



Participant Guide

HELPER MASON (Construction)

LN CON HMA L1 ENG PG VER 1.00

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Foreword

LabourNet is a social enterprise that creates sustainable benefits for workers in the informal sector, by taking an end to end solution focused on plugging gaps in the eco-system of the market, to address all the challenges faced by the workers in the unorganized sector This course is created to impart the skills necessary for working as a Helper Mason in Construction sector.

This course book is designed for the training model known as work integrated learning. Trainees will be imparted with knowledge through lectures in the construction site premises for a fixed duration every day. For the remaining time trainees will be working in a construction site. The trainer will be providing guidance for limited duration as and when required to ensure the trainee is acquiring the required skills to function as a independently as a helper mason in construction industry.

The advantage of this model is that the trainee will be learning in the working environment and not many new facilities are required for training delivery, except sparing of the tools and equipment for on-the job training under the guidance of the supervisor along with need based periodic intervention from the trainer.

This course for helper mason is designed to ensure that the trainee will be able to meet all the performance, knowledge and core skills criterion specified in the draft Qualification Pack for Helper Mason (Construction) vide Reference ID: CON/Q0101 published by NSDC.

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Module 1- Overview of construction industry and role of helper Mason

Module Objectives

By completing this module the trainee would have gained knowledge about:

- Construction industry in India
- Parts of a building
- Commonly used construction tools and materials
- Roles of a helper Mason

Session Plan 1- Introduction to construction and role of helper mason

Session Objectives

At the end of the session, the trainee will be able to:

- Explain the importance of construction industry
- List and describe parts and functions of a building
- Describe common tools and materials used in construction
- Describe methods of measurement, unit conversion and calculate areas and volumes of simple elements
- Describe the roles of a Mason

Relevant Knowledge

1.0 Introduction to construction and role of a helper Mason

1.1 Overview of construction industry

The Construction industry of India is an important indicator of the development of the country as it creates investment opportunities across various related sectors. The construction industry has contributed an estimated Rs. 670,778 crore to the national GDP in 2011-12 (a share of around 8%). The industry is fragmented, with a handful of major companies involved in the construction activities across all segments; medium sized companies specializing in niche activities; and small and medium contractors who work on the subcontractor basis and carry out the work in the field. The sector is labor-intensive and, including indirect jobs, provides employment to more than 3.5 crore people!

The Indian economy has witnessed considerable progress in the past few decades. Most of the infrastructure development sectors moved forward, but not to the required extent of increasing growth rate up to the tune of 8 to 10 per cent. The Union Government has underlined the requirements of the construction industry.

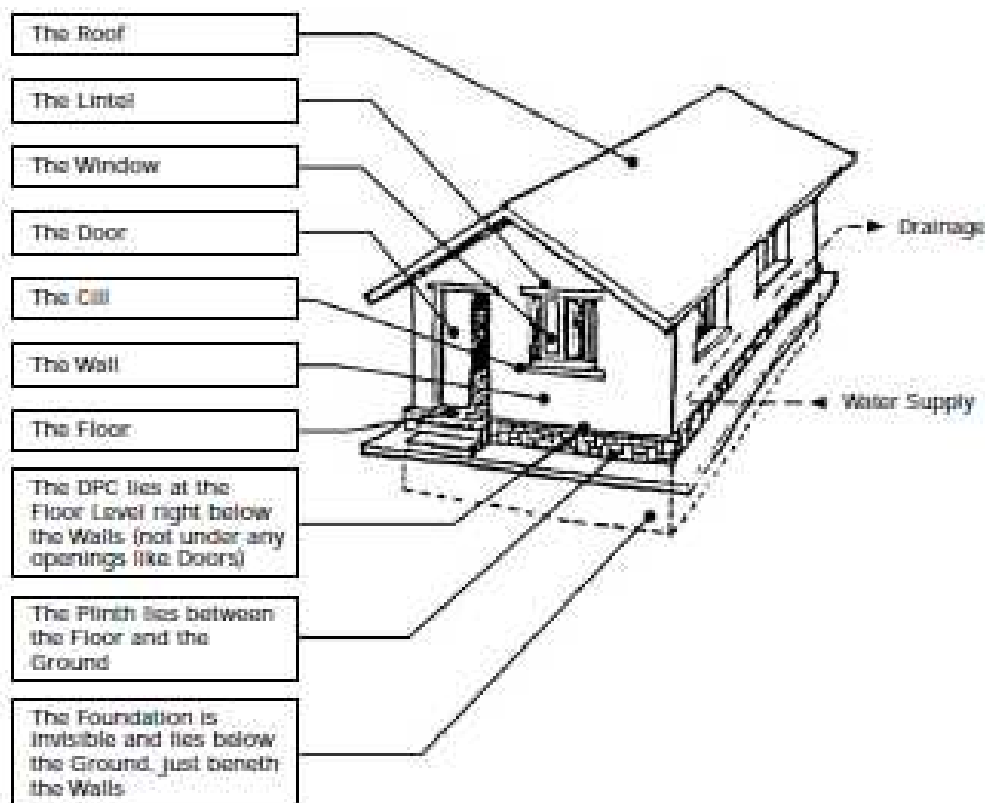
With the present emphasis on creating physical infrastructure, massive investment is planned in this sector. The Planning Commission has estimated that investment requirement in infrastructure to the tune of about Rs. 14,50,000 crore during the 11th Five Year Plan period.

This is a requirement of an immense magnitude. Budgetary sources cannot raise this much resources. Public Private Partnerships (PPP) approach is best suited for finding the resources. Better construction management is required for optimizing resources and maximizing productivity and efficiency.

1.2 Parts of a Building

1. Building

A building provides shelter against natural elements such as rain, sunshine and wind. It also provides security and privacy. A building consists of the following basic parts:



Raw materials for masonry works

The raw materials required for masonry work, together with the skill of the mason are decisive factors for the final quality of the masonry work. Therefore, it is important that the correct raw materials are used. Basic know-how about the different required raw materials is essential for masons as well as supervisors.

The following main raw materials for brick masonry are needed:

- Bricks

- Stones
- Concrete blocks
- Mortar (Sand, Cement, Water)

1.4 Construction Measurements and Calculations

Unit Conversions

Length

Unit	mm	Cm	m	km
1 millimeter (mm)	1	0.1	0.001	0.000001
1 centimeter (cm)	10	1	0.01	0.00001
1 meter (m)	1,000	100	1	0.001
1 kilometer (Km)	1,000,000	10,000	1,000	1
1 inch (in.)	25.4	2.54	0.0254	0.0000254
1 feet (ft.)	304.8	30.48	0.3048	0.0003048

Note: For construction work the most common and practical units are metres and centimetres.

1.5 Basic Tools Used in Construction

This topic covers only tools used generally in construction. Tools specifically used by helper masons are covered in subsequent modules.

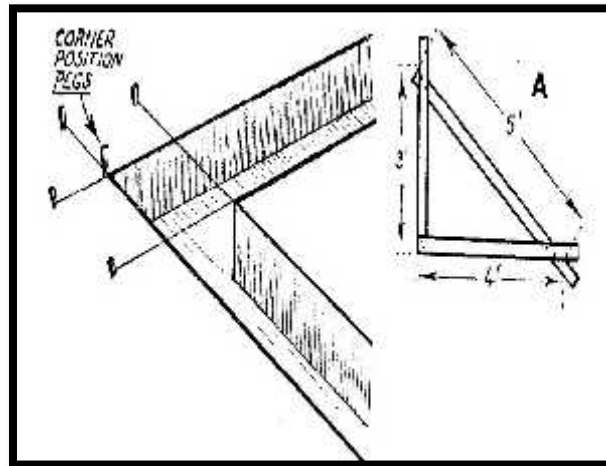
General

Virtually every project of construction industry requires a spade and perhaps a shovel, a hammer, wheelbarrow and tape measure. Without these basic tools, it is not possible to set out the area accurately or excavate it.

Tape measures are probably the first item in any tool-kit. A good quality retractable steel tape, ideally with a locking mechanism is required. They come in various lengths; 8m and 10m are both useful lengths.



Pegs and line are used to set out paths, steps and patios. Make pegs out of excess or reject timber.



Chalk is sold for setting out building sites. Instead a little cement or even flour also can be used, which often works out the cheapest.



1.6 Roles of a helper mason

A helper mason is expected to work as Helper in masonry trade while attending and responding to the needs and requirement of the tasks under his trade senior and above.

The following activities describe the role of a helper mason

- Follow all Health, Safety and Environmental measures on the site
- Identify and use basic tools, equipment and materials
- Follow correct material handling and storing procedures
- Practice correct methods of preparation of cement mortar and concrete mix
- Use different types of bonds in basic brickwork
- Erect and dismantle 3.6 meter temporary Scaffold

- Perform Cutting, Filling, Leveling and Compaction of Earth

Points to remember:

1. The Indian construction industry employs over 3 crore people and creates assets worth over Rs. 20,000 crore.
2. A foundation is necessary to evenly distribute the entire building load on the soil in such a manner that no damaging settlements take place.
3. Bricks must be of good quality and without visible cracks for a load-bearing wall.
4. A good building stone must be hard, tough, compact grained and uniform in texture and color.
5. For construction work the most common and practical units are meters and centimeters.
6. When working out areas always make sure that all the units are the same.
7. Spirit levels are used to check that both vertical and horizontal surfaces are level.
8. Squares are vital for checking right angles.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

Fill in the blank

1. Around 16 per cent of the nation's working population depends on _____ for its livelihood.
2. List at least 10 parts of a building

3. What is plinth? What is the purpose of the plinth?

4. What is plinth beam? What is the purpose of the plinth beam?

5. List 5 basic tools used in construction and describe the purpose of these tools.

Module 2- Health, Safety and Environment

Module Objectives

By completing this module the trainee would have gained knowledge about:

- Demonstrating and using the right PPE for the right type of work they are doing on the site.
- Practicing safe working at heights and following safety measures on site.
- Practicing first aid, ensuring waste disposal and following safety related activities in steel.
- Practicing safe systems of work and demonstrating correct methods of lifting and hauling.

Session Plan 2- Health, Safety and Environment

Session Objectives

At the end of the session, the trainee will be able to:

- Demonstrate and use Personal Protective Equipment meant to protect a worker's head, feet, face, eyes, ears, hands and body. Demonstrate and use respiratory protection and fall protection as necessary.
- Follow and heed the Do's and Don'ts during working at heights
- Carry out safety measures and drills with action and roles in normal times and emergency by mock drills.
- Practice first aid with identification and use of basic dressing materials and bandages, resuscitation practices and actions
- Ensure waste disposal and pollution control with organic and inorganic waste disposal methods, sound and noise control and protection methods.
- Carry out Environment, Health and Safety performance.
- Follow safety related activities in steel, bars open in work area, while cutting, bending the same and the measures to avoid accidents.
- Practice safe system in work area or clear plan on safety action

- Demonstrate lifting operations manually, pallets and using slings for crane operations.

Relevant Knowledge

2.0 Health, Safety and Environment

2.1 PPE

Introduction

PPE stands for Personal Protective Equipment, it is protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities.

The purpose of personal protective equipment is to reduce construction worker exposure to hazards when engineering and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present.

The Requirement for PPE

To ensure the greatest possible protection for construction workers in the workplace, the cooperative efforts of both employers and construction workers will help in establishing and maintaining a safe and healthful work environment.

In general, construction workers should:

- Properly wear PPE,
- Attend training sessions on PPE,
- Care for, clean and maintain PPE, and
- Inform a supervisor of the need to repair or replace PPE.



Some of the Do's and Don'ts of working at heights are

Do:

- Make sure the surface/access equipment in use is stable and strong enough to support the worker's weight and that of any equipment. Any edge protection should be wide enough and strong enough to prevent a fall.
- Work as much as possible from the ground or partly from the ground. For example, assemble structures on the ground and lift them into position with lifting equipment.
- Take precautions when working on or near fragile surfaces, such as an asbestos cement roof, to prevent a fall or to minimize the distance and reduce injuries in the event of a fall.
- Follow safe route to and from where you want to work at height, and also follow emergency evacuation and rescue procedures.
- In case you are not confident to work at height do not hesitate to approach the seniors/supervisors for guidance before you start working at height.
- Choose the most appropriate equipment, as instructed, for the type of work being done and how often it will be used.
- Follow the standard protection measures from falling objects.
- When using ladders; if you cannot maintain three points of contact (two hands and one foot, or one hand and two feet) at the working position, consider an alternative safe system of work.
- Make sure equipment used for work at height is well maintained and inspected regularly.

Don't:

- Overload ladders. Do not take up any load (including your weight) exceeding the highest load stated on the ladder.
- Overreach on ladders or stepladders. Keep your belt buckle (navel) inside the stiles and both feet on the same rung throughout the task.
- Use ladders or stepladders if the nature of the work is deemed to be 'heavy' or if the task will take longer than 30 minutes to complete.
- Let anyone who is **not** competent carry out work at height

Points to remember:

1. The purpose of personal protective equipment is to reduce construction worker exposure to hazards when engineering and administrative controls are not feasible or effective to reduce these risks to acceptable levels.
2. A head injury can impair a construction worker for life or can be fatal.

3. Safety shoes have impact-resistant toes and heat-resistant soles that protect the feet against hot work surfaces common in roofing, paving and hot metal industries.
4. When working on ladders: The worker and anything he or she is taking up should not exceed the highest load stated on the ladder.
5. To prevent noise pollution: noise limits should be measured regularly and should not exceed 85-dB (A) during an 8-hour exposure time.
6. If you are a new comer to the site, attend HSE induction training before entering into the construction area.
7. One of the major hazards of working around rebar is impalement (piercing of steel into the worker's body causing serious harm, injury or death). Unless the risk of impalement is eliminated, workers should not work around rebar.
8. As recommended by the International Labour Organization, it is desirable that the weight of a load to be lifted manually by an adult male worker is limited to 55kg.
9. When lifting bundles of rebar or other loose materials, whether banded or not, slings should be double wrapped.
10. One of the most important aspects of good technical drawing is the production of good quality lines of the correct weight and to the correct size.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

Fill in the blank

1. What is the PPE? What are the requirements with regards to wearing PPE ?

2. List the types of PPE? Describe the purpose of each.

3. List the do's and don'ts of working at heights.

4. What are the objectives of a mock drill?

5. What is difference between a bandage and a dressing? Describe the use of each.

6. List 5 rules of waste disposal.

7. List at least 5 workers responsibilities with regards to EHS

8. List common hazards of masonry and describe the preventive measures.

9. List the steps for team lifting.

10. List some of the symptoms of communication problems in an organization:

Module 3: Identification and use of basic tools, equipment and materials

Module Objectives.

By completing this module the trainee would have gained knowledge about:

- Identification and use of basic tools, equipment and materials by helper mason in the construction site.

Session Plan 3- Identification and use of basic tools, equipment and material

Session Objectives

At the end of the session, the trainee will be able to:

- Identify, select and use of hand and measuring tools such as mason trowel, brick hammer, bluster chisel, comb hammer, straight edge, plumb bob, spirit level etc.
- Identify, select and use of construction materials such as bricks, fine aggregates, course aggregates, cement, wood, paint and water.
- Identify and select basic power tools such as drill machines, compactor, vibrator, stone cutting machine etc

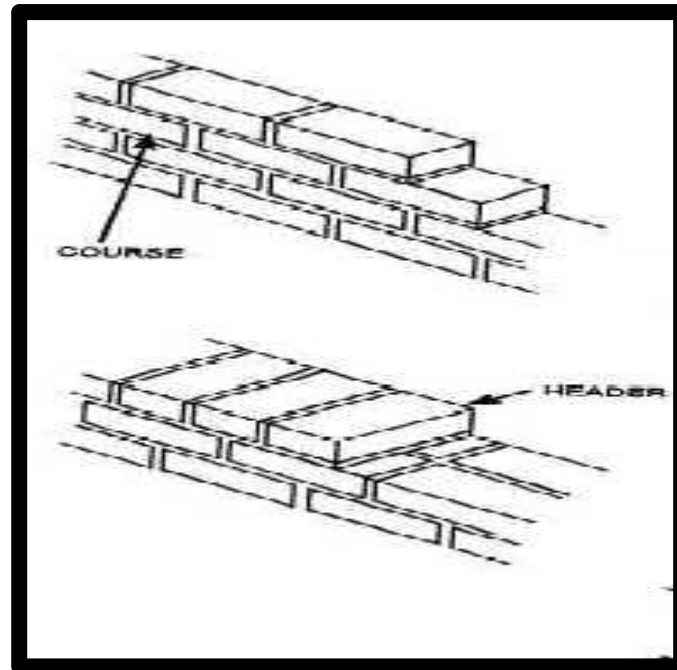
Relevant Knowledge

3.0 Identification and use of basic tools, equipment and materials.

3.1 Masonry tools

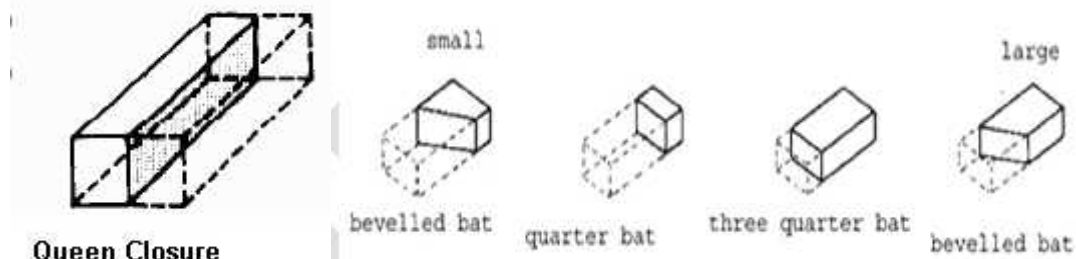
Masonry terms:

- **Course:** A horizontal layer of blocks.
- **Bed:** This is the lower surface of a block perpendicular to the line of pressure.
- **Header:** A block which lies with its greatest length at right angles to the face of the work.
- **Stretcher:** A block which lies with its longest side parallel to the face of the work.



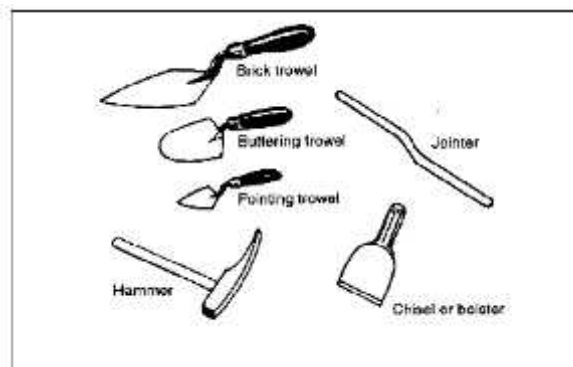
Closure: blocks which are cut along their length or width keeping the depth equal to that of a full block is called a closure.

Bat: The portion of block cut along the width is called a bat.



Basic Mason Tools:

Masonry tools: Masonry tools are the tools used by mason (construction worker) for building of structures in the construction industry.



Mason trowel: Is a small hand tool with a handle and flat metal blade; used for scooping or spreading plaster or similar materials. The blade is made of forged steel to last longer. Handles

are generally made of plastic or wood. Blades vary from 9 to 12 inches in length and 4 to 7 inches in width. The larger trowels are used for spreading mortar. A variety of smaller trowels are used repairing old mortar joints and scraping off excess mortar. There are different kinds and sizes of trowels.

Bucket trowel: (Bucket Trowels) stainless steel, aluminum or plastic scoops used to transfer and measure plaster of Paris powder and smoothing mortar.



Concrete finishing trowel: is usually rectangular, used to smooth, level, or texture the top layer of hardening concrete.



Gauging trowel: A gauging trowel is designed in a way that helps the user be able to mix small specified proportions. The tool contains a rounded tip that is broad for picking mortar out of a bucket and applying the mortar on a surface. Its handle has got a polished steel ferule that helps in handling it when in use.



Margin trowel: A margin trowel is used for many remodeling jobs including laying tile, counter tops, hardwood flooring and working with concrete. It's a tool that every home builder needs to complete the job. It's mainly used for detailed work like touching up and working in small areas



Pointing trowel: is a type of trowel used to fill and finish masonry joints with mortar or cement. Also used for breaking up earth, digging small holes



Pool trowel or round trowel: Is a variation of the concrete finishing trowel; rounded blade prevents it from digging into wet concrete.



Step trowel: Is a type of trowel used for shaping inside angles on concrete steps. The center of the 90-degree bend in the blade allows for rounded edges



Points to remember:

Mason trowel: Is a small hand tool with a handle and flat metal blade; used for scooping or spreading plaster or similar materials

Holding the Trowel

Learning to hold the trowel correctly is important and will make the job easier. Gripping the handle with four fingers and putting the thumb on top of the metal band (ferrule) on the handle is the correct way to hold a trowel.

Plumb Bob is used to check if the surface is perfectly vertical, it can be useful in situations like: hanging objects, carpenter work, brick layer or building construction

Qualities of Good brick:

- The brick should be uniform in shape and should be of standard size.
- The brick when broken should show a uniform compact and homogeneous structure free from voids.

Cement: A building material made by grinding calcined limestone and clay to a fine powder, which can be mixed with water and poured to set as a solid mass or used as an ingredient in making mortar or concrete

The Varieties of Cements manufactured by India Cements Limited are:

- Ordinary Portland Cement (OPC-53, OPC-43, OPC-33)
- Portland Pozzolana cement (PPC)
- Sulphate Resistance Cement (SRC)

Basic Power Tools: Drilling Machine, Stone cutting tools and compactor.

Power Tool Warnings:

- Disconnect tools when not in use, before servicing and cleaning, and when changing accessories
- Keep people not involved with the work away from the work
- Secure work with clamps or a vise, freeing both hands to operate the tool

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

Fill in the blank

1. What is masonry tools? List any 3 types of masonry tools and its use?

2. List the tools use to check straightness of line and surface level?

3. List the 3 grades of cement and give any 2 uses of them?

4. What is difference between fine aggregates and coarse aggregates?

5. List any 4 safety precautions when using power tools?

Module 4: Material Handling & Storing

Module Overview

This module provides the trainees the skills and knowledge required to handle and store the construction materials on site.

Module Objectives.

By completing this module the trainee would have gained knowledge about:

- Manual handling, loading and unloading construction materials, proper storing and stacking materials, methods to lift tools and materials individually and in a team and handle loose and fluid materials in the construction site.

Session Plan 4- Material handling and storing

Session Objectives

At the end of the session, the trainee will be able to:

- Lift & shift the materials by involving push and pull in accordance with workplace EHS requirement.
- Follow methods and sequence of loading, unloading of materials such as cement, steel, sand, aggregate, paint and wood etc.
- Maintain proper Storing and stacking of cement, steel, wood, aggregate, paints, inflammable and other construction materials.
- Handle and lift different materials such as sand, bricks, blocks & metals
- Recognize individual work and team work for lifting, loading and unloading of materials
- Carry loose and fluid materials like chemicals, form-oil, fuel & admixtures.

Relevant Knowledge

4.0 Material Handling & Storing

4.1 Lift & shift the materials in accordance with workplace EHS requirement

Work Station Design

Reduce the distance over which the load has to be moved by relocating production and storage areas.

Design work stations so that workers:

can store and handle all material between knuckle and shoulder height; waist height is most desirable

- can begin and end handling material at the same height
- can face the load and handle materials as close to the body as possible
- do not have to handle loads using awkward postures or an extended reach, and
- do not handle loads in confined spaces that prevent them from using good body mechanics.

Facilitate access to material by:

providing workbenches and other work stations with toe cut-outs, so that workers can get closer to the load

supplying bins and totes with removable sides

removing obstructions, such as unnecessary railings on bins

Pushing and Pulling

Eliminate pushing or pulling by ensuring the use of:

powered conveyors, powered trucks, slides, monorails, air tables and similar mechanical aids

Make loads easier to push or pull by ensuring the use of:

carts, hand trucks and dollies with large diameter casters and good bearings, and

grips or handles on loads or mechanical aids, placed to provide optimal push force and prevent awkward postures

Instruct employees to:

push rather than pull

avoid overloading – limit the load pushed or pulled at one time

ensure the load does not block vision

never push one load and pull another at the same time



Workplace Injury and Illness Prevention

- Replacing burned out lights inside and out.
- Knowing and using proper lifting techniques.

4.3 Storing and stacking of construction materials.

5S Concept

‘5S’ is a system of steps and procedures that can be used by individuals and teams to arrange work areas in the best manner to optimize performance, comfort, safety, and cleanliness.

4.5 Handling loose and fluid materials

Chemical admixtures are the ingredients in concrete other than Portland cement, water, and aggregate that are added to the mix immediately before or during mixing.

Points to Remember:

Work Station Design

Reduce the distance over which the load has to be moved by relocating production and storage areas

Eliminate pushing or pulling by ensuring the use of:

powered conveyors, powered trucks, slides, monorails, air tables and similar mechanical aids

Workplace Injury and Illness Prevention

- Replacing burned out lights inside and out.
- Knowing and using proper lifting techniques

Core components of safe material handling to include:

- Body mechanics
- Appropriate working heights
- Power position, stabilization and weight shifting

Proper stacking in the workplace ensures that materials are accessible when needed; it keeps the stacked materials in proper condition; and most important of all, it prevents injuries.

Cement should always be stored in a dry place, protected from rain by an undamaged, impermeable plastic sheet and raised off the floor if possible.

Team lifting is often neither time nor cost effective. Alternatives to team lifting should be considered during the planning phase. If team lifting is utilized all workers involved must be trained and the lift coordinated.

Chemical admixtures are the ingredients in concrete other than portland cement, water, and aggregate that are added to the mix immediately before or during mixing.

Concrete Form Oil is a mixture of light colored mineral oils (to not discolor the concrete) and special release agents that will react with the concrete to form a barrier preventing the concrete from adhering together wood or metal forms. Concrete Form Oil may be applied by spraying, or brushing.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

Fill in the blank

1. What is 5S principle? List all 5 elements of 5S principle?

2. What safety precautions should be when manual handling materials?

3. List any 4 safety measures for proper stacking of materials.

4. List all the 9 steps followed for individual lifting, loading and unloading materials.

5. List any 3 safety precautions to be taken when using admixtures in construction.

Module 5: Preparation of cement mortar and concrete mix

Module Overview

This module provides the trainees the skills and knowledge required to prepare, move and place cement mortar and concrete mix in a construction site.

Module Objectives.

By completing this module the trainee would have gained knowledge about:

- Selecting proper mixing platform, preparing, moving and placing cement mortar and concrete mix in a construction site.

Session Plan 5- Preparation of cement mortar and concrete mix

Session objectives

At the end of the session, the trainee will be able to:

- Select Proper mixing platform by ensuring surface to be clean, dry, smooth and hard.
- Measure the dry ingredients correctly by using appropriate measuring / weighing scales
- Open use & stack cement bag properly.
- Mix the mortar or concrete uniformly within stipulated time.
- Make 0.245 cum cement mortar mix in 30 minutes with one helper
- Move, place and operate the hand operated concrete mixtures
- Pour the material into the concrete mixtures
- Place and transport the concrete
- Make 0.25 cum cement concrete mix in 30 minutes with one helper.
- Do curing for the elements for the minimum stipulated time.
- Maintain the site tidiness accordingly.

- Demonstrate how to weigh dry ingredients and stack cement
- Demonstrate how to make mortar and concrete mix.
- Demonstrate operating hand concrete mixer
- Demonstrate how to transport, place and cure concrete and maintain site housekeeping activities

Relevant Knowledge

5.0 Preparation of cement mortar and concrete mix

5.1 Surface preparation

Below are important points to follow during surface preparation

- Surfaces to receive mortar and concrete mix should be clean and free of dirt, loose debris, grease, oil, etc., for the best possible bond.
- Mixing platform should be set up as near as possible to the laying area. A piece of scrap shutter board or hardboard, about a meter on each edge, makes a good platform; rinse the board and allow it to dry - in order to be used again.
- Keep floors clear to avoid slipping and tripping hazards.
- Concrete surfaces may be contaminated with oils, greases, dirt and chemicals. In addition to removing these contaminants, the surface should also be free of curing membranes and form release agents.

5.8 Construction site cleanup

Do's

- Gather up and remove debris to keep the work site orderly.
- Plan for the adequate disposal of scrap, waste and surplus materials.
- Keep the work area and all equipment tidy. Designate areas for waste materials and provide containers.
- Keep stairways, passageways, ladders, scaffold and gangways free of material, supplies and obstructions.
- Secure loose or light material that is stored on roofs or on open floors.
- Keep materials at least 2m (5 ft.) from openings, roof edges, excavations or trenches.
- Remove or bend over nails protruding from lumber.
- Keep hoses, power cords, welding leads, etc. from laying in heavily travelled walkways or areas.
- Ensure structural openings are covered/protected adequately (e.g. sumps, shafts, floor openings, etc.)

Don'ts

- Do not permit rubbish to fall freely from any level of the project. Use chutes or other approved devices to materials.
- Do not throw tools or other materials.

Points to remember

- Surfaces to receive mortar and concrete mix should be clean and free of dirt, loose debris, grease, oil, etc., for the best possible bond.
- The most important step in placing concrete is planning. Always plan every step before any concrete is delivered. Proper planning avoids delays, wastage, segregation and problems which develop from these. To eliminate problems of delay, segregation and wastage.
- Concrete is a mixture of sand, cement, and water, but it also contains rock chippings or gravel.
- Mortar is used to hold building materials such as brick or stone together. It is composed of a thick mixture of water, sand, and cement only.
- A mortar mix of proportions 1:3 means that cement, and sand are in the ratio 1:3 or the mix contains one part of cement and 3 parts of sand.
- A concrete mix of proportions 1:2:4 means that cement, fine and coarse aggregate are in the ratio 1:2:4 or the mix contains one part of cement, two parts of fine aggregate and four parts of coarse aggregate.
- Hand operated concrete mixer is a device which uniformly mixes cement, sand, water and aggregates together to form a consistent concrete mix.
- The main objective in transporting concrete is to ensure that the water-cement ratio, slump or consistency, air content, and homogeneity are not modified from their intended states.
- Gather up and remove debris to keep the work site orderly.
- Plan for the adequate disposal of scrap, waste and surplus materials.
- Keep the work area and all equipment tidy. Designate areas for waste materials and provide containers.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

1. List any 4 major differences between concrete and mortar.

2. What are the components used for mixing cement mortar? What is the ratio of the mix?

3. List the steps to use a hand operated concrete mixer.

4. What are the components used for mixing cement concrete? What is the ratio of the mix?

5. What is curing? List any 3 methods of curing?

Module 6: Different types of bonds in basic brickworks

Module Overview

This module provides the trainees the skills and knowledge required to use different types of bonds in basic brickworks.

Module Objectives.

By completing this module the trainee would have gained knowledge about:

- Using different types of bonds in basic brickworks and construction of brick wall layer by layer in a construction site.

Session Plan 6- Different types of bonds in basic brickworks.

Session Objectives

At the end of the session, the trainee will be able to:

- Arrange, shift, and stack the required materials, tools and tackles.
- Mark the header/ stretcher/ English bond layout.
- Set out 90 degree using building square or 3-4-5 method for corners
- Make the Dry bon ding
- Assist to Construct the brick wall by making layer by layer to avoid vertical joints with appropriate closures.
- Follow the trade safety & construction techniques up to completion.
- Aware of overall length of wall, heights of wall, regular joint thickness, plumb and wall alignment as per the requirement.
- Complete the task as per the Productivity and housekeeping requirement..

Relevant Knowledge

6.0 Different types of bonds in basic brickworks

6.1 Shift and stack required materials

Following are points to note when storing and handling bricks or construction materials:

- Unload bricks mechanically and directly to a prepared level or hard base. Take care to minimize chipping, soiling or breakage, particularly with bricks of special shapes. Protect from rain, splashing by vehicles and mortar mixing.
- When bricks arrive at the construction site, arrange for a forklift or crane to lift them to floor levels rather than workers carrying them in wheelbarrows.

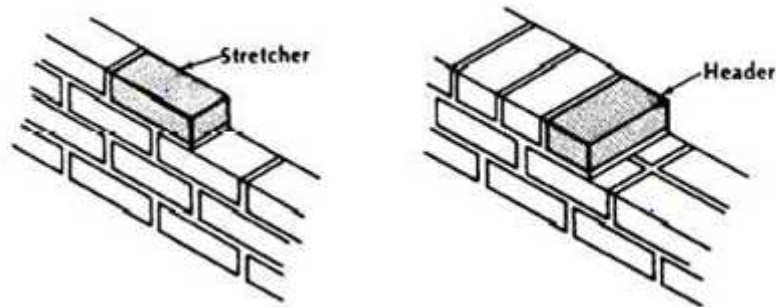
6.2 Mark header/ stretcher/ bond layout

Header:

Header is a masonry unit laid on its bed across the width of the wall with its face perpendicular to the face of the wall. Generally use to bond two Wythe's (A continuous vertical section or thickness of masonry 4" or greater)

Stretcher:

Stretcher is a masonry unit laid flat on its bed along the length of a wall with its face parallel to the face of the wall.



Bonds

The term “bond” as used in masonry has three different meanings such as structural bond, mortar bond, or pattern bond.

Structural bond refers to how the individual masonry units interlock or tie together into a single structural unit.

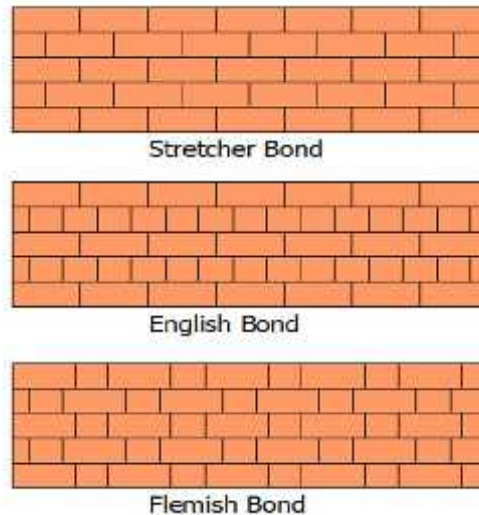
Mortar bond refers to the adhesion of the joint mortar to the masonry units or to the reinforcing steel.

Pattern bond refers to the pattern formed by the masonry units and mortar joints on the face of a wall. The pattern may result from the structural bond, or may be purely decorative and unrelated to the structural bond.

Stretcher bond is the easiest bond to lay and it minimizes the amount of cutting required. It is originally used for single brick walls.

Flemish Bond

In a Flemish bond, each course consists of alternating headers and stretchers. The headers in every other course center over and under the stretchers in the courses in between. The joints between stretchers in all stretcher courses align vertically. When headers are not required for structural bonding, bricks called blind headers are used.



6.3 Setting out 90 degree 3-4-5 method

In brick work, it is often necessary to set out right angles or perpendicular lines on the field. In the sections that follow, a few practical methods indicate how this can be done. These methods include:

- 3-4-5 method: used to set out a right angle from a certain point on the base line;
- Rope method: used to set out a line perpendicular to the base line, starting from a point which is not on the base line;
- The single prismatic square and the double prismatic square: used to set out both right angles and perpendicular lines.

. Points to remember

- Unload bricks mechanically and directly to a prepared, level, hard base. Take care to minimize chipping, soiling or breakage, particularly with bricks of special shapes. Protect from rain, splashing by vehicles and mortar mixing.
- **Header:** Header is a masonry unit laid on its bed across the width of the wall with its face perpendicular to the face of the wall. Generally use to bond two Wythe's (A continuous vertical section or thickness of masonry 4" or greater)
- **Stretcher:** Stretcher is a masonry unit laid flat on its bed along the length of a wall with its face parallel to the face of the wall.
- The English bond consists of alternating courses of headers and stretchers.
- **Concave:** Concave joints are the most common because it is waterproof and bonds the bricks very well.
- **V joint:** A V joint stands out from bricks in a V shape. It is created using a V shaped jointer, which will give you perfectly uniform ridges that will stick out from the face of the bricks.
- The 3-4-5 method: used to set out a right angle from a certain point on the base line.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

1. List any 4 points to be noted to lift, store and stack materials.

2. Define header and stretcher in brickwork?

3. What is English bond? List the rules followed to construct English bond?

4. List all the steps required to set 90 degree (3-4-5) for the corners.

5. Briefly describe how to measure the area and perimeter of a wall?

Module 7: Erect and dismantle 3.6 meter temporary scaffold

Module Overview

This module provides the trainees the skills and knowledge required to erect and dismantle a 3.6 meter temporary scaffold

Module Objectives

By completing this module the trainee would have gained knowledge about:

- Erecting and dismantling 3.6 meter temporary scaffold

Session Plan 7- Erect and dismantle 3.6meter temporary scaffold

Session Objectives

At the end of the session, the trainee will be able to:

- Arrange, shift, and stack the required materials, tools and tackles at the identified location.
- Use the required safety gadgets
- Follow the trade safety in erecting and dismantling 3.6 meter temporary scaffold.
- Erect and dismantle 3.6 meter temporary scaffold
- Shift the materials such as brick, sand, mortar, concrete, etc. from the bottom level of temporary scaffolding to the landing of temporary scaffolding
- Complete the task within the time limit.
- Maintain the site tidiness accordingly

Relevant Knowledge

7.0 Erect and dismantle 3.6 meter temporary scaffold

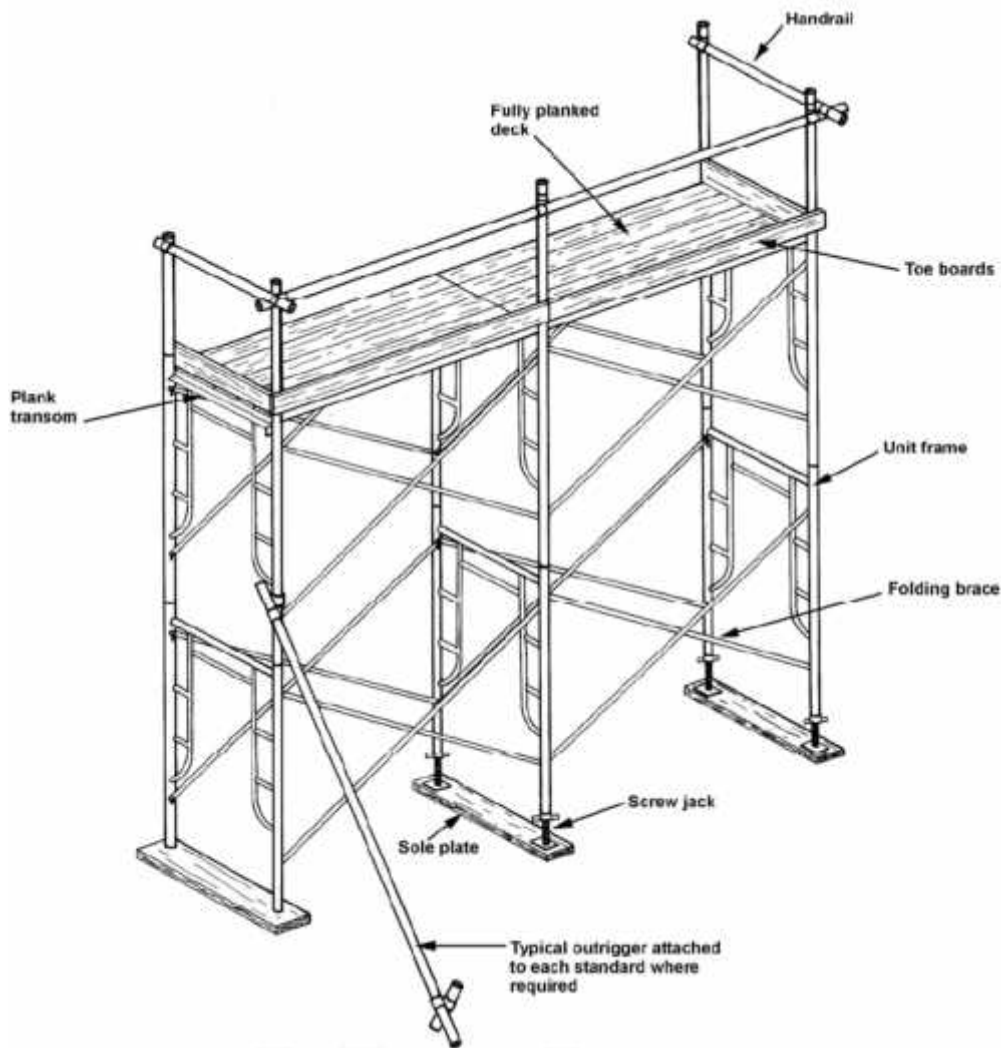
7.1 Scaffold and its parts

Scaffold

A Scaffold is a temporary structure consisting of standards (verticals) and ledgers (horizontal) generally of bamboo, timber or metal, erected to provide a working platform for workers, tools and materials in the course of construction.

There are several types of scaffolds which are erected for different purposes, each capable of handling different types of loads and equipment. Scaffolds can be built to reach any, height if properly planned, designed and erected. One of the simplest types of metal scaffold that can be easily erected to a height of 3.6 meters is the frame scaffold, which has been covered in this session.

Typical frame scaffold



Points to remember:

- A Scaffold is a temporary structure consisting of standards (verticals) and ledgers (horizontal) generally of bamboo, timber or metal, erected to provide a working platform for workers, tools and materials in the course of construction.
- Always carry 2 to 3 extra numbers of each part of the scaffold.
- Before starting to erect a scaffold make sure that the ground is a level as possible
- Never stand on the scaffold that is being dismantled, use mechanical lifts to access the scaffold from the outside when dismantling the scaffold.
- When dismantling the scaffold work from top to bottom starting at one end and working towards the other end one bay at a time. All pieces must be passed down one at a time.
- Inspection and tagging of the scaffold is to be performed by a competent worker experienced in the erection of scaffold.
- Red: "DANGER – UNSAFE FOR USE" tag(s), will be used during erection or dismantling or when the scaffold is left unattended. Replace all green "Safe for Use" tag(s) or yellow "Caution / Hazard" tag(s) in the event a scaffold has been deemed unfit for use.
- Do not sit or climb on the guardrails.
- Do not lean out from the scaffold.

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise

1. What is a scaffold? What is the purpose of a scaffold?

2. List 5 parts of a frame scaffold and the purpose of each part.

3. What measures should be taken before dismantling a scaffold?

4. List a few hazards of working on scaffolds.

5. What are 3 colors of tags used? What is the purpose of each?

6. List 10 general safety scaffold tips.

Module 8: Cutting, filling, levelling and compaction

Module Overview

This module provides the trainees the skills and knowledge required to cut, fill, level and compact earth.

Module Objectives

By completing this module the trainee would have gained knowledge about:

- Cutting, filling, levelling and compaction of earth.

Session Plan 8- Cutting, filling, levelling and compaction

Session Objectives

At the end of the session, the trainee will be able to:

- Identify Tool & tackles required for the job
- Cut & fill the earth as per the markings and layout
- Leveling & compaction of earth at desired level & location.
- Operate the hand roller.
- Help & support to the concerned tradesman prevent the collapse of the trench.
- Use of PPE & take protective action before and after during hazards.

Relevant Knowledge

8.0 Cutting, filling, levelling and compaction

8.1 Cutting, filling and levelling

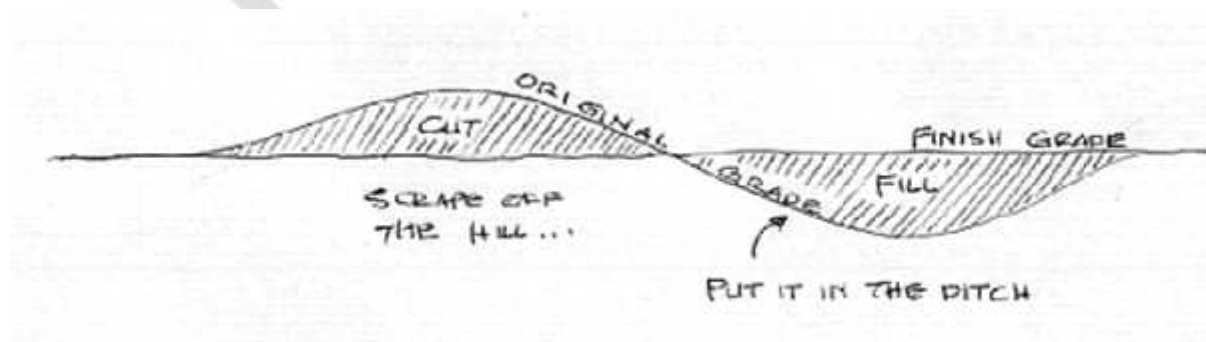
Cutting is the process of removing earth from one place to make ground surface level.

Filling is the process of adding earth to one place to make the ground surface level.

Levelling is the process of preparing the ground by removing/ adding earth (cutting and filling) in order to make the ground surface of the construction site, completely free of undulations/uneven surfaces, ready for construction.

Cutting, filling and levelling methodology

A 'cut' is made when earth is cut from above the desired ground height and a 'fill' is when earth is used to fill a hole to desired ground level. Cutting and filling is a common technique used to create an even ground surface (levelling). The illustrations below show the basic principle of cutting, filling and levelling.



Note: as the above illustrations show, filling of earth is not always done by using the material obtained during cutting. As required, filling might have to be done by using materials that might have to be brought in from a different location more suitable for the type of construction being done on the site. Same applies to cutting earth as well, the cut materials might have to be disposed of or transported to a different location as required.

Points to remember

- Cutting and filling is the process of moving earth from one place to another to make ground more level. A 'cut' is made when earth is cut from above the desired ground height and a 'fill' is when earth is used to fill a hole to desired ground level.
- As a helper mason you are not authorized to use cutting, filling, levelling or compacting heavy construction equipment's. Do not try to operate any of the mentioned equipment without proper training, certification or supervision. Operating earth moving equipment without proper training can lead to serious injury or even death to yourself and others around you.
- In order for the earth to be safe enough for use in foundations it needs to be compacted to avoid settling. If it's not properly compacted, settling earth can cause disastrous consequences including cracked foundations.
- Trench collapse occurs when the trench walls can no longer contain the large amount of pressure put on them by the surrounding soil.
- Daily inspections of excavations, adjacent areas, and protective systems must be made by a competent person for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions.
- Never enter an unprotected trench.
- Excavated or other materials and equipment must be at least 2 feet back from the edge of a trench.
- A safe way to exit must be provided within 25 feet of workers in a trench

NOTES

Use the blank space provided below to make important notes based on your understanding of the topics or anything which is important for you to remember.

Exercise sheet

1. List any 3 hand operated and machine operated tools for cutting and filling.

2. Briefly describe cutting and filling of earthwork?

3. List at least 5 steps required to prevent collapse of trench during excavation.

4. Why is compaction done? List some desirable soil properties brought out due to compaction.

5. What is a hand operated roller? What is it used for?

PREVIEW