wet material This is the most widely used method. It is done by covering the concrete surfaces by wet Hessian cloth, canvas or sacking and is kept constantly wet for at least 7 days from the date of placing of concrete. Normally, for the first 24 hours, the concrete is protected by formwork. In structural concrete formwork supporting the vertical surfaces are struck off after 24 hours. These surfaces such as those of columns and walls are then kept moist by surrounding it with Hessian cloth. Horizontal surfaces such as those of road-slabs, house floors, etc. are covered by wet Hessian, damp sand or damp sawdust. A layer of at least 5 cm of earth and sand or sawdust or 15 cm of straw is spread and is kept wet. The frequency of wetting depends upon the temperature, velocity of wind, humidity, etc. With higher temperatures, greater wind velocity and dry climates, wetting should be frequently resorted. It is important that the concrete should not be allowed to dry and exposed to extremes of temperature even for short intervals.



Fig 3.3 Covering concrete surfaces

C) Continuous sprinkling of exposed surfaces

Continuous sprinkling is done by spraying water through hose. In this type, it is important to ensure that the surface is continuously kept wet for three days and later on, the spraying may be intermittent. Floor slabs can be kept wet by a single hose pipe. But for long walls or sloping surfaces of large areas and columns the spraying is done by a perforated hose-pipe, allowing the water to trickle from the top along the surface. Sprinkling of water starts when the concrete surface has initially sufficiently hardened. The efficiency of this method is the same as that of ponding, but the total water requirement is higher.

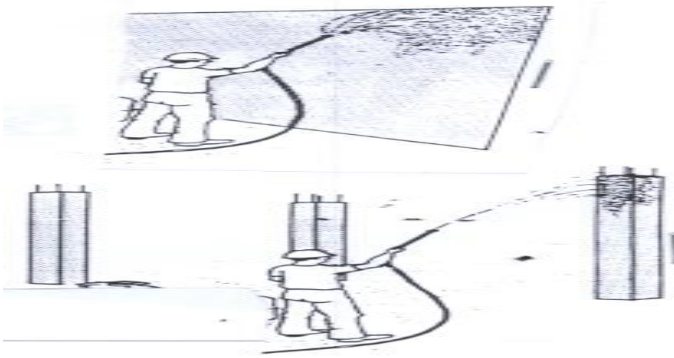


Fig 3.4 sprinkling concrete surfaces

D Ponding method This is the most efficient method of Curing. For the first 18 to 24 hours. The exposed surface is covered with Moist Hessian or canvas. After that Small banks of dykes of clay or earth are built across and along the slab, dividing the slab into number of Rectangular ponds. These ponds are filled with water. This method is suitable for the construction of Floors, roof slabs, roads and airfields. This method is very efficient especially when the concrete has a low w/c ratio below 0.4. The water requirement for this method is higher than that for the Hessian cloth method but less than that for the continuous spraying method. One disadvantage is the difficulty of removing the mud from the slab on completion of the curing process. But this is not serious in view of its efficiency.

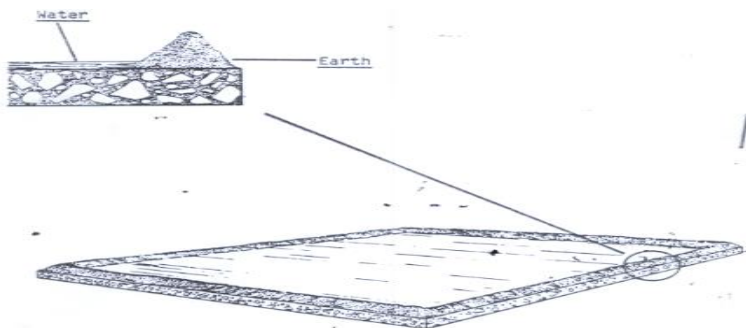


Fig 3.5 Ponding method

'3.1.4 Duration of curing

Concrete mix design strength is determined on specimens cured under water for 28 days. The test samples for quality control of construction are also cured for 28 days. For the development of the stipulated design strength therefore, the same curing period of 28 days should be specified. From practical considerations, however, this is rarely done. The exposed surfaces of concrete should be kept continuously in a damp or wet condition for at least 7 days from the date of placing concrete. For concrete roads stipulates moist curing with wet Hessian for the first day, and thereafter 14 days curing by bonding water in earthen dykes made on the slab. The dykes are to be filled with water on the fourteenth day; and the wet earth cover left in place till such time that the required strength of concrete is attained



Self-Check -2	Written Test
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Directions the following question are true or false items write if the statement is True and write true false if the statement is false

- 1 Ponding method is the most efficient method of Curing (3 points)
- 2 Advantage of Curing is to Improves wearing quality of the concrete (2point)
Choose the best answer
- 3 which one the following is advantage of curing (2point)
A Improves wearing quality of the concrete B Improves the strength of the concrete
C Improves the impermeability of the concrete d improves the durability of the concrete
E all

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions



Operation Sheet 2	mixing, placing and compaction Material to make castings
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Method of mixing placing material and compact to make castings:

Step 1 wear ppe

Step 2- preparing tools and equipment

Step3.Measuring raw materials

Step 4- mixing raw material

Step 5-casting concrete in the mold

Step 6-compacting concrete

Step 7-clean work area



LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1 mixing placing material and compact to make castings



Masonry

Level II

Learning Guide 103

Unit of Competence: Produce Cement concrete Castings

Module Title: Producing Cement concrete Castings

LG Code: EIS MAS2 M20 LO3-LG103

TTLM Code: EIS MAS2 M20 0919v1

LO 3: Clean up

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Instruction Sheet 3	Learning Guide 103
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Cleaning Work area and disposing ,reusing or recycling materials
- Cleaning , checking , maintaining and storing, Tools and equipment's
- Accomplishing necessary documentation

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 –**

- Clean Work area and disposing ,reusing or recycling materials
- Clean , checking , maintaining and storing, Tools and equipment's
 - Accomplish necessary documentation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Utilize properly each information sheets
4. Accomplish the given “Self-checks.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation sheet.
6. Do the “LAP test” (if you are ready).



Information Sheet-1	Cleaning Work area and disposing ,reusing or recycling materials
----------------------------	---

3.1 Clean work area

Cleanliness is both the abstract state of being clean and free from dirt, and the process of achieving and maintaining that state.

Cleanliness may be endowed with a moral quality, as indicated by the aphorism "cleanliness is next to godliness,"^[1] and may be regarded as contributing to other ideals such as health and beauty.

In emphasizing an ongoing procedure or set of habits for the purpose of maintenance and prevention, the concept of cleanliness differs from purity, which is a physical, moral, or ritual state of freedom from pollutants. Whereas purity is usually a quality of an individual or substance, cleanliness has a social

Dimension, or implies a system of interactions.^[2] "Cleanliness," observed Jacob Burckhardt, "is indispensable to our modern notion of social perfection."^[3] A household or workplace may be said to exhibit cleanliness, but not ordinarily purity; cleanliness also would be a characteristic of the people who maintain cleanness or prevent dirtying.

On a practical level, cleanliness is thus related to hygiene and disease prevention. Washing is one way of achieving physical cleanliness, usually with water and often some kind of soap or detergent. Procedures of cleanliness are of utmost importance in many forms of manufacturing.

3.1.1 Reusing or recycling disposing waste materials

Reuse and recycling of materials is one component of a larger holistic practice called sustainable or green building construction. The efficient use of resources is a fundamental tenet of green building construction. This means reducing, reusing, and recycling most if not all materials that remain after a construction or renovation project. Green building construction practices can include salvaging dimensional lumber from the project, using aggregates reclaimed from crushed concrete or grinding drywall scraps for use on site as a soil amendment. At the end of a building's life, demolition generates large amounts of materials that can be reused or recycled, principally wood, concrete and other types of masonry, and drywall. Rather than demolish an entire building, consider "deconstructing" all or part of the structure. Deconstruction is the orderly dismantling building components for reuse or recycling. In contrast to demolition, where buildings are knocked down and materials are either land filled or recycled, deconstruction involves carefully taking apart portions of buildings or removing their contents with the primary goal being reuse. It can be as simple as stripping out cabinetry, fixtures, and windows, or as involved as manually taking apart the building frame.

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Self-Check -1	Written Test
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Directions the following question are true or false items write if the statement is

True and write false if the statement is false

1 Cleanliness is both the abstract state of being clean and free from dirt, (3 points)

2 Disposing, reusing and recycling waste materials to crate green environment (2point)

Choose the best answer

3 what is the use of Disposing, reusing and recycling waste materials in construction?(2point)

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____



Information Sheet-2	Clean , checking , maintaining and storing, Tools and equipment's
----------------------------	--

3. 1.2 Maintaining plants, tools and equipment

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

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

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

Inspect and repair all construction equipment and tools at the completion of each job. Make all repairs to the equipment that are necessary for future construction work. This will prevent time being wasted repairing faulty equipment at future construction job sites.



Self-Check -2	Written Test
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Directions the following question are true or false items write if the statement is

True and write true false if the statement is false

1 cleaning Tools and equipment used as the construction site (3 points)

2- The use of Inspect and repair all construction equipment and tools at the completion of each job (2point)

Give short answer

3 what is the purpose of Maintaining tools and equipment?

Note: Satisfactory rating – 4and above points Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____



Information Sheet-3	Accomplish necessary documentation
----------------------------	---

3.1 Accomplish necessary documentation

- Written documents are required by formal laboratory standards, including those leading to accreditation. Standards generally require that policies and procedures be written and available. ... Everyone, both inside and outside the laboratory, must know exactly what is being done, and what should be done at each step.

Documentation – seems to be a herculean task for a project manager. Project managers are often engaged in delivering high-end complex projects. They are supposed to produce expected deliverables by encountering triple constraints in a project. Hence, the job of a project manager is always challenging with managing lots of activities. With this busy schedule, project manager seldom appreciates documentation part of project management. But, even then, a good project manager never strays from the documentation, while managing a project's nitty-gritty. Reason being, project documentation is equally important for a good project manager.

- What is documentation?

Let's review some standard definitions of Documentation,

Oxford dictionary says, "Documentation is the material that provides official information or evidence or that serves as a record, the process of classifying and annotating text"

Merriam Webster defines, "Documentation is the act or an instance of furnishing or authenticating with documents"

Cambridge dictionary states, "Documentation as official papers, or written material that provides proof of something"

Hence, documentation is a set of

- officially written,
- maintained or recorded material
- With information or evidence.

3.1.1 Purpose of documentation

It can serve the purpose of providing proof of traceability or reference of something done.

What is Project Documentation?

Project documentation encompasses all the documentation part involved in a project.

It makes

- project expectations and objectives intact;
- project tasks traceable; and
- Helps address any project issues among others.

In some or other way, project management helps project manager save her job. Indeed, she is responsible and answerable for the project status & outcomes. A project manager should be vigilant professional with an eye on tracking project progress.

Project documentation helps to track project progress & performance and to make decisions.

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Sometimes, project documentation seems a burden to project management professional. But, a seasoned professional can understand the significance of good documentation. She never undermines the use of documentation throughout a project cycle. Rather, she advocates the usage of good documentation templates. She tries to foster a culture of documenting and recording. Inadequate or no documentation increases the chances of project failure. Also, inadequate documentation can lead to the issues related to inadequate support in a project.

3.1.2. The Importance of Documentation

Here at my Zone we've written several articles related to outsourcing and how to manage small teams for maximum productivity. One of the key factors to accomplish both of these is effective documentation; if you keep track of how all of your processes work and the steps to each task that you set your team, it becomes much easier to both manage and train everyone who is working with you.

Creating effective documentation can seem like a monumental task, and companies often don't know where to get started, which is why we've created this article to walk you through it. Simply read on for everything you need to know on creating clear and concise documentation for your company.

3.1.3 Why Documentation is Important

First things first: You're probably wondering exactly why you need to care about documentation in the first place. Most companies will pride themselves on the fact that their staff know how to do their jobs, and seem put off by the tedious process of jotting everything down.

While you may be right in saying that your team knows how to go about their tasks, you shouldn't use that as an excuse to skip documenting. As we said earlier, effective documentation is the building block of team management and plenty of other tasks such as outsourcing, and plays a major role in streamlining your business practices. Here's why:

3.5. What is Process Documentation?

Process documentation is key for any organization. Learn what it is, why you need it, how to do it using our process documentation software and more in this comprehensive guide.

9 min read

3.1.4 What is process documentation?

A process document outlines the steps necessary to complete a task or process. It is an internal, ongoing documentation of the process while it is occurring—documentation cares more about the “how” of implementation than the “what” of process impact. A business is essentially a group of interrelated processes, and if these processes aren't in writing, breakdowns can occur. Companies have repeatable processes

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Self-Check -3	Written Test
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Directions the following question are true or false items write if the statement is

True and write true false if the statement is false

1 advantage of Documentation is the material that provides official information or evidence or that serves as a record, (3point)

Give short answer

2 What is written document (2point?)

3 What is process documentation (2point?)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____



Operation Sheet-2	Techniques Cleaning and checking , maintaining and storing, Tools and equipment's
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Follow Techniques for Maintaining and storing tools and equipment's

Step 1-wear ppe

Step 2-- Identifies tools and equipment's depends on their type.

Step 3- set in order by placing the tools and equipment's in proper places.

Step 4-- clean each tools and equipment.

Operation Sheet-3	Cleaning Work area and disposing ,reusing or recycling materials
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Techniques reusing or recycling disposing waste materials to clean work area

Step 1-wear ppe

Step 2-- Identifies tools and equipment's depends on their type.

Step 3 -selecting Reusing or recycling Disposing waste materials

Step 4- Reusing or recycling Disposing waste materials

Step 5 -clean work area



LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1. Maintaining and storing tools and equipment's

.Task 2 Reusing or recycling disposing waste materials to clean work area



List of Reference Materials

- 1 <https://www.google.com> Organizational first aid
2. <https://theconstructor.org/concrete/concrete-curing-compound-types/13478/>
- 3.<https://www.safetyinfo.com/rules-policies-safety-index/>
- 4 <https://theconstructor.org/concrete/13-types-of-cement-uses/5974/>
- 5 <http://civilrind.com/calculate-cement-sand-and-aggregate-for-nominal-mix-concrete/>
- 6 <http://www.greenspec.co.uk/building-design/aggregates-for-concrete/>
- 7 <http://constructionexec.com/article/what-does-environmental-protection-mean-to-the-construction->



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