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Participant Handbook

Sector
Construction

Sub-Sector
Real Estate and Infrastructure Construction

Occupation
Masonry

Reference ID: **CON/Q0102, Version 3.0**
NSQF Level 3.0

Assistant Mason

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Prime Minister of India

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Certificate

COMPLIANCE TO

QUALIFICATION PACK- NATIONAL OCCUPATIONAL STANDARDS

is hearby issued by the

CONSTRUCTION SKILL DEVELOPMENT COUNCIL OF INDIA

for

SKILLING CONTENT:PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/Qualification Pack:'Assistant Mason'

QP No.'CON/Q0102, Version 3.0, Level 3

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Acknowledgements

This participant's handbook meant for Assistant Mason is a sincere attempt to ensure the availability of all the relevant information to the existing and prospective job holders in this job role. We have compiled the content with inputs from the relevant Subject Matter Experts (SMEs) and industry members to ensure it is the latest and authentic. We express our sincere gratitude to all the SMEs and industry members who have made invaluable contributions to the completion of this participant's handbook.

This handbook will help deliver skill-based training in the field of masonry. We hope that it will benefit all the stakeholders, such as participants, trainers, and evaluators. We have made all efforts to ensure the publication meets the current quality standards for the successful delivery of QP/NOS-based training programs. We welcome and appreciate any suggestions for future improvements to this handbook.

About this book

This participant handbook has been designed to serve as a guide for participants who aim to obtain the required knowledge and skills to undertake various activities in the role of an Assistant Mason. Its content has been aligned with the latest Qualification Pack (QP) prepared for the job role. With a qualified trainer's guidance, the participants will be equipped with the following for working efficiently in the job role:

- Knowledge and Understanding: The relevant operational knowledge and understanding to perform the required tasks.
- Performance Criteria: The essential skills through hands-on training to perform the required operations to the applicable quality standards.
- Professional Skills: The ability to make appropriate operational decisions about the field of work.

The handbook details the relevant activities to be carried out by the Assistant Mason. After studying this handbook, job holders will be adequately skilled in carrying out their duties according to the applicable quality standards. The handbook is aligned with the following National Occupational Standards (NOS) detailed in the latest and approved version of Assistant Mason QP:
Compulsory NOS:

- CON/N0101: Erect and dismantle temporary scaffold up to 3.6 meter height
- CON/N0105: Handle and use hand and power tools related to masonry work
- CON/N0106: Assist in tiling, stone laying and concrete masonry works
- CON/N0107: Assist in brick/block work including fixing doors and windows and plastering work
- CON/N8001: Work effectively in a team to deliver desired results at the workplace
- CON/N9001: Work according to personal health, safety and environment protocols at construction site
- DGT/VSQ/N0101: Employability Skills 30 Hours

The handbook has been divided into an appropriate number of units and sub-units based on the content of the relevant QP. We hope it will facilitate easy and structured learning for the participants, allowing them to obtain enhanced knowledge and skills.allowing them to obtain enhanced knowledge and skills.

Symbols Used


Key Learning Outcomes


Exercise


Notes


Unit Objectives


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Table of Contents

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1. Introduction to the Job Role of an Assistant Mason

Unit 1.1 Introduction to Construction Industry

Unit 1.2 Role and Responsibilities of an Assistant Mason

Key Learning Outcomes

By the end of this module, participants will be able to:

- Explain the role and responsibilities of Assistant Mason.
- Identify the career progression for Assistant Mason.

Unit 1.1 Introduction to Construction Industry

Unit Objectives

By the end of this unit, participants will be able to:

- Give an overview of the construction sector.

1.1.1 Introduction

Construction industry helps in developing and enhancing economic sector as well as aids in the development of the country. Construction activity plays an important role in country's infrastructure and industrial development. Construction refers to building of different structures such as hospitals, schools, townships, offices, and houses and other buildings (including water supply, sewerage, and drainage), highways, roads, ports, railway tracks, dams etc. If we are covering a wide spectrum, construction activity becomes the basic input for socio-economic development.

Fig. 1.1.1 Construction Industry

Construction is the second largest employment generating sector in India after agriculture. This sector comprises of small, medium and large industries or companies which are involved in different types of projects. This creates a diverse requirement of work force.

Construction industry is broadly divided into two major sub-sectors:

1. Real estate & infrastructure construction; and
2. Rural construction.

Real Estate & Infrastructure Construction

The real estate sector holds significant global recognition, encompassing housing, retail, hospitality, and commercial sub-sectors. Its growth is closely linked to the expansion of the corporate landscape and the rising demand for office spaces, urban, and semi-urban accommodations. Among the 14 major sectors, the construction industry ranks third, considering its direct, indirect, and induced effects on the economy as a whole.

In India, the real estate sector stands as the second-largest employment generator, trailing only the agriculture sector. There is a strong expectation of increased investment from non-resident Indians (NRIs) in both the short and long terms. Bengaluru is anticipated to be the most favored destination for

NRI property investments, followed by Ahmedabad, Pune, Chennai, Goa, Delhi, and Dehradun.

According to the Economic Times Housing Finance Summit, about three houses are built per 1,000 people per year compared with the required construction rate of five houses per 1,000 populations. The current shortage of housing in urban areas is estimated to be ~10 million units. An additional 25 million units of affordable housing are required by 2030 to meet the growth in the country's urban population.

India's urban population is estimated to stand at 675 million in 2035, the second highest behind China's one billion, the U.N. has said in a report, noting that after the COVID-19 pandemic, the global urban population is back on track to grow by another 2.2 billion by 2050.

Fig. 1.1.2 Township Construction

Fig. 1.1.3 Bridge Construction

Government Initiatives under Urban Development

Fig. 1.1.4 Building Construction Site

Fig. 1.1.5 Industrial Building Construction Site

Indian government has undertaken several initiatives under urban development to address the challenges posed by rapid urbanization and to promote sustainable and inclusive growth in cities and towns.

Some of the key government initiatives include:

- **Smart Cities Mission:** Launched in 2015, the Smart Cities Mission aims to develop 100 smart cities across the country. These smart cities are intended to be equipped with advanced infrastructure and technology to enhance quality of life, promote sustainable development, and provide efficient urban services to residents.
- **Atal Mission for Rejuvenation and Urban Transformation (AMRUT):** The AMRUT scheme was launched in 2015 to focus on providing basic urban infrastructure in cities and towns, such as water supply, sewerage, and urban transportation. The goal is to improve the quality of life for urban residents.
- **Pradhan Mantri Awas Yojana (PMAY):** This scheme, launched in 2015, aims to provide affordable housing for all by 2022. It consists of two components: Pradhan Mantri Awas Yojana (Urban) for urban areas and Pradhan Mantri Awas Yojana (Gramin) for rural areas.
- **Swachh Bharat Mission (Urban):** The Swachh Bharat Mission focuses on promoting cleanliness, sanitation, and hygiene in urban areas. It aims to eliminate open defecation, improve solid waste management, & ensure a clean urban environment.
- **Heritage City Development and Augmentation Yojana (HRIDAY):** This scheme aims to preserve and revitalize the rich cultural heritage of heritage cities in India, making them more livable and tourist-friendly.
- **National Urban Livelihoods Mission (DAY-NULM):** DAY-NULM was launched to reduce poverty and vulnerability of urban poor households. It provides self-employment opportunities, skill development, and access to credit and capital.

Rural Construction

Fig. 1.1.5 Rural Roads

Fig. 1.1.6 Rural House

Rural Construction: This sub-sector aims at the constructional requirements of rural India and construction of rural households, warehouses, village roads etc.

Rural infrastructure is not only an important element of rural expansion but also a significant element in ensuring any sustainable poverty reduction plan. The appropriate expansion of infrastructure in rural zones improves the rural financial system and quality of life. It encourages augmented agricultural profits, satisfactory employment etc.

Government Initiatives under Rural Development

- Indian government has launched various initiatives under rural development to uplift rural areas, improve the living standards of rural communities, and promote inclusive growth. Some of the key government initiatives under rural development include:
- Pradhan Mantri Gram Sadak Yojana (PMGSY): Launched in 2000, PMGSY aims to provide all-weather road connectivity to unconnected rural habitations. The program focuses on improving rural access and connectivity, which has a positive impact on economic development and social integration.
- Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA): MGNREGA, launched in 2005, guarantees 100 days of wage employment to every household in rural areas. It aims to provide livelihood security to rural households and promote rural development through the creation of durable assets and infrastructure.
- Pradhan Mantri Awaas Yojana - Gramin (PMAY-G): Launched in 2016, PMAY-G aims to provide affordable and quality housing to rural households. It focuses on improving the living conditions of the rural poor and providing them with a safe and secure dwelling.
- Swachh Bharat Mission (Gramin): Similar to the urban counterpart, this mission focuses on promoting cleanliness and sanitation in rural areas. It aims to achieve an open defecation-free rural India and improve rural sanitation facilities.

"Bharat Nirman"

"Bharat Nirman" was an initiative launched by the Indian government in 2005 to accelerate rural development and bridge the infrastructure gaps in rural areas.

Fig. 1.1.7 Bharat Gramin Yojna for improving Rural Infrastructure

It aimed to enhance the quality of life and economic opportunities for rural communities by focusing on six key areas:

- **Rural Housing:** Bharat Nirman aimed to provide affordable housing to the rural poor and ensure that every rural household had access to a safe and secure dwelling.
- **Rural Roads:** The initiative focused on improving rural connectivity by constructing and upgrading rural roads under the Pradhan Mantri Gram Sadak Yojana (PMGSY). This helped in facilitating easier access to markets, healthcare, and education for rural residents.
- **Rural Water Supply:** Bharat Nirman aimed to provide safe and sustainable drinking water to rural areas under the National Rural Drinking Water Programme (NRDWP). The goal was to ensure that every rural household had access to potable water.
- **Rural Electrification:** The initiative sought to electrify all unelectrified villages and provide electricity connections to rural households. The focus was on enhancing rural electrification and promoting energy access in remote areas.
- **Rural Telecommunication:** Bharat Nirman aimed to extend telecommunication services to rural areas, including mobile and broadband connectivity, to bridge the digital divide and enable access to information and services.
- **Irrigation:** The initiative sought to increase the irrigation potential in rural areas to enhance agricultural productivity and income. This was done through various schemes and projects promoting water conservation and management.
- Bharat Nirman played a significant role in boosting rural development and improving the overall socio-economic conditions in rural India. It brought attention to the importance of infrastructure development in rural areas and contributed to rural empowerment and growth.

Notes

Scan the QR code to watch the video

https://youtu.be/1WVzo2UFyo8

Types of Construction

Unit 1.2 Role and Responsibilities of an Assistant Mason

Unit Objectives

By the end of this unit, participants will be able to:

- Discuss the roles and responsibilities of an Assistant Mason.
- Explain expected personal attributes required in masonry occupation.
- Discover future possible progression and career development options of an Assistant Mason

1.2.1 Role of an Assistant Mason

An Assistant Mason is responsible for assisting in brick/block work, plastering, fixing doors and windows, tiling, stone laying, concrete masonry work, brick soling and Plain Cement Concrete (PCC) flooring. The individual also assists in erecting and dismantling temporary scaffold of 3.6m height.

Fig. 1.2.1 Assistant Mason

1.2.2 Responsibilities of an Assistant Mason

1. **Tiling and Stone Laying**: Assist in the installation of tiles and laying stones, ensuring precision and alignment to meet project specifications.
2. **Concreting**: Support the concreting process by preparing the necessary materials, assisting with pouring, leveling, and finishing to achieve a smooth and durable concrete surface.
3. **Anti-Termite Solution**: Prepare and apply anti-termite solutions to protect the construction from termite infestations, contributing to the longevity of the structure.

Fig. 1.2.2 Tiling

Fig. 1.2.3 Concreting

Fig. 1.2.4 Anti-Termite Solution

4. **Brick Soling and PCC Flooring**: Carry out brick soling and PCC flooring work, maintaining the required thickness and uniformity for a sturdy and level surface.
5. **Brick/Block Work**: Assist in brick and block masonry, including laying bricks or blocks in precise patterns, aligning them accurately, and ensuring proper bonding.

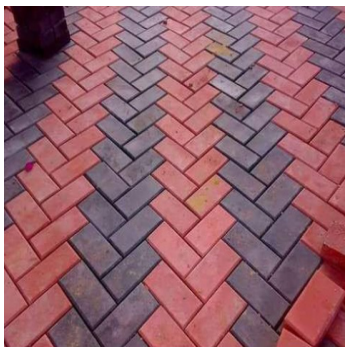

Fig. 1.2.5 Brick Soling

Fig. 1.2.6 Plastering

Fig. 1.2.7 Brick Work

6. **Plastering**: Support the plastering process by preparing the plaster mix, applying it evenly, and achieving a smooth finish on walls and ceilings.
7. **Door and Window Frames**: Participate in the installation of door and window frames, ensuring they are securely fixed in place, plumb, and level.
8. **Scaffold Assembly**: Erect and dismantle temporary scaffolds up to 3.6 meters in height safely and efficiently, ensuring stability for construction workers.

Fig. 1.2.8 Plastering

Fig. 1.2.9 Door and Window Fixing

Fig. 1.2.10 Scaffolding

1.2.3 Personal Attributes for Job Role of Assistant Mason

An Assistant Mason in addition to his skills should also possess certain personal attributes such as:

1. Ability to perform physically demanding tasks such as lifting heavy materials and working in various weather conditions.
2. Precision in brick/block placement, alignment, and finishing for quality work.
3. Strict adherence to safety protocols and practices to prevent accidents.
4. Collaborative mindset to work effectively with colleagues and contribute to project success.
5. Effective communication to coordinate tasks and convey progress.
6. Flexibility to handle different masonry tasks and adapt to changing project requirements.

1.2.4 Career Progression of Assistant Mason

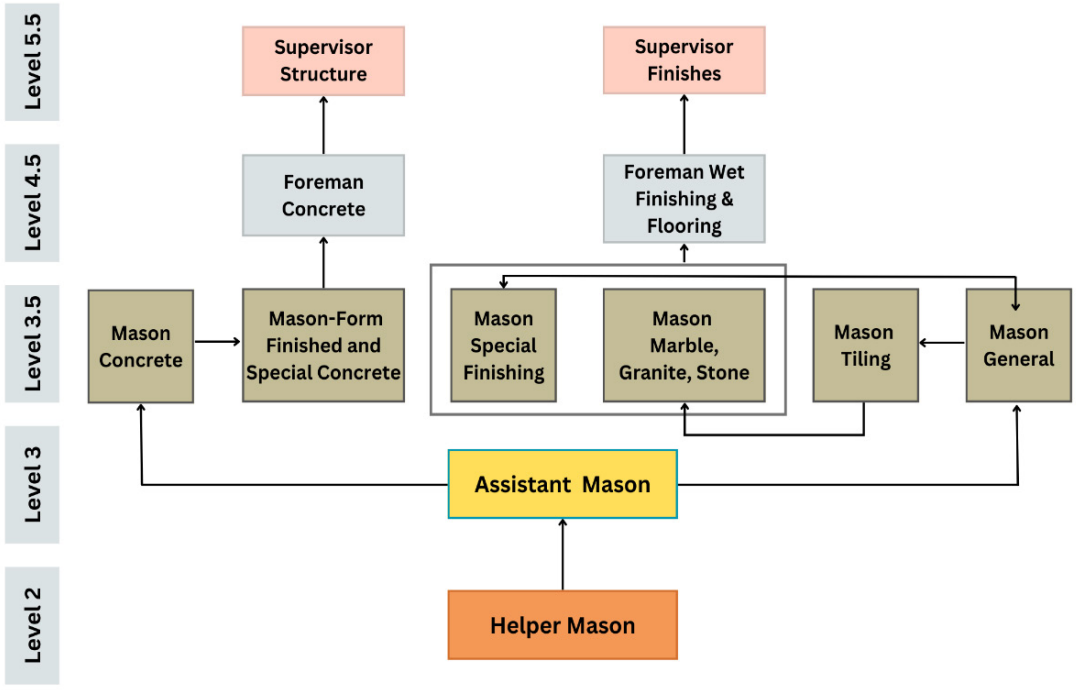

Fig 1.2.11 Career progression of an Assistant Mason

Exercise

A. State whether the following statements are True or False.

i. An Assistant Mason assists in various masonry tasks on construction sites.

ii. Physical fitness is not very important for an Assistant Mason due to indoor work.

iii. Precision in measurements helps prevent errors in collected survey data.

iv. Effective communication is crucial for an Assistant Mason's role.

v. Assistant Masons typically work alone and don't need teamwork skills.

B. Fill in the blanks

(Hint: data, consciousness, coordinate systems, detail, masonry)

i. An Assistant Mason supports the main surveyor by providing assistance in various _____ tasks conducted on construction sites.

ii. Safety _____ is vital for Assistant Masons to minimize risks on hazardous construction sites.

iii. Assistant Masons contribute to accurate masonry by assisting in tasks like setting up equipment, taking measurements, and recording _____.

iv. An Assistant Mason should have a keen eye for _____ to ensure accurate measurements and prevent costly mistakes in collected data.

v. A foundational understanding of geodesy and _____ is crucial for precise referencing of locations and measurements

C. Answer the following questions

i. Show the career path of an Assistant Mason.

ii. What are the roles and responsibilities of an Assistant Mason?

iii. State few personal attributes required by Assistant Mason.

Notes

Scan the QR code to watch the video

https://youtu.be/B82slHhnUrQ

Role and Responsibilities of an Assistant Mason

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2. Erect and Dismantle Temporary Scaffolding

Unit 2.1 - Basics of Scaffolding

Unit 2.2 - Concept of Conventional Scaffolding

Unit 2.3 - Concept of Modular Scaffolding System

Unit 2.4 - Erecting and Dismantling of Temporary Scaffolding

(CON/N0101)

Key Learning Outcomes

By the end of this module, participants will be able to:

- Explain the process of erecting and dismantling temporary scaffold.

Unit 2.1 Basics of Scaffolding

Unit Objectives

By the end of this unit, participants will be able to:

- Describe about the basic concept of a temporary scaffolding
- Understand the benefits of a scaffolding
- Discuss the types of temporary scaffolding

2.1.1 Scaffolding

- Scaffolds are temporary work platforms.
- Scaffolds are used when work cannot be performed from the ground level.
- Scaffolds provide a platform for workers to work at heights, and keep materials and tools.
- Scaffolds are erected used, and dismantled and removed to another construction site for reuse.
- Scaffolds are made from various types of material including wood, bamboo etc.

Now-a-days metal scaffolding is used as they are easy to erect and dismantle.

Fig. 2.1.1 Scaffolding

2.1.2 Advantages of using Scaffolding

Scaffolding:

- Provides a secure elevated work area for workers and tools.

- Offers a safer alternative for working at heights store than ladders.
- Helps workers to access the work area.
- Provides a stable platform to transport and store building materials from the base to the topmost parts of structures.

2.1.3 Types of Scaffolding

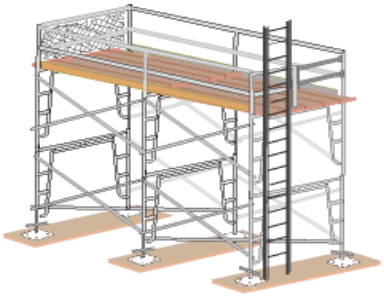
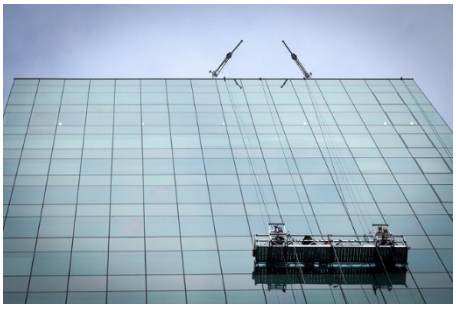
Types	Description	Picture
Supported Scaffolding	• The most commonly used form of scaffolding • Built from the base upwards • The easiest, safest, and most cost effective form of scaffolding • Very convenient and flexible in terms of application/use.	
Suspended Scaffolding	• Suspended from a tall building or roof • Used when constructing a base is difficult or impossible • Ideal for just one or two workers • Allows workers to reach very high levels on buildings • Commonly used by window cleaners	
Rolling Scaffolding	• Castor wheels on the base • The wheels allow the scaffolding to be moved without dismantling it • The wheels are locked when workers or materials are on the scaffolding	

Table 2.1.1 Types of scaffolding

Aerial Lifts	• The most common are vehicle-mounted aerial platforms • Allow workers to access multiple levels in order to do their job • Save the time in erecting and dismantling scaffolding • Commonly seen when people are working on lampposts and telephone poles	

Table 2.1.1 Types of scaffolding

2.1.4 Types of Scaffolding - Based on Material

There are mainly two types of systems of scaffolding:

Conventional System (Bamboo & Ballie and Pipe & Coupler)

In this system, Vertical and horizontal members are bamboo which are joined together at the intersection of joints by means of knotted rope.

Fig. 2.1.2 Bamboo system

Modular System (Cuplock and Frame)

In this system, different prefabricated parts are assembled together with the help of pins, wedges or cups.

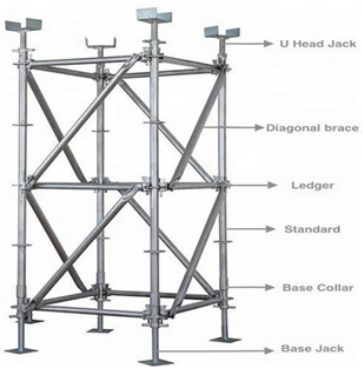


Fig. 2.1.3 Cuplock system

Fig. 2.1.4 Frame system

Notes

Scan the QR code to watch the video

https://youtu.be/QiGqH-XYo94

Scaffolding Components Size

Unit 2.2 Concept of Conventional Scaffolding

Unit Objectives

By the end of this unit, participants will be able to:

- Describe the material used in bamboo scaffolding
- Know how to erect and dismantle a bamboo scaffolding

2.2.1 Introduction

Scaffolding is a temporary structure constructed to support man and materials for various construction activities.

- In bamboo scaffolding, plastic fibre straps or coconut and bamboo shoots together form a solid and secure scaffold structure without screws.
- Bamboo scaffolding does not need to have a foundation on the ground as long as the scaffolding has a fulcrum for structural support.
- Bamboo scaffolding is widely used in India for construction.
- It was widely used in the building of houses and multi-story buildings (up to four stories high) prior to metal scaffolding.
- It is also useful for short-term construction projects such as durga puja pandals, marriage pandals etc.
- Bamboo is an ideal material for scaffolds due to its high resistance and its lightness. The joints are done so that a vertical force acts directly on the tied node.
- In the case of high diameter canes, the friction can be increased by making the rope pass between the two canes.
- The ropes used are soft, so that it's possible to modify their tension.

Fig. 2.2.1 Bamboo scaffolding

Fig. 2.2.2 Safety net

2.2.2 Material used in Conventional Bamboo

Bamboo Members

- The Bamboo members should be 3 to 5 years old and air-dried in vertical positions under indoor condition for at least 3 months before use.
- All bamboo members should be free from visual defects, and meet the following requirements on the cross-sectional dimensions:
    - The nominal external diameter should not be less than 40-70 mm with a nominal minimum thickness of 10 mm.

Fig. 2.2.3 Bamboo and ropes used in conventional bamboo scaffolding

Organic ropes (mostly bamboo and rattan coconut, or Nylon Strips for Knotting

- Usually these natural materials are softened in water and only after tied they get dry and create a very strong joint
- Nylon strips of adequate strength, stiffness and durability can be used for knotting in bamboo scaffolds.
- All knots should be tightened with at least 5 rounds of rope. The ends of the ropes should be crossed and twisted to form a single twisted end which passes through the knot twice to give one round turn for proper anchorage.

Lateral Restraints

- Effective lateral restraints should be provided to the main posts of the outer layer of double-layered bamboo scaffolds.
- An effective lateral restraint takes the form of putlog which consists of a metal tie and a bamboo strut. It should be properly anchored to structural elements with the use of an anchor bolt together with a properly installed bamboo strut.
- The free-standing portion of bamboo scaffolds at the top should be tied back to the building structure.

2.2.3 Sequence of Operations to Join Two Bamboo Culms

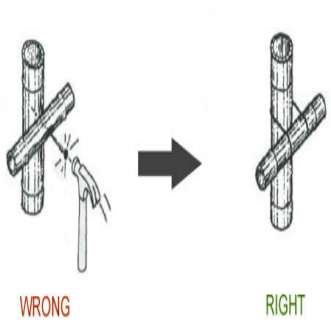
	
Step 1: Put bamboos in a cross form or parallel as may be required	Step 2: First fix the rope around the vertical culm making a loop
	
Step 3: Then start to pass the rope diagonally between the two beams some times in one sense and then some times in the other sense (the number depends on the specific case).	Step 4: Finally tie the rope with a simple knot

Table 2.2.1 Sequence of operations to join two bamboo culms

About Balli Joints

"Bamboo Balli Joints" typically refer to a traditional method of joining bamboo poles together in construction. Bamboo is a versatile and sustainable material that has been used for centuries in various construction practices, particularly in regions where it is abundant. "Balli" is a term used to describe a specific type of joint used to connect bamboo members.

Fig. 2.2.4 Balli joints

Bamboo Balli Joints have been utilized in various construction applications, such as building frameworks for huts, temporary shelters, scaffolding, and even more complex structures. These joints capitalize on bamboo's natural strength, flexibility, and resilience, making them suitable for lightweight construction purposes.

2.2.4 Erection Procedure of Bamboo Scaffolding

To start the erection, erect two bamboos as the main vertical posts. Posts are the vertical members which rest on the ground or steel brackets and are usually in good quality and strong. They would then be connected with horizontal ledgers in order to fix their position. Then, three bamboos will be erected in between the two vertical bamboos as standards.

Standards are vertical members that overhang on the ledgers and would not rest on ground and brackets. Thus, a total of five bamboo poles now span over a distance of about 3m so that the distance between two adjacent standards is about 750mm. The vertical distance between two ledgers (i.e. distance between an upper ledger and a lower ledger) is also about 750mm (2.5 feet); therefore, the bamboo scaffolding is in square form. The inner layer is erected in the same way.

Transoms: They are erected to connect the inner and the outer layers. These transoms are used to support the working platform.

Bracing: The integrity and lateral stability of bamboo scaffolding structure rely on the provision of bracing. Each bracing section should consist of two pieces of bamboo, which are fixed in an "X" shape and usually in an angle between 60 - 70° over the section of bamboo scaffolding to be braced. Each bracing should also be tied to both the standards and the transoms of the scaffolding. In this way, the loading on the scaffolding can be distributed evenly.

Working platforms: These are used to provide access for workers and provide a levelled and safe working area for workers to carry out their construction work. Working platforms may be covered by planks and are mainly used by plasterers and painters.

Fig. 2.2.5 Bamboo Scaffolding with working platforms

2.2.5 Systems to Anchor the Scaffold to the Building and to the Ground

- To anchor of the scaffold to the building there are different methods, like ropes (the same used to tie the beams) fixed to some hooks put into the facade or to the gutter pipes or to any other element and bamboo beams that pierce windows or walls.
- Sometimes we can find other beams contrasting the detachment of the scaffold from the building.
- For the ground joint, the beams are simply lean and aren't fixed in any way.
- They are many times cut at the end so that the surface in contact with the ground is less, to limit the problems with water infiltration.

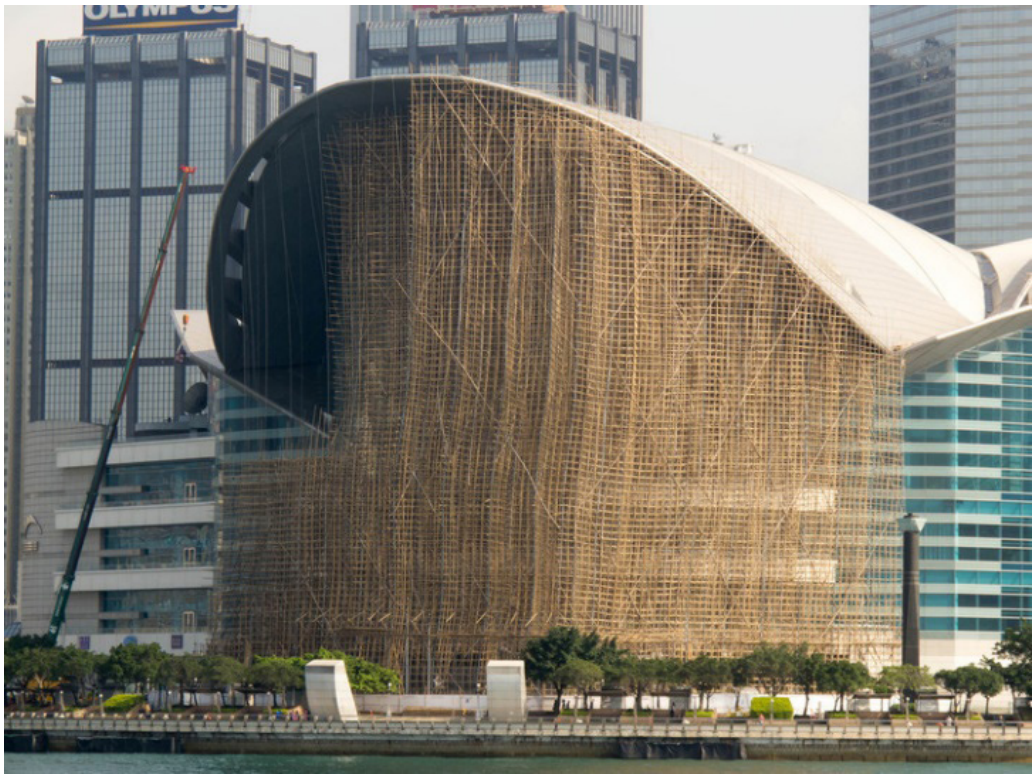


Fig. 2.2.6 Anchoring bamboo scaffold with building

2.2.6 Dismantling of Scaffolding

- Bamboo scaffolds must be immediately removed once the construction/repair works are completed.
- Dismantling work must be carried out by trained workmen under the immediate supervision of a competent person.
- Before dismantling the critical members, such as ledgers, ties, struts, transoms or bracings, the stability of the bamboo scaffolds must be assured by fixing a similar piece of bamboo member at a lower level before removing that critical member.
- Dismantling should start from upper level to lower level, from exterior to interior and from non-loadbearing parts to load-bearing parts.
- No materials or debris shall be stacked on the scaffold.

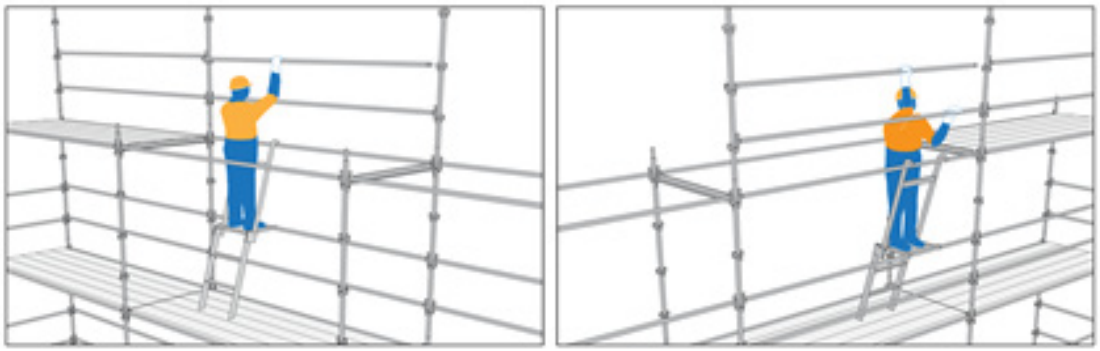


Fig. 2.2.7 Dismantling of scaffolding

2.2.7 Do's and Don'ts for Bamboo Scaffolding

Fig. 2.2.8 Working on bamboo scaffolding

For material shifting and Stacking

- **Do**
  - A suitable place should be provided at the site for storage of bamboo members and the associated materials, tools or equipment.
  - The storage area should be clearly shown on the site plans.
  - The bamboo members should be stored in dry area and in vertical position to prevent the accumulation of waste water inside, thus causing them to decay.
  - Bamboo should be properly stacked and tied to prevent accidental displacement and collapse.
- **Don't**
  - Don't use defective materials.
  - Defective material on the site should be properly labelled to show that they are defective and should not be used.

For Erection

- **Do**
  - The ground or structure on which a scaffold is constructed should be solid, levelled and rammed to give a hard surface, and should be strong enough to keep the scaffold upright.
  - Bamboo scaffolds shall be erected, added to, or altered by trained workmen under the immediate supervision of a competent person

- All workers must wear protective equipment. For example, safety helmets, safety nets and safety belts with suitable anchorage.
- Guard-rails and toe-boards shall be installed at edges where persons are liable to fall from height.
- Work should be started from the bottom level to the top level and from the interior part to the exterior part.
- The height of the bamboo scaffold erected at any side should not be higher than the topmost part of the building/structure by one storey.
- Where a scaffold is erected adjacent to a road or pathway, overlay or screen nets must be erected to envelop the scaffold for the protection of person or vehicular traffic against falling objects.
- All the fastenings between bamboo members should be tight and secure.

For Dismantling

- **Do**
  - For dismantling start the work from upper level to lower level, from exterior to interior and from non-loadbearing parts to load-bearing parts.
  - Dismantling should be orderly and planned and should proceed generally from the top in horizontal sections.
  - If dismantling has reached the stage at which a critical member has to be removed, for example, a tie or a brace, fix an adequate member in place lower down before the member to be taken out is removed.
  - All the stacked materials and debris placed on the scaffold should be removed.
  - Every scaffolder involved in the dismantling work at height should wear safety belt attaching to suitable and sufficient anchorage and suitable fixings as well as other PPE
- **Don't**
  - Scaffolds should not be dismantled in vertical sections from one end towards the other unless special consideration is given to ties and bracings.
  - Lower level of scaffolds should not be loosened till upper ones are completely removed.
  - Don't keep the removed bamboos and ropes close to the dismantling area otherwise it can result in tripping or slippage

Notes

Scan the QR code to watch the video

https://youtu.be/YuBFUtGGcbk

Types of Scaffold

Unit 2.3 Concepts of Modular Scaffolding Systems

Unit Objectives

By the end of this unit, participants will be able to:

- Understand about types of modular scaffolding
- Summarize the components of cuplock system scaffolding
- Identify the components of frame system scaffolding

2.3.1 What is a Modular Scaffolding System?

Modular scaffolding system consists of different prefabricated individual components that can be connected with each other.

The basic components of modular scaffolding are tubes, couplers and boards. Tubes are usually made either of steel or aluminium. They are either galvanized (tinted black), or painted with other darker colours in order to prevent accidents caused by glare.

Fig. 2.3.1 Modular scaffolding system

2.3.2 Advantages of Modular Scaffolding System

Modular Scaffolding System:

- can be adjusted to any shape
- are quick to erect and dismantle
- can be erected outside as well as in inside the structure
- are safe and reliable
- are easy to transport
- are easy to store; they can be easily stacked
- have higher strength compare to similar sized
- conventional bamboo scaffolding system

2.3.3 Types of Modular Scaffolding System

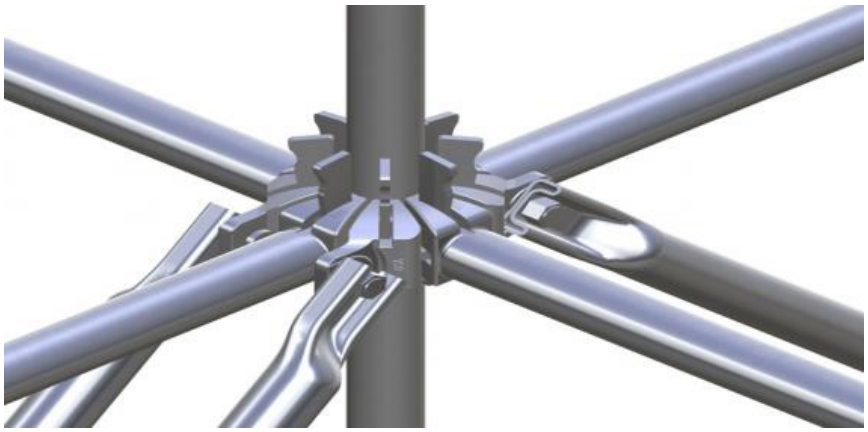


Fig. 2.3.2 Ring system scaffolding

Fig. 2.3.3 Cuplock system scaffolding

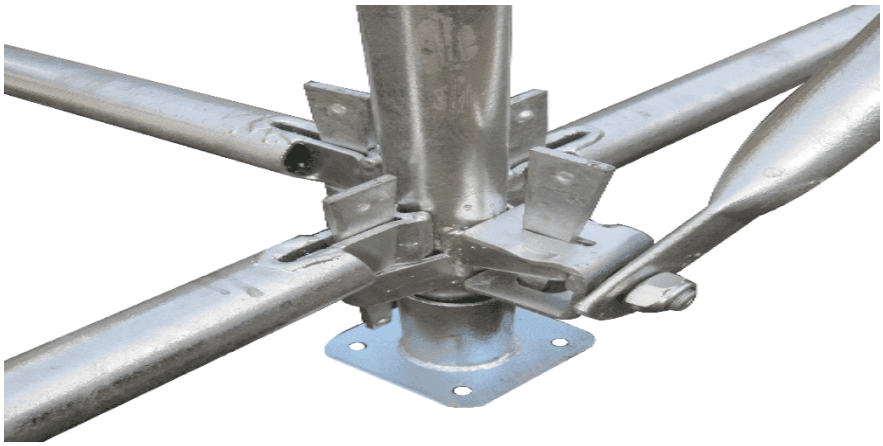


Fig. 2.3.4 Kwikstage scaffolding

7.3.4 Cuplock System Scaffolding and Its Advantage

Cuplock system scaffolding is widely used in construction because of its easy-to-use and highly versatile nature.

In cuplock system, there is a node point connection which allows up to four horizontal members to be connected to a vertical member in one single action - without the use of nuts and bolts, or wedges.

Advantages of cuplock system scaffolding:

- Easy to erect - does not use nuts and bolts or wedges
- Versatile
- Time tested and proven design with safety accessories
- Quick fastening of horizontals
- Time and labour saving
- Lightweight
- Low maintenance

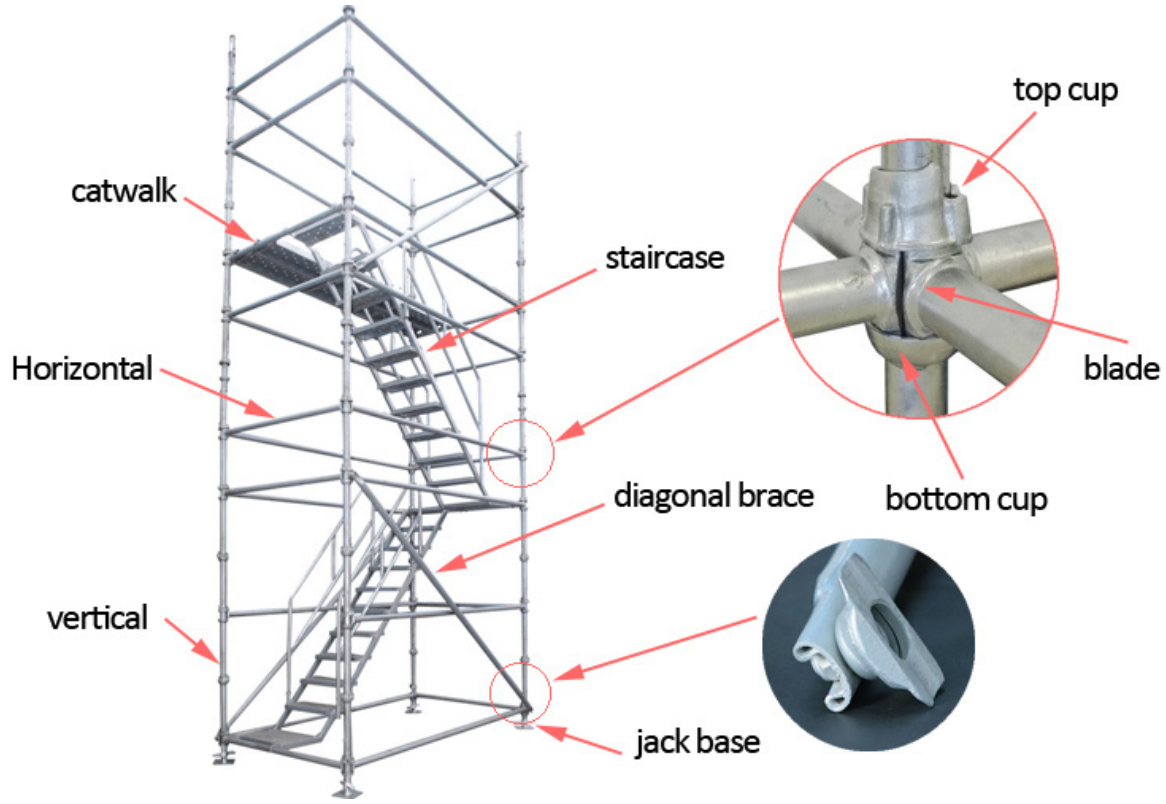


Fig. 2.3.5 Components of cuplock system scaffolding

2.3.5 Components of Cuplock System Scaffolding

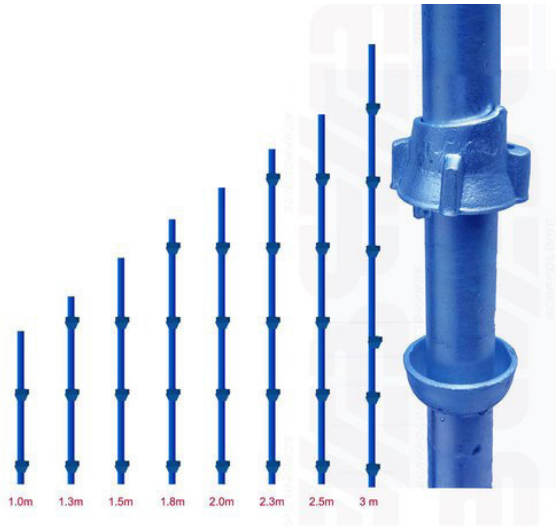


Fig. 2.3.6 Standards

Standards

- They are vertical load-carrying members.
- They are made from high grade steel tubing.
- All standards have lower fixed cups at 500mm intervals.
- They are available.

Ledgers

- They are horizontal members made from tube.
- They have two forged blades at both sides which fit in bottom cups of the standards and are locked in place by the corresponding top cups.
- They are available in various lengths from 0.6m to 2.5m.
- They are also used as guardrail and midrail.

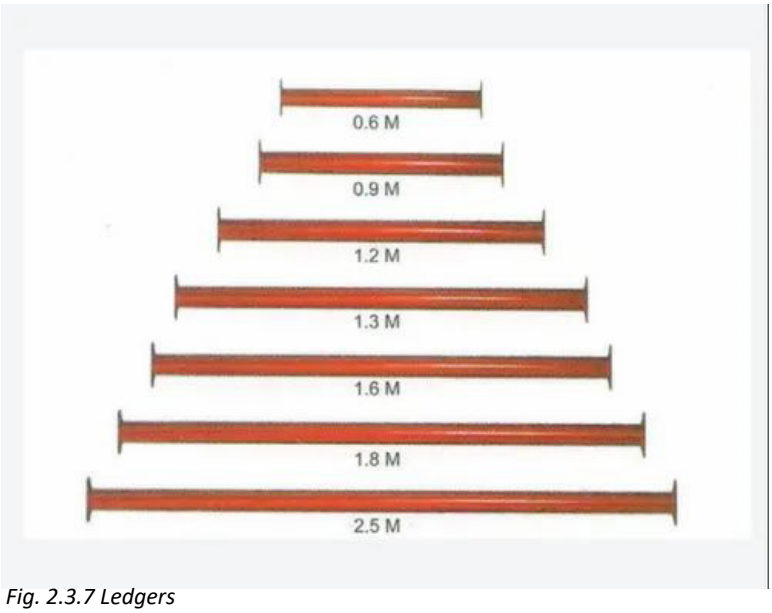


Fig. 2.3.7 Ledgers

Transoms

- They are made of high grade steel tubing.
- They are fabricated from angles fixed back to back with a drop forged blade at each end.
- The transom blade locates into a bottom cup and is locked in position by the top cup.
- Intermediate transoms have two 'U' shape hooks at both sides and they can be put to anywhere between horizontals to decrease the free space.
- They are available in various lengths.

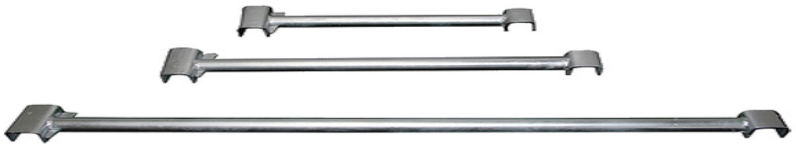


Fig. 2.3.8 Transoms

Braces

- The vertical braces are made of high grade steel tubing with wedge connections at both ends.
- The vertical braces increase the stiffness of the scaffold.

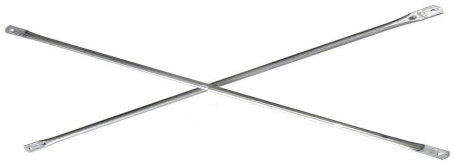


Fig. 2.3.9 Braces

Fig. 2.3.10 Base jack

Base jack

- It is a square plate that distributes the load of the scaffolding.
- It is connected with the standards.
- The adjustable base jack is used for levelling the standards at the same height.
- U-Head is used to insert in the top of the vertical standard to support beam etc.

Fig. 2.3.11 Side bracket

Transoms

- The side bracket can be used to expand the working platform.
- This expansion can be made by a one board bracket (0.39m wide bracket) or by a two board bracket (0.73m wide bracket).

Toe board

- The toe boards are mounted on every working platform.
- They prevent material from falling down from the working platform.

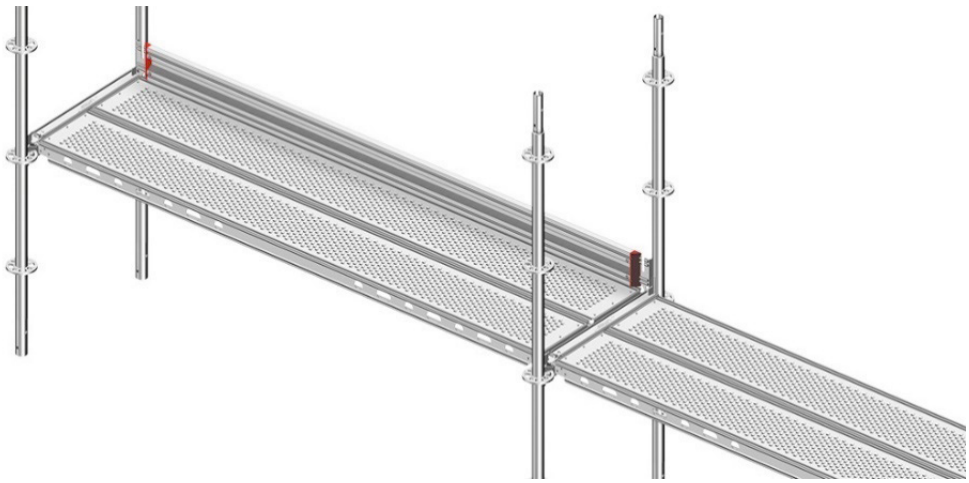


Fig. 2.3.12 Toe board

Platforms/walk boards – Steel deck

- The steel deck is used to create platforms.

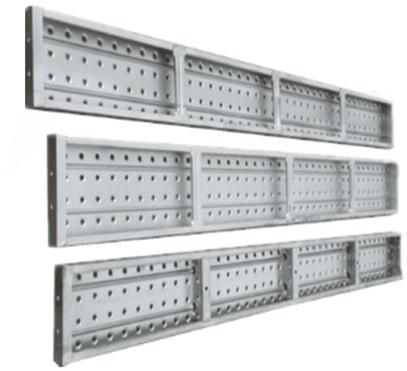


Fig. 2.3.13 Platforms/walk boards – Steel deck

- The decks are made of light-weight steel sheets with a non-skid surface.
- The steel decks are placed on the transoms.
- They have two hooks at both sides which fit in the horizontals.

Timber sole plate

- It is laid under base jacks.
- Base jack is screwed with sole plate.
- It prevents scaffolding from displacement or sinking.
- It should be of at least 25cm wide and 5cm thick.

Fig.2.3.14 Timber sole plate

2.3.6 Frame System Scaffolding

Frame scaffolds are a common type of scaffold because they are versatile, economical and easy to use.

Frame system scaffolding has two frames. These frames are rigid welded frame of horizontal and vertical pipes. They can be connected with diagonal/cross brace, horizontal brace, walk board, adjustable jack base etc.

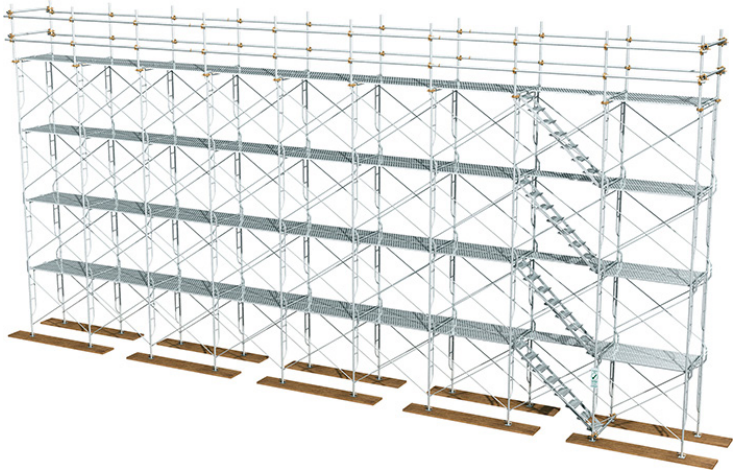


Fig. 2.3.15 Frame System scaffolds

H-frame or U-frame:

- These frames are prefabricated.
- They are fabricated from galvanized tubing.
- Vertical and horizontal members are welded together to form a frame.
- Walkthrough frames provide an easy access for human mobilization with clear head room throughout the erected scaffolding structure.

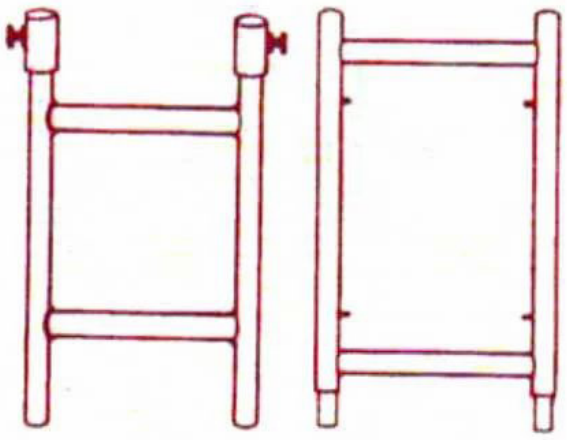


Fig. 2.3.16 H-frame or U-frame

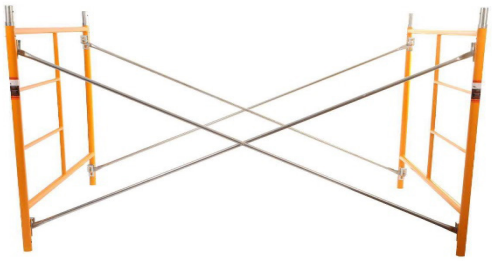


Fig. 2.3.17 Cross braces

Cross braces:

- All cross braces are fabricated from galvanized steel tubing.
- Cross braces are used to brace the frames with drop locks at various spacings.

2.3.7 Components of Frame System Scaffolding

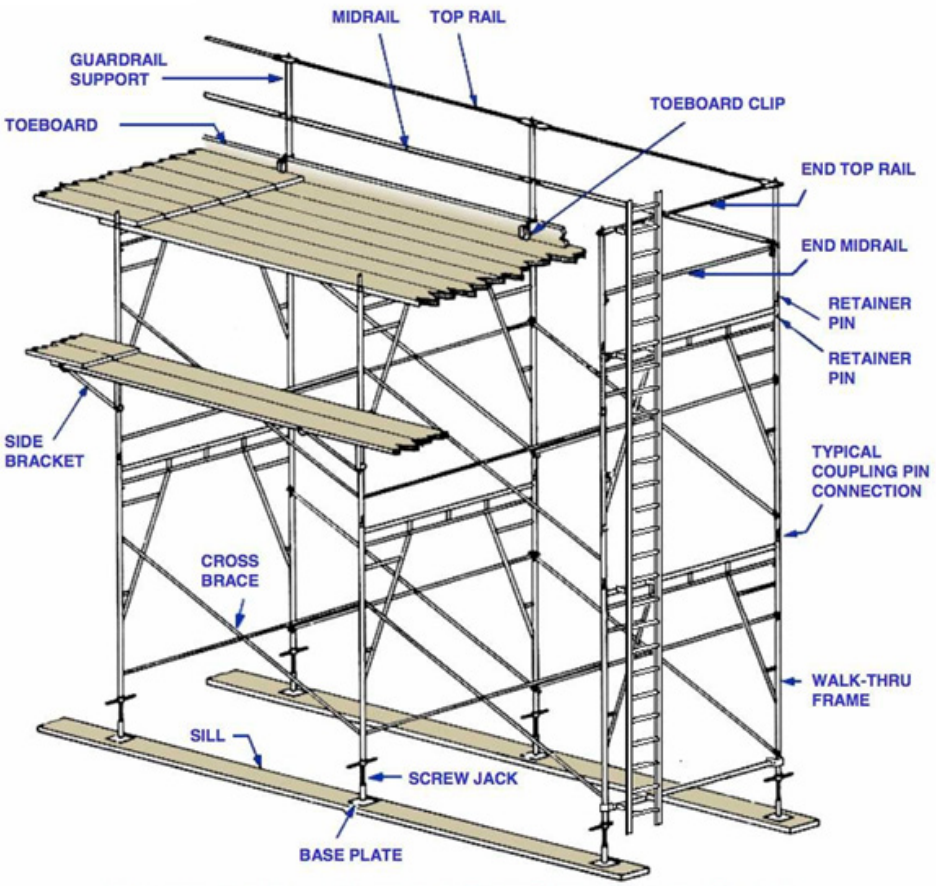


Fig. 2.3.18 Components of Frame System

Notes

Scan the QR code to watch the video

https://youtu.be/fIEaRC07D1M

Staging with Cuplock System

Unit 2.4 Erecting and Dismantling Modular Scaffolding System

Unit Objectives

By the end of this unit, participants will be able to:

- Describe the scaffolding tools
- Use the scaffolding tools
- Erect cuplock system scaffold in correct way
- Erect frame system scaffold in correct way
- Dismantle the scaffold
- Work safely while erecting and dismantling the scaffold

2.4.1 Scaffolding Tools

A scaffold has four basic parts: the planks, cross-bars, frame and connecting pins or clamps. It is very important to correctly assemble different parts to prevent accidents. Several scaffolding tools are necessary to properly erect scaffold sections and secure them in place.

	Level: It is used to check the plumb and level of the assembled components of the scaffold.
	Measuring tape: It is used to measure the height, the distance between the scaffold and building and helps to square up the frames.

	Hammer: A heavy-duty hammer is used to drive the pins or cups into place or to help remove them when scaffold is dismantled.
	Ratchet, Wrenches & Podger: Ratchet and wrench is used to tighten or loosen the nuts.
	Pliers: It is a hand tool used to hold objects firmly.

Table 2.4.1 Scaffolding tools

Erect a Frame-System Scaffold

Erecting a scaffold is a team work. It should be erected by a team of 2 persons.

Let us now look at how to erect a frame-system scaffold. This type of scaffold is put together using prefabricated components.

Resources needed:

Components	Scaffolding tools	PPE & Warning signages
• Sole plates	• Level	• Safety helmet
• Leveling jacks	• Measuring tape	• Safety shoes
• 5’ high frames	• Hammer	• Safety gloves
• Cross-braces	• Ratchet	• Safety goggles
• Decks § Guardrail	• Wrench	• Warning signage
• Midrail § Toeboard	• Plier	• Safety harness
• Side bracket	• Nails	

Table 2.4.2 Scaffolding resources

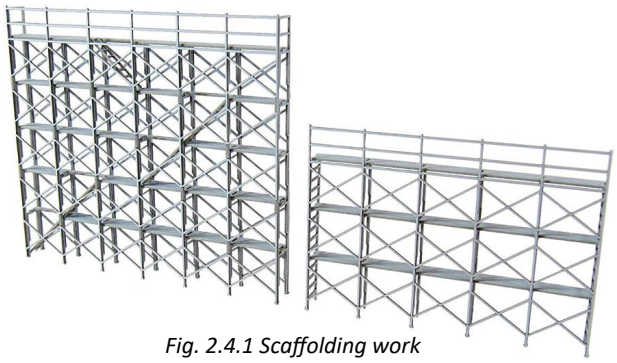


Fig. 2.4.1 Scaffolding work

Steps to erect a frame system scaffold:

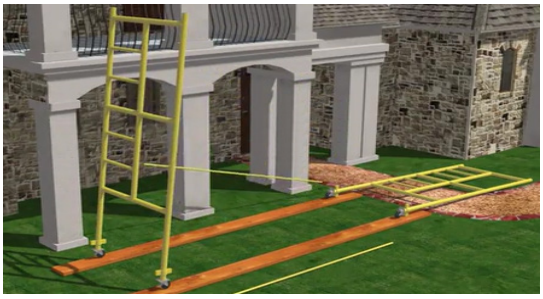
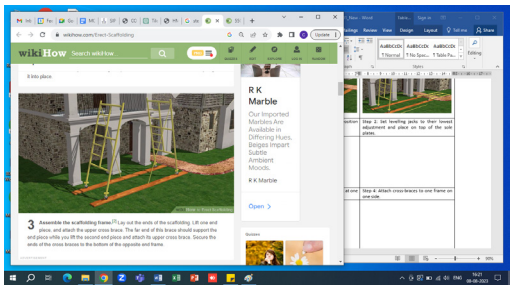
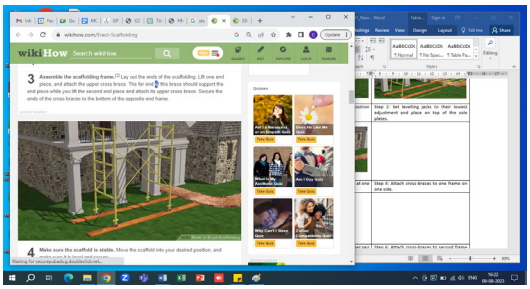
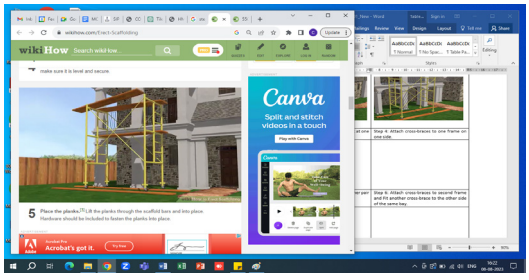
	
Step 1: Place sole plates, set out their position and bed them as level as possible.	Step 2: Set levelling jacks to their lowest adjustment and place on top of the sole plates.
	
Step 3: Stand a unit frame on each jack at one side. Step 4: Attach cross-braces to one frame on one side. Step 5: Stand another unit frame on other pair of jacks.	Step 6: Attach cross-braces to second frame and Fit another cross-brace to the other side of the same bay. Step 7: Check the level and plumb of the bay and adjust the jacks. Step 8: Fix jacks to the sole plates.
	
Step 9: Deck the working platform with planks.	Step 10: Fit toeboards, guardrails and midrails.

Table 2.4.3 Steps to erect a frame system scaffold

Steps to Erect a Cuplock-System Scaffold

Let us now look at how to erect a cuplock-system scaffold.

Resource needed

Components	Scaffolding tools	PPE & Warning signages
• Sole plates • Leveling jacks • Standards • Ledgers • Vertical component • Toeboards • Walkways	• Level • Measuring tape • Hammer • Ratchet • Wrench • Plier • Nails	• Safety helmet • Safety shoes • Safety gloves • Safety goggles • Warning signage

Table 2.4.4 Steps to erect a cuplock-system scaffold

Steps to erect a cuplock systems scaffold

- Step 1: Sift and stack all the components to the place where scaffold has to be erected.
- Step 2: Place sole plates, set out their position and Set levelling jacks to their lowest adjustment and place on top of the sole plates.
- Step 3: Stand vertical on each jack at one side.
- Step 4: Attach ledgers between two adjacent erected vertical.
- Step 5: Stand another vertical on other pair of jacks.
- Step 6: Attach ledgers to second frame.
- Step 7: Fit another ledger to the other side of the same bay
- Step 8: Fix ledgers at multiple levels.
- Step 9: Adjust the jacks as per levelling requirement.
- Step 10: Place walkways on the ledgers.
- Step 11: Deck the working platform with planks as shown in the picture.
- Step 12: Fit toe boards, guardrails and midrails as shown in the picture.

Fig. 2.4.2 Scaffolding work by mason

2.4.2 Dismantling the Scaffold

The scaffold should be dismantled section by section as it was erected.

- Remove the toeboards, guardrail and midrail.
- Remove the decks.
- Loosen the top cups using hammer.
- Remove ledgers.
- Remove standards.
- Clean all parts properly.
- Check all parts for any damage.
- Stack them in the store for re-use

2.4.3 Safety Precautions and Practices

- Erect the scaffolding on level and solid ground.
- Plumb and level the scaffold as it is being erected.
- Ensure all components are installed and fixed in proper way.
- Check all components for any damage before erecting the scaffolding.
- Scaffolding components must not be allowed to drop at any time.

2.4.4 Storage of Scaffolding Material

- Store material of same size and type at one place
- Stack material properly up to desirable height
- Provide adequate ground clearance to the material stack to avoid contact with water/ moisture
- Store damaged material separately
- Tag stacked material as per their size and type

Fig. 2.4.3 Scaffolding storage

Exercise

1. What is the purpose of temporary scaffolding in construction projects?
2. Define what temporary scaffolding is and its primary function on a construction site.
3. How does temporary scaffolding enhance worker safety and efficiency during construction?
4. What are the key components of a conventional scaffolding system?
5. How is the stability of a conventional scaffolding structure ensured during construction tasks?
6. How does a modular scaffolding system improve adaptability and ease of setup?
7. Mention some advantages of using modular scaffolding systems for construction projects.

Notes

Scan the QR code to watch the video

https://youtu.be/OKawvyUhUkA

Scaffolding Safety Erection and Dismantle Procedure

Skill India
कौशल भारत-कुशल भारत

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GOVERNMENT OF INDIA
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Skill Development
Corporation
Transforming the skill landscape

3. Hand and Power Tools Relevant to Masonry

Unit 3.1 - Hand and Power Tools Relevant to Masonry

(CON/N0105)

Key Learning Outcomes

By the end of this module, participants will be able to:

- Describe the process of using masonry tools.

Unit 3.1 Hand and Power Tools Relevant to Masonry

Unit Objectives

By the end of this unit, participants will be able to:

- Elucidate the functions, use and maintenance of basic measuring, levelling, manual and power tools used in masonry.
- Discuss the standard masonry practices.
- Explain the safety regulations concerning the handling and use of construction tools, equipment, and materials.
- Explain the importance of personal protection and the use of relevant safety gear and equipment.
- Describe the process of transferring levels using basic leveling devices.
- Demonstrate how to check the usability of tools, including the signs of wear and tear.
- Demonstrate the process of performing minor repair and maintenance of tools and equipment, such as cleaning and oiling.
- Demonstrate the process of setting up and using basic levelling tools, such as spirit level, water level, and straight edge.
- Show how to transfer levels and set out using appropriate tools.

3.1.1 Masonry

Masonry is the skilled practice of constructing a building or structure using materials like bricks, stones, or related substances. This process often involves joining these materials together with mortar, a type of plastering substance, which effectively bonds and secures them in place.

The term “masonry” can also be used to describe the actual building blocks or units, such as stones or bricks that are used in this construction method.

Fig. 3.1.1 Masonry

3.1.2 Standard Masonry Practices

Standard masonry practices are essential guidelines and techniques followed by masons and builders to ensure safe, durable, and high-quality masonry construction.

1. **Material Selection**:

   - **Bricks or Stones:** Ensure that bricks or stones are of appropriate quality and meet regional or national standards.
   - **Mortar:** Use mortar that complies with local building codes and standards. The mortar mix should match the project requirements.

Fig.3.1.2 Brick and Stones Walls

Fig.3.1.3 Mortar Mix

2. **Foundation Preparation:**

Properly excavate and level the foundation to the required depth and dimensions.

Install footings or a foundation wall as needed for structural support.

Fig.3.1.4 Foundation Preparation

3. **Layout and Design:**

Accurately mark the layout and dimensions of the masonry structure using chalk lines, levels, and plumb bobs.

Ensure proper alignment, spacing, and coursing of bricks or stones to match the design specifications.

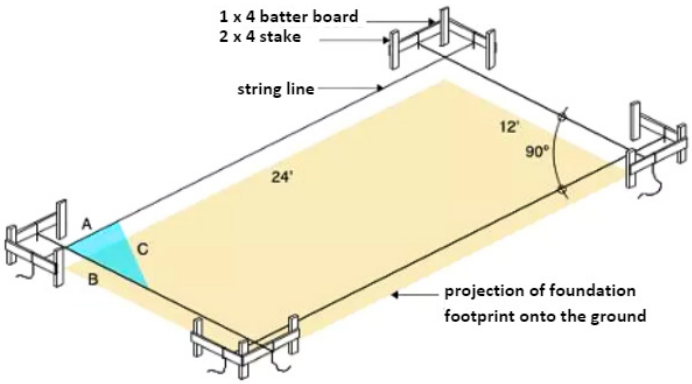


Fig.3.1.5 Foundation Layout

4. Mortar Mixing and Application:

- Follow manufacturer guidelines for mixing mortar, paying attention to the correct water-to-mortar ratio.
- Apply mortar evenly and consistently, using a trowel or a pointing tool.
- Use the appropriate mortar joint profile (e.g., concave, flush, or V-shaped) as specified in the design.

Fig.3.1.6 Mortar Preparation

5. Bond Patterns:

- Employ suitable bond patterns (e.g., running bond, stretcher bond, Flemish bond) based on structural requirements and design preferences.
- Maintain consistent bond patterns throughout the construction.

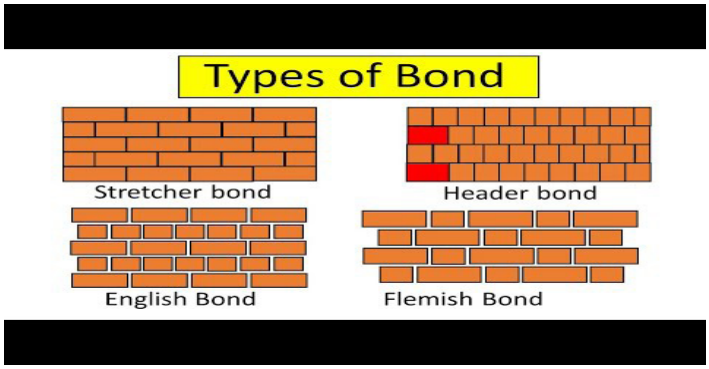


Fig.3.1.7 Types of Brick Bonds

6. Reinforcement:

- Incorporate steel reinforcement, such as rebar or wire mesh, when required by the design to enhance structural strength and stability.
- Place reinforcement accurately and secure it within the masonry units.

Fig.3.1.8 Reinforcement Work in Masonry

7. Curing:

- Allow the mortar to cure properly by keeping it moist for the prescribed time. This prevents cracking and ensures optimal strength development.
- Protect the masonry from excessive drying, wind, and extreme temperatures during curing.

Fig.3.1.9 Concrete Pavement Curing

8. Expansion Joints:

- Install expansion joints where necessary to accommodate thermal expansion and contraction, preventing cracks and damage to the masonry.

Fig.3.1.10 Expansion Joints

9. Flashings and Weep Holes:

- Properly install flashings, through-wall flashings, and weep holes to manage moisture and prevent water infiltration in critical areas like window and door openings.

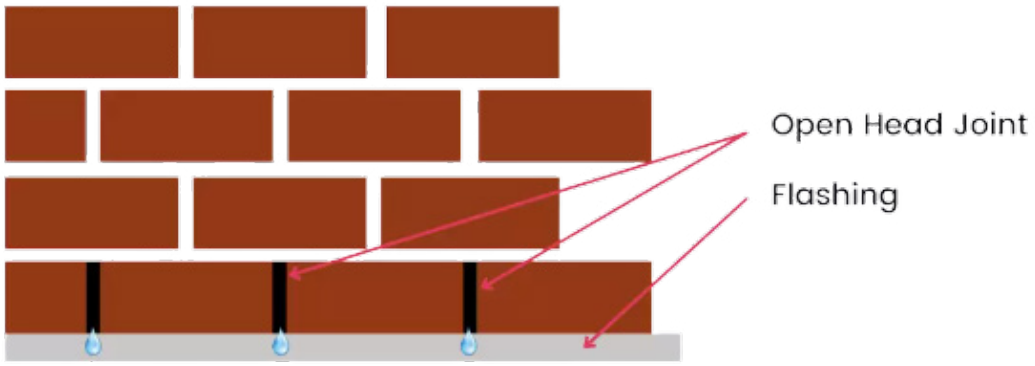


Fig.3.1.11 Flashings and Weep Holes

10. Clean and Finish:

- Clean excess mortar and debris from the masonry surface immediately after construction to maintain a neat appearance.
- Finish the mortar joints to the desired profile and texture.

11. Inspection and Quality Control:

- Regularly inspect the masonry work for structural soundness, alignment, and aesthetics.
- Address any defects or issues promptly to ensure a high-quality finish.

12. Maintenance and Repair:

- Implement a regular maintenance plan to address wear and tear, especially in regions with harsh weather conditions.
- Perform repairs as needed to extend the life of the masonry structure.

13. Compliance with Building Codes:

- Ensure that the masonry work complies with local building codes and regulations, including seismic and wind load requirements.

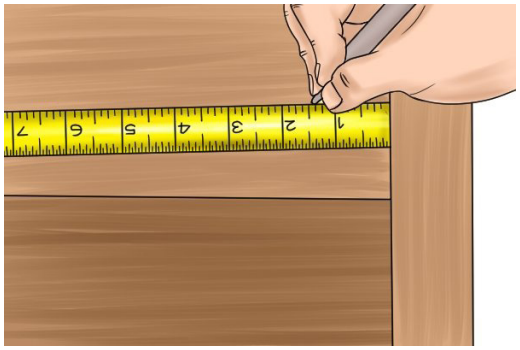
3.1.3 Levelling Masonry Tools

Tools Name	Image	Specification
Spirit Level		Spirit level is used to check the evenness across a wall or surface. While marking the lines, look from the top and make sure the air bubble is in the center of the tube.
Plumb Bob		Plumb is used to check the evenness of the edges up and down a wall or column. While dropping the Plumb, make sure that the tip is not tilting
Line Thread		Nylon rope helps to ensure that bricks are aligned properly in the form of a mason's line.
Water Pipe Levelling		It is used to fix or transfer a level to another point. While marking make sure there is no air bubble in the tube level.
Straight Edge		A straightedge in masonry is a long, straight, and flat tool used to check the flatness and straightness of masonry surfaces, such as walls, floors, or other horizontal or vertical structures.

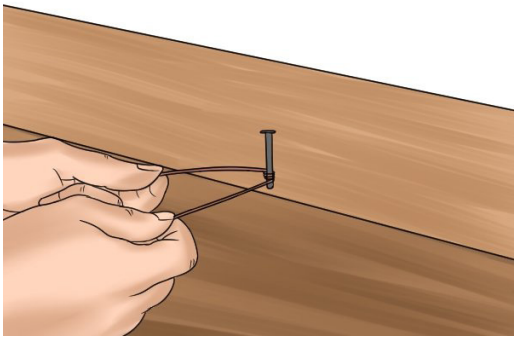
Table 3.1.1 Levelling Masonry Tools

3.1.4 Process of using Plumb Bob

Step 1: Mark a point 50mm (2 inches) from the wall.



Step 2: Secure Nail and String



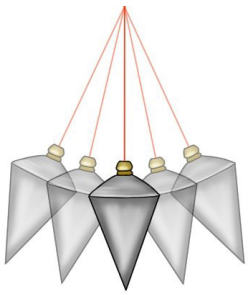
Fix a nail at the marked point and tie a string to it.

Step 3: Suspend Plumb-Bob

Hang the plumb-bob with the string, allowing it to swing freely.

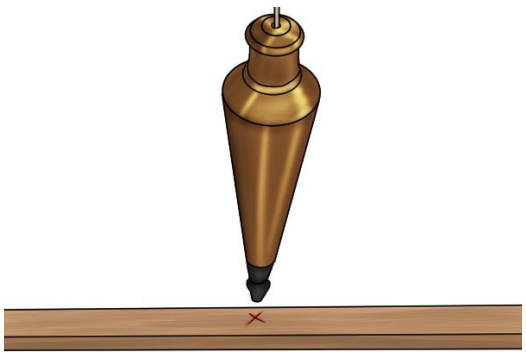
Step 4: Stabilize Plumb-Bob

Let the plumb-bob come to a complete stop, ensuring a taut string.



Step 5: Mark Point below Plumb-Bob

Mark the point directly beneath the plumb-bob's tip.



Step 6: Measure Distance

Measure the distance from the wall to the marked point. If it's precisely 5cm (2 inches), the wall is plumb.

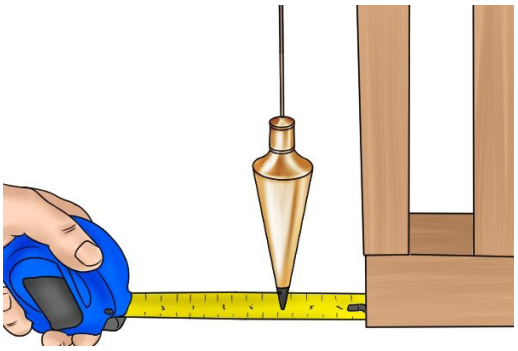
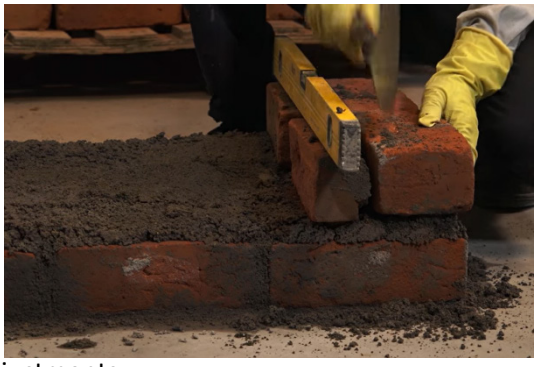
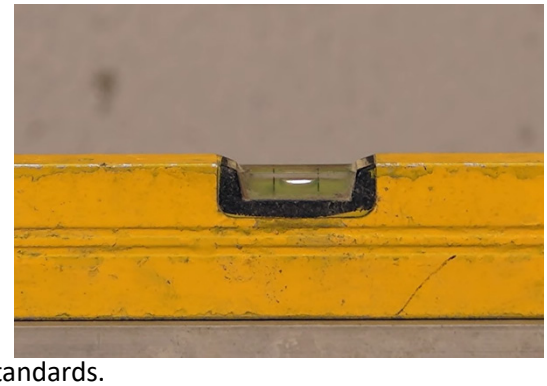


Fig.3.1.12 Process of using Plumb Bob

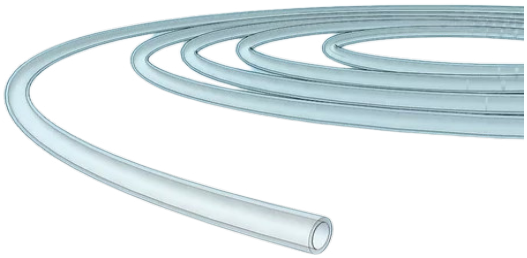
3.1.4 Process of using Spirit Level

Step 1: Apply Mortar  Begin by applying mortar evenly on the foundation.	Step 2: Place the Brick  Gently set the brick into the mortar bed.
Step 3: Level Check  Employ the spirit level to check if the brick is level horizontally.	Step 4: Mortar Adjustment  If the brick is not level, either remove excess mortar beneath it or add more mortar to achieve the desired level.
Step 5: Adjustment Tools Use hand pressure or a trowel to make precise  adjustments.	Step 6: Re-Level Inspection Recheck the level to ensure it meets the required  standards.

Step 7: Using Straightedge	Step 8: Spirit Level Check on Straightedge
 When the gaps between two bricks are wider than the spirit level's length, place a straightedge across them.	Position the spirit level on top of the straightedge to verify the level. 

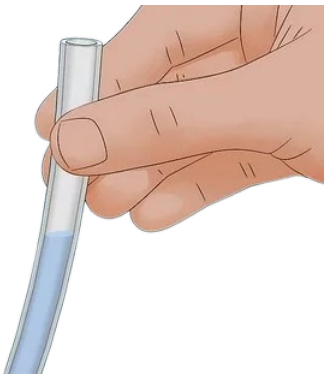
Fig.3.1.13 Process of using Spirit Level

3.1.5 Process of using Water Level

Step 1: Selecting Water Level	Step 2: Prepare the Tube
Use 50 to 100 feet (15 to 30 m) of tubing with a 5⁄16 in (0.79 cm) diameter 	Attach one end of the clear tubing to a stake or dowel. Place the stake in the ground or secure it to a work table using clamps. 

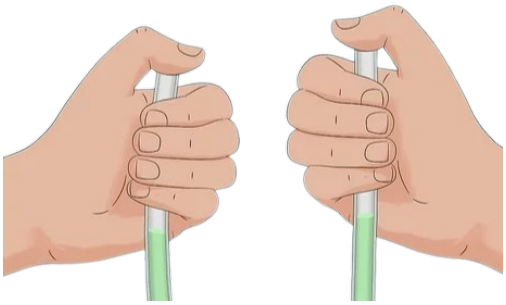
Step 3: Fill with Water

Hold the other end of the tubing at the same height as the attached end. Fill the tube with water, 2 to 3 inches below the attached end.



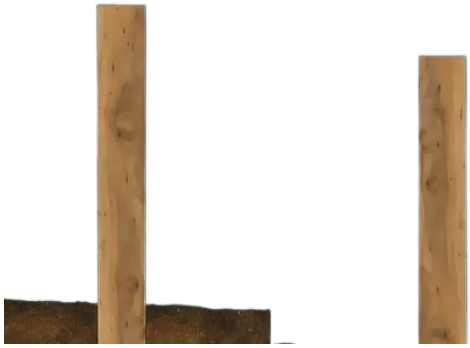
Step 4: Prevent Spills

Use thumbs or caps on the ends to prevent water from spilling out.



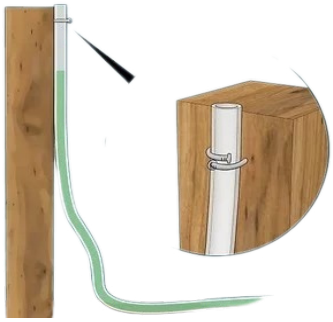
Step 5: Stabilize the Items

Ensure that the items are firmly in the ground or secured on a worktable clamp for stability.



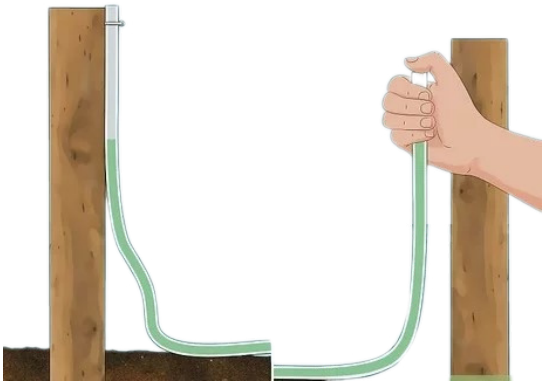
Step 6: Attach the Water Level

Hold one end of the water level against one of the items, making sure the open end faces upward. Use nails or clamps to secure the level in place.



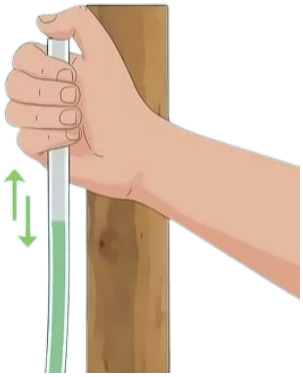
Step 7: Check the Water Level

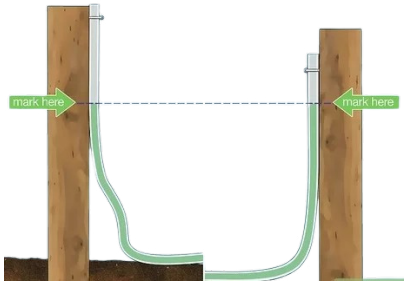
Observe where the water settles in both ends of the tube. If it appears higher or lower in one end, it indicates that the spots are not level.



Step 8: Adjust the Level

Slide the free end of the tube up or down until the water levels match on both ends. Continue checking as you adjust until they align.





Step 9: Mark the Level Spot

Once the water levels on both ends of the tube are even (the meniscus is level), use chalk or a pencil to mark the level spot on both posts or items.

Fig.3.1.14 Process of using Water Level

3.1.6 Masonry Hand Tools

Tool	Image	Description
Trowel		A trowel is a flat, pointed, and rectangular hand tool with a handle. It typically has a metal blade. Trowels are used for spreading, leveling, and shaping mortar and plaster during bricklaying and other masonry tasks. They help create smooth and even surfaces.
Mason's Hammer		A mason's hammer, also known as a brick hammer, has a dual-headed design. One end features a flat, square face, while the other end has a chisel-like edge. It used for cutting bricks and stones, as well as for striking chisels or other tools to shape or break apart materials.
Jointers		Jointers are small, pointed hand tools with a curved or V-shaped edge. Jointers are used to create a rounded or concave finish in the mortar joints between bricks or stones.
Mallets 		Mallets are hammer-like tools with a soft, non-metallic head, often made of rubber or wood. They have a handle attached to the head. Mallets are used to tap or strike various masonry tools without damaging them.

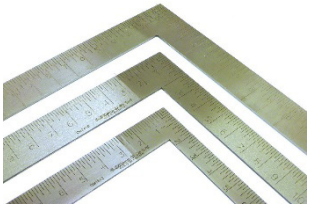
Wedges		Wedges are tapered, often triangular, tools made of metal or wood. Wedges are used to split rocks, bricks, or stones. They are driven into a pre-cut groove, and the pressure they create causes the material to split along the groove.
Bolster Chisel		A bolster chisel is a flat, wide, and sturdy chisel with a beveled cutting edge. Bolster chisels are employed for cutting bricks or stones to the desired size and shape. They are used in combination with a mason's hammer to achieve precise cuts.
Spade		A spade is a shovel-like tool with a flat, rectangular blade and a long handle. In masonry, spades are used for excavation and for mixing materials like mortar or concrete.
Measuring Tape		A measuring tape is a flexible and retractable tool typically made of metal or fabric. It consists of a long tape marked with measurements, often in both metric and imperial units.
Steel Square		A steel square is a measuring and layout tool made of metal, often in the shape of an "L." Steel squares are used to ensure accurate right angles and measurements during the layout and construction of masonry walls, ensuring that the bricks or stones are properly aligned and squared.

Table 3.1.2 Masonry Hands Tools

3.1.7 Masonry Power Tools

Tools Name	Image	Specification
Power Wet Saws		Power wet saws are specialized cutting machines equipped with a circular blade that is cooled with water to reduce heat and friction during cutting. They can be handheld or tabletop models. Power wet saws are used for precisely cutting through a variety of masonry materials, such as tiles, bricks, and stone.

Electric Drills		Electric drills are handheld power tools equipped with a rotating drill bit for making holes in various materials. They can be corded or cordless. Electric drills with masonry drill bits are used to create holes in concrete, brick, or stone surfaces.
Tile Cutters		Tile cutters are handheld or tabletop tools designed specifically for cutting ceramic or porcelain tiles. They typically have a scoring wheel or blade.
Vibrators		Vibrators are power tools that consist of a vibrating head or rod attached to a motor. They are used to impart vibration to freshly poured concrete.
Grinders		Grinders are power tools with rotating abrasive discs or wheels. They come in various sizes and configurations. Grinders are used for tasks such as smoothing rough surfaces, grinding down concrete or mortar, and shaping masonry materials.
Concrete Mixer		A concrete mixer is a machine that combines cement, sand, aggregates, and water to create concrete. It can be a stationary or portable unit.

Table 3.1.3 Masonry Power Tools

3.1.8 Repair and Maintenance of Tools and Equipment

Performing minor repair and maintenance of tools and equipment is essential to ensure their longevity and efficient operation.

Step-by-step guide on how to clean and oil tools and equipment:

Tools and Materials Needed:

- Dirty Tools and Equipment: Items that require cleaning and oiling.
- Clean Cloth or Rag: For wiping down surfaces.
- Wire Brush: To remove rust and dirt.

- Cleaning Solution: Soap and water, degreaser, or a suitable cleaning agent.
- Bucket or Sink: For soaking and cleaning.
- Toothbrush or Small Brush: To reach tight spots.
- Oil or Lubricant: Appropriate for the type of equipment you're maintaining.
- Safety Gear: Gloves and eye protection if necessary.
- Owner's Manual: Helpful for specific maintenance instructions.

Procedure:

1. **Safety First:** Ensure you're wearing any necessary safety gear and that the tools or equipment are turned off and disconnected from power sources.
2. **Inspect:** Examine the tools and equipment for visible dirt, dust, rust, or damage. Make a note of any parts that may need replacement.
3. **Dismantle (if needed):** For some tools and equipment, it may be necessary to disassemble them to access all parts for cleaning and oiling. Refer to the owner's manual for guidance on how to safely disassemble them.
4. **Cleaning:**
    - **Remove Loose Debris:** Use a wire brush or a small brush to remove loose dirt, dust, and rust from the surfaces. Pay attention to corners, crevices, and moving parts.
    - **Soaking:** If the tools or equipment are particularly dirty, you can soak them in a bucket or sink filled with a cleaning solution. Allow them to soak for a suitable amount of time to loosen stubborn grime.
    - **Scrubbing:** Use the toothbrush or small brush to scrub hard-to-reach areas and remove any remaining dirt.
    - **Wipe Down:** Use a clean cloth or rag to wipe down all surfaces, ensuring they are dry and free of residue.
    - **Inspect Again:** After cleaning, inspect the tools and equipment once more to ensure that all dirt and rust have been removed.
5. **Oiling and Lubrication:**
    - **Identify Lubrication Points:** Refer to the owner's manual or your knowledge of the equipment to identify where lubrication is needed. Common areas include hinges, moving parts, and bearings.
    - **Use the Right Oil:** Select an appropriate lubricant for your equipment. Different tools may require different types of oil, such as machine oil, silicone spray, or specific lubricants.
    - **Apply Lubricant:** Apply a small amount of lubricant to the identified points. Be careful not to over-lubricate, as excess oil can attract dirt.
    - **Operate (if applicable):** For equipment with moving parts, operate them a few times to ensure the lubricant is distributed evenly.
    - **Reassemble:** If you disassembled any parts, reassemble them according to the owner's manual's instructions.
    - **Final Inspection:** Inspect the tools and equipment one last time to ensure they are clean, lubricated, and in proper working condition.

3.1.9 Safety Regulations

Safety regulations are essential to protect the well-being of workers and ensure that construction projects are carried out safely and efficiently. Some common safety guidelines and regulations that are typically observed on construction sites are:

Fig.3.1.15 Safety training

1. Training and Certification: Workers should receive proper training and certification in the safe operation of construction tools and equipment before they are allowed to use them.
2. Personal Protective Equipment (PPE): All workers should wear appropriate PPE, which may include safety helmets, steel-toed boots, high-visibility vests, safety goggles, hearing protection, and respiratory protection, as required by the specific job and hazards present.

Fig.3.1.16 Personal Protective Equipment

3. Tool and Equipment Inspection: Tools and equipment should be regularly inspected for defects or damage before use. Damaged tools or equipment should be repaired or replaced promptly.

4. **Safe Use and Handling:**

   - Workers should use tools and equipment only for their intended purposes and follow the manufacturer's guidelines for safe use.
   - Proper lifting techniques should be employed to prevent back injuries when handling heavy tools and materials.

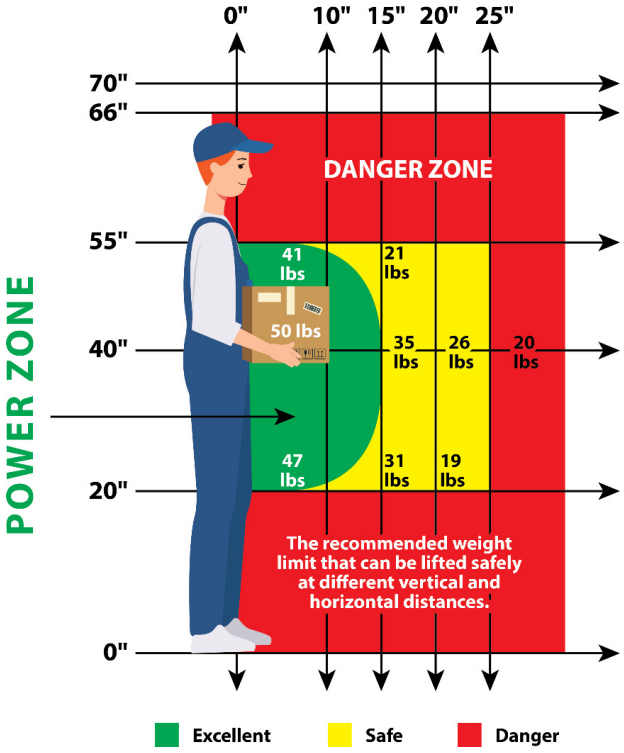


Fig.3.1.17 Proper lifting technique

   - Tools should be kept in good condition, with sharp blades and properly maintained moving parts.
   - Extension cords and electrical tools should be grounded and used in a safe manner.

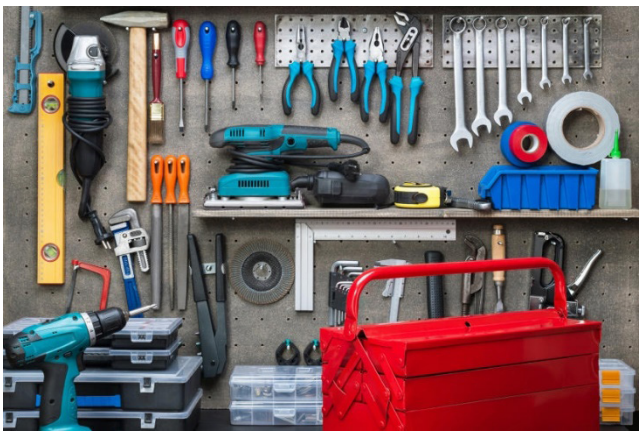


Fig.3.1.18 Ideal Tools Storage

5. **Material Handling:**
    - Materials should be stored and stacked securely to prevent falling hazards.
    - Workers should use appropriate lifting and carrying techniques when handling heavy or awkward materials.
    - Load limits for equipment, such as cranes and forklifts, should be observed.

6. **Fire Safety:**
    - Flammable materials should be stored and handled according to regulations.
    - Fire extinguishers should be readily available and workers should be trained in their use.

Fig. 3.1.19 Fire Safety Training

7. **Hazard Communication:** Proper labelling and communication of hazardous materials should be ensured.

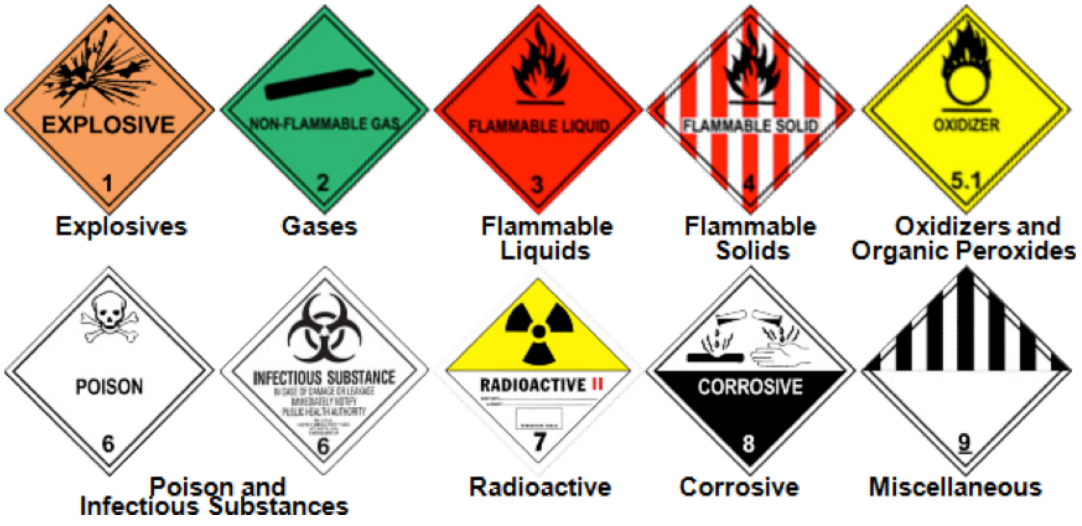


Fig.3.1.20 Hazardous Material Labelling

8. **Machine Guarding:** Equipment with moving parts should have appropriate guarding to prevent accidental contact.
9. **Fall Protection:** Fall protection measures, such as guardrails, safety nets, or personal fall arrest systems, should be in place when working at heights.

Fig.3.1.21 Construction Worker equipped with Fall Protection Equipment

10. **Scaffolding Safety:** Scaffolding should be erected, used, and inspected by trained personnel according to safety regulations.

Fig.3.1.22 Inspected Scaffold

11. **Excavation Safety:** Proper shoring, sloping, or benching techniques should be used when working in trenches or excavations to prevent cave-ins.
12. **Emergency Procedures:** Workers should be familiar with emergency procedures, including evacuation routes and first aid.
13. **Safety Signs and Barricades:** Adequate signage and barricades should be used to warn of hazards and restrict access to dangerous areas.

Fig.3.1.23 Safety Signs and Barricades

14. **Supervision and Compliance:** Construction supervisors and managers should enforce safety regulations and ensure that all workers comply with them.

Exercise

A. Fill in the blanks

(Hint: masonry, tube, unit, hammer, bricks and stones)

1. Masonry is the skilled practice of constructing a building or structure using materials like _____, or related substances.
2. A spirit level is used to check the evenness across a wall or surface. While marking the lines, look from the top and make sure the air bubble is in the center of the _____.
3. A bolster chisels are used in combination with a mason's _____ to achieve precise cuts.
4. Power wet saws can be handheld or tabletop models and are used for precisely cutting through a variety of _____ materials.
5. A concrete mixer is a machine that combines cement, sand, aggregates, and water to create concrete. It can be a stationary or portable _____.

B. Short Answer Questions

1. What are the primary materials used in masonry construction, and why is it important to ensure their quality and compliance with standards?
2. Explain the purpose of using a spirit level and a plumb in masonry work. What do you check when using these tools?
3. How is a trowel typically used in masonry tasks, and what is its primary function?
4. Describe the dual-headed design of a mason's hammer and provide examples of its applications in masonry work.
5. What is the main function of a steel square in masonry, and how does it contribute to ensuring accuracy during construction?

C. Match the following

Tools Name	Image
Power Wet Saws	
Electric Drills	

Jointers	
Mallets	
Grinders	
Concrete Mixer	
Spirit Level	
Plumb Bob	

Notes

Scan the QR code to watch the video

https://youtu.be/PCVIAvs5c88

Common Masonry Tools

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

4. Assist in Tiling, Stone Laying and Concrete Masonry

Unit 4.1 – Assist in Tiling Work and Stone Laying

Unit 4.2 – Assist in Concreting

Unit 4.3 – Assist in Brick Soling and PCC flooring

(CON/N0106)

Key Learning Outcomes

By the end of this module, participants will be able to:

- Describe the process of assisting in tiling and stone laying.
- Explain the process of assisting in concreting.
- Describe the process of preparing and applying anti-termite solution.
- Describe the process of carrying out brick soling and PCC flooring

Unit 4.1 Assist in Tiling Work and Stone Laying

Unit Objectives

By the end of this unit, participants will be able to:

- Explain the use of basics sketches for tiling, stone laying and concrete masonry.
- Discuss the basic principles of measurement.
- State the standard sizes and maintenance of all masonry tiling and concreting tools.
- Elucidate how to select and use basic tools for tiling, stone laying and concreting, such as measuring tape/ruler, hammer, mallet, spade, bolster chisel, wedges, power wet saws, tile scribes or hand-held tile cutters, screeds, floats, shovels, rakes, vibrators etc.
- Describe the techniques and procedures for cutting different types of tiles and stones to size and as per design requirements.
- Elucidate the types, physical properties and applications of different types of tiles.
- Describe the methods and techniques of preparing bed mortar and cement slurry.
- Explain the techniques for preparing different surfaces.
- Explain the importance and process of hacking RCC surfaces.
- Explain the importance of tile/ stone laying as per the specifications within the applicable tolerance limits

4.1.1 Sketches used in Tiling Work

1. Layout Planning: Tiling sketches help plan the layout of tiles on a surface, such as a floor or wall. This includes determining the starting point, tile orientation (e.g., square or diagonal), and any tile patterns or borders.

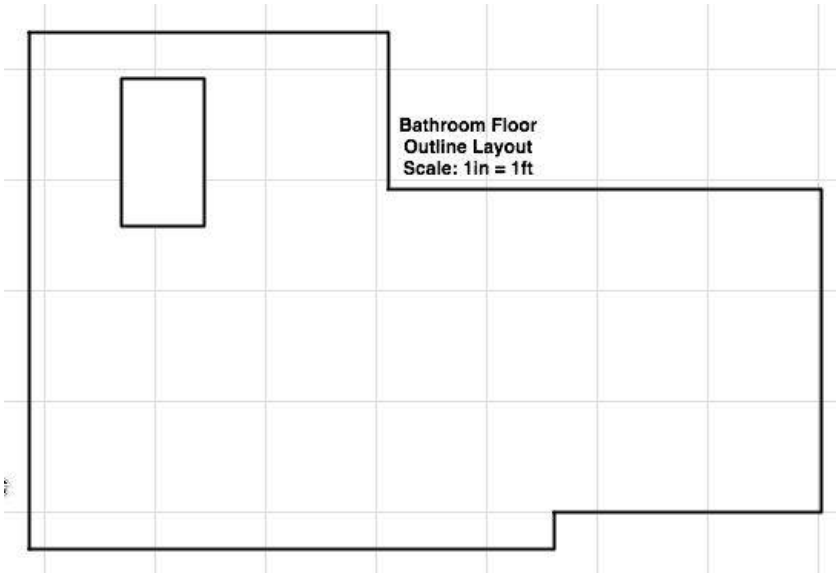


Fig.4.1.1 Layout Design

2. Tile Placement: The sketch serves as a guide for masons to accurately place each tile. It indicates the location and orientation of each tile in relation to neighboring tiles, ensuring a uniform and aesthetically pleasing arrangement.

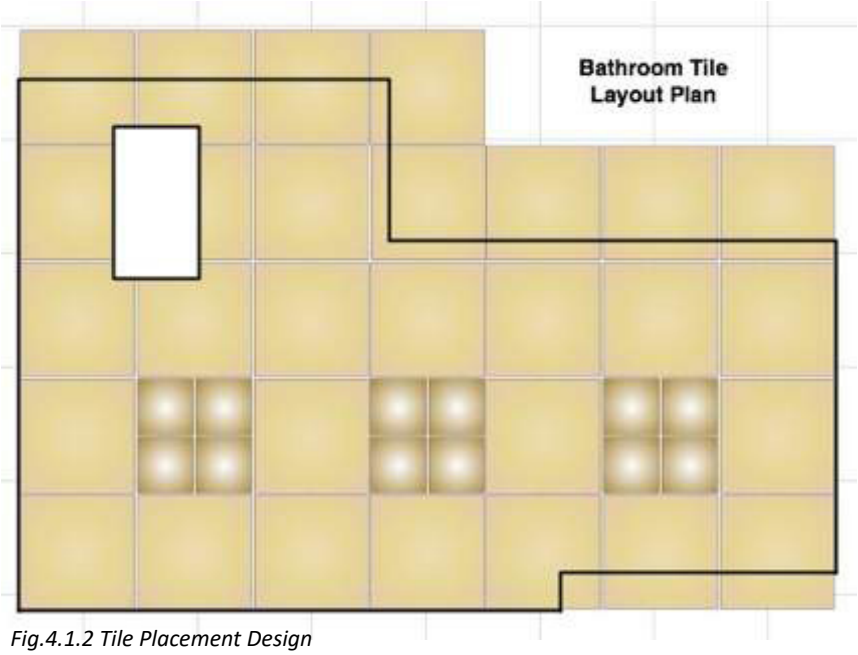


Fig.4.1.2 Tile Placement Design

3. Estimation: Tiling sketches can be used for estimating the number of tiles required for a specific area. By measuring and calculating the dimensions in the sketch, masons can determine the tile quantity needed.

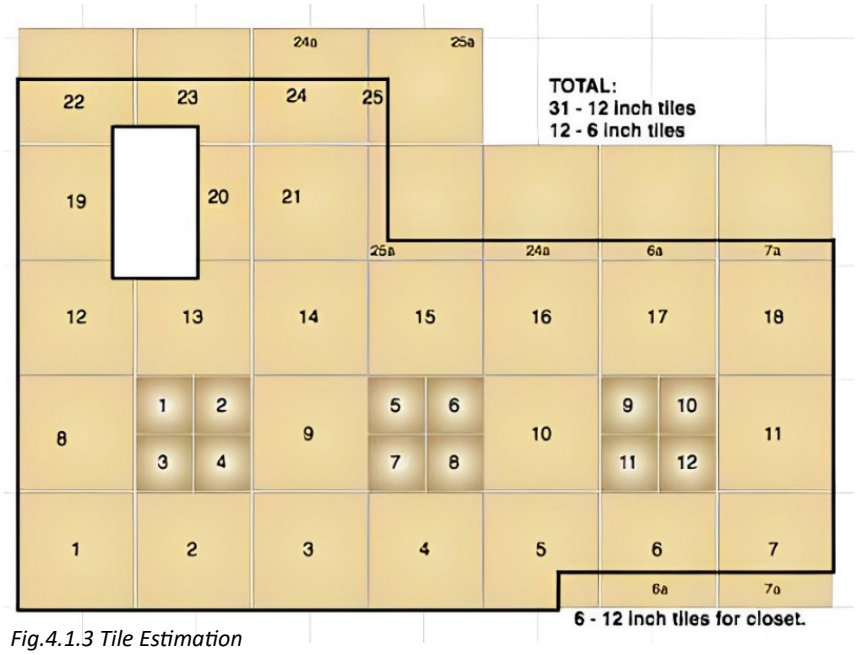


Fig.4.1.3 Tile Estimation

Fig.4.1.4 Complex Tile Pattern

4. Pattern Design: In cases where complex patterns or designs are desired, sketches help in planning and visualizing the tile pattern before actual installation.

4.1.2 Sketches used in Stone Laying Work

1. Layout and Design: Stone laying sketches are used to plan the arrangement of stones in a wall, pathway, or other structures. They provide a visual representation of the stone placement and help maintain a balanced and attractive design.

2. Alignment: The sketch assists masons in aligning stones properly, both horizontally and vertically, ensuring structural integrity and a level surface.

3. Estimation: Similar to tiling, stone laying sketches can be used to estimate the quantity of stones required for a project, considering the dimensions and layout depicted in the sketch.

4. Bond Patterns: In stone masonry, different bond patterns, such as random rubble, ashlar, or coursed, can be achieved through careful planning in sketches. These patterns influence the appearance and stability of the finished structure.

4.1.3 Sketches used in Concrete Masonry Work

1. Formwork Planning: In concrete masonry, sketches are often used to plan the formwork, which defines the shape and dimensions of the concrete structure. Formwork sketches help masons create molds or frames to pour concrete into.

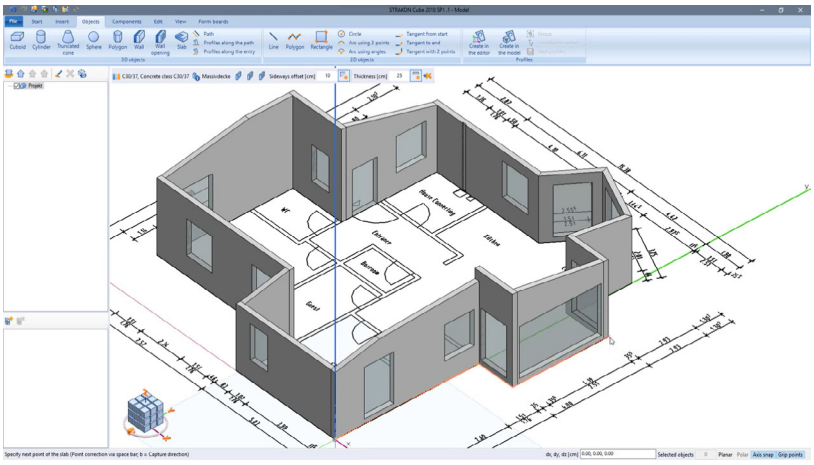


Fig. 4.1.5 Formwork Plan

2. Reinforcement Layout: For reinforced concrete structures, sketches are used to specify the placement of steel reinforcement bars (rebar). They indicate the location, size, and spacing of the rebar within the concrete.

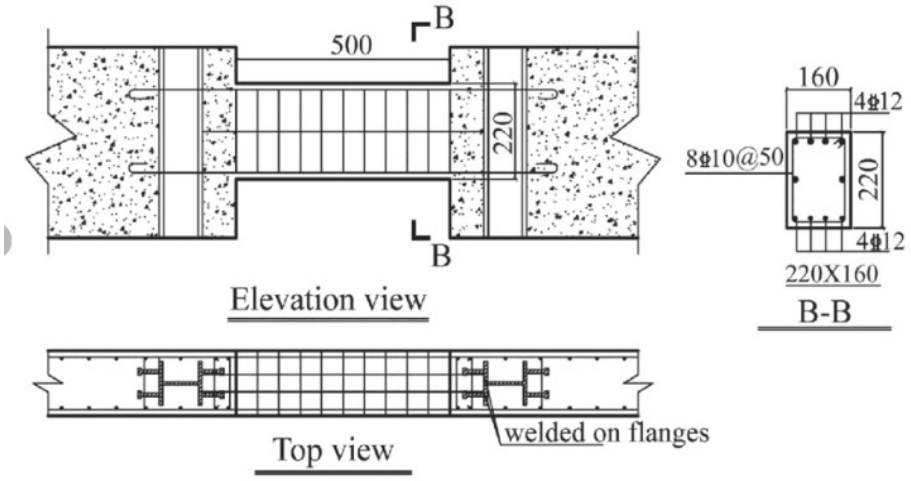
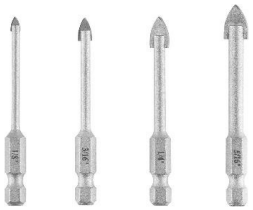


Fig. 4.1.6 Detailed reinforcement layout

3. Detailing: Detailed sketches can illustrate specific construction details, such as corners, joints, and openings, ensuring that masons follow the design and structural requirements accurately.

Tool	Image	Use of tool
Tile Scribe		A tile scribe is a tool used to put marking (scribe) on the tile surface so that tile can be broken along the scribe line.
Tile Cutter		Tile cutter helps in cutting large number of tiles along straight lines.
Tile Nippers		Tile nipper is a hand held tool which is used to cut/nip small piece of tile of irregular shape.

Tile Hand Saw		A tile saw is used to cut the tiles in various shapes (specifically along straight lines).
Tile Drill		These are special Carbide-tipped bits used for drilling on tile, mirror & glass.
Tile File		Tile file is used to smoothen rough edges of the tiles and to shape tiles.
Profile Gauge		A profile gauge is used to transfer irregular/ curved shapes on the tiles.
Notched spreader		Notched spreader is used to spread the adhesive over the wall or floor before placing the tile. Notched spreader is mainly used for small scale work.
Tile Trowel		Tile trowel is used to spread adhesive over the wall or floor before placing the tiles. Tile trowel is mainly used for large scale tiling work.

Grouting Spreader		Grout spreader is used to spread grout in the gaps/ space between the tiles.
Grout scraper		Grout scraper is used to remove old/ unwanted grout from the tile joint.
Grout Float		A grout float looks like as trowel but features a rubber base rather than a metal one. By using this tool, you can quickly and easily pick up grout and apply it to a tiled surface.
Pointing Trowel		Pointing trowel is used to fill grout between joints of bricks, stones etc.
Tile Removing Chisel		Tile removing chisel is used to remove tile from the walls or floors in a quick & easy manner with minimum damage.
Spirit level		It is used to check the level of tiled floor and wall surface.

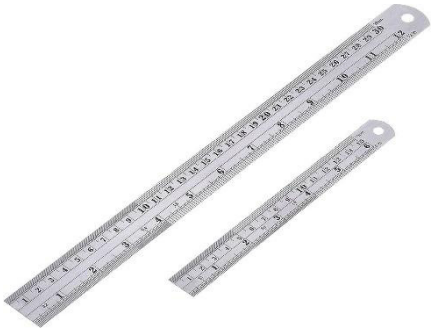
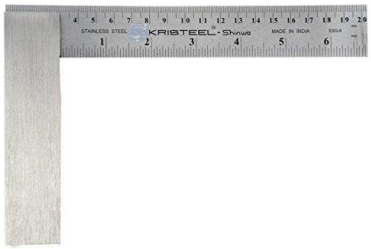
Plumb bob		Plumb bob is used to check the verticality of the wall.
Steel rule		It is used to draw /scribe a straight line. Also used to check accuracy of a flat surfaces. Scale for setting dividers and other marking tools.
Tape rule		For the measurement and marking of tiles tape rule is used.
Engineers square		When marking out lines at right-angles to the edge of work. It helps to setting up or testing work for square.

Table 4.1.1 Tools used in Tiling and Stone Laying Work

4.1.4 Types of tiles

For residential and commercial applications there are many types of tiles being used. Tiles help in choosing cost- effective and environment-friendly flooring choices. Tiles are created from natural clay and often from other (recycled) materials.

Tile Name and Description	Image
1. Ceramic Tile: This tile is commonly used in the offices, stores and homes. There are two types of ceramic tile: • Unglazed tiles, are made from clay and then heated. • Glazed Ceramic tiles: These have a protective coating on them and are available in varied colors which are created through the glazing process.	
2. Quarry (Unglazed) Tile: Quarry tile is unglazed ceramic tile. • Low cost & used for industrial, residential and commercial tiling applications. • Durable and less prone to scratches and chipping. • For colder region, freeze-resistant grades of quarry tiles are used • Used in kitchens and pathways.	
3. **Porcelain Tile:** It is a type of ceramic tile manufactured by heating clay at a much higher temperature. • Relatively thicker and damp proof. • Stain-resistant as these are less permeable to liquid or air. • The cost is high. • Longer durability due to its high density & hardness.	
4. Mosaic Tile: These can be made of ceramic, glass, natural stones etc. • Used to create a variety of designs. • Smaller in size and used to create variety of patterns. • For quick installation and even spacing, these are also available as paper mounted or mesh mounted.	

5. Marble Tile: Marble tile is made from natural stone. • Used to create a luxurious and unique look. • Have a lot of color variation and they are made from natural stone. • Porous and need to be sealed.	
6. Vitrified Tiles: These are manufactured using white clay that is heated over high temperatures. These tiles are solid and non-permeable. • Used in floors of homes & offices due to their mirror finish look. • Scratch resistant, • Resistance to acids, • Better mechanical strength (mor), resistance to staining, alkalies and chemicals compared to marble or natural granite.	
7. Terracotta Tiles: These tiles are made up of fired clay and used for indoors or outdoors. • In comparison to other tiles, these are soft and porous and need to be sealed when being used indoors. • Since these tiles retain moisture in the open air, these are ideally left uncoated. If these tile are coated, white salts are collected under the sealer.	

4.1.5 Cutting of tile

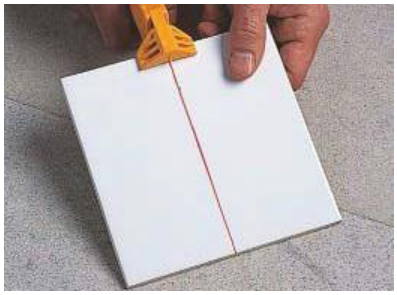
Manual cutter or electrical wet saw cutter is used for cutting of tiles.

Using manual cutter for cutting tiles

It is not always easy to cut tiles using tile scribe. Therefore, it is recommended that it can be used in combination with a tile snapper. This ensures that tiles are cut with application of little pressure only. Tile snapper cuts tiles using following steps:

Step 1

First, mark the tile you want to cut in the normal way. Then, using a steel rule, run the cutting wheel of the tool along the line, pressing down firmly and to score the glaze.



Step 2

Place the tile between the jaws of the tool and align the scribe line with the centre mark. The tile will break into two parts along the scribe line, when the ends of the tiles are pressed firmly.

How to make curved cuts in wall tiles

The simplest ways to make curved cuts in wall tiles is by using tile saw. The tile saw consists of a round blade which helps to change direction easily.

Step 1

Take a piece of paper or card as per the tile size and cut it to the shape required. Then lay it over the tile and mark the shape on the face of the tile.

Step 2

Clamp your tile securely and cut along the line with a tile saw. Check the cut profile of the tile and make any adjustments with a tile file.

How to use a tile-cutting machine

Tile cutting machine is a hard-wearing lever-action tool having a snapper, and a strong bed which supports the tile. Some machines also have a removable gauge for measuring the tiles, and even make an allowance for a grout gap and tapered cut. Tile-cutting machines are simple to use and cost effective too.

Step 1

Firstly, select the tile you want to cut and carry out marking of the tile. Then put it into the machine, lining up the mark with the tool's guide. In order to bring the scorer into contact with the tile lower the handle, then press down and push the handle forward.

Step 2

Fit the tile into the slide of the handle, carefully aligning the scored mark with the guide. Then lower the handle until the snapper touch the underneath of the tile.

Step 3

To break the tile along the cutting line, press down firmly on the handle.

Cutting tiles by using wet saw

To reduce the risk of breaking of tiles when they are being cut, it is advisable to saw 3/4th of the length of the tile on one side and then rotating the tile around and cutting the remaining length.

Step 1: Aligning tile on the table

Tile should be placed in such a way that when the layout line is at the blade, the widest part of the tile should be between the blade and the fence. Hands should be kept away from the blade during the cutting.

Always wear a pair of safety glasses and back the tile away from the blade prior to turning on the saw.

To check how to position the tile, try setting it up in different positions and use the one that supports the largest section of tile on the table during the cut.

Step 2: Cutting tile

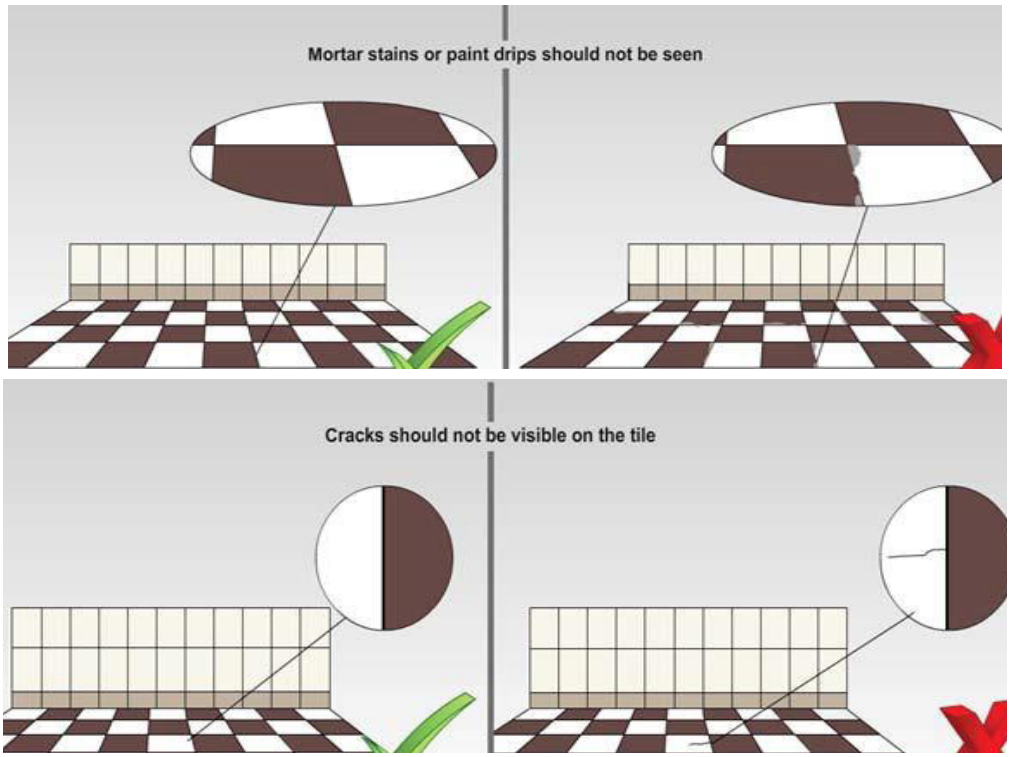
Use both hands for holding the tile, and then feed it along the fence and into the blade.

Always put hands away from the blade.

Push the tile piece between the blade and fence till the time tile completely clears the blade.

Tips

- For marble tiles usually 0.16 to 0.32 cm spacers are recommended.
- To ensure proper levelling of floor, use the longest level.
- If the floor slope is more than 1/16 of an inch (0.16 cm) for every 3 feet (0.9 m), then a sub-floor needs to be laid.
- Marble cancrack or chip easily so it is advisable to lay it flat.



4.1.6 Surface preparation

Surface preparation is carried out prior to fixing of the tiles. For this the base concrete should be spotless, dry and free of dirt, oil, dust, mortar spatter and development of form release.

Methods of surface preparation:

1. **Broom Cleaning -** Brooming, air blast or vacuum cleaning is used to remove all surface dirt and other contaminants.

2. **High Pressure Water Blasting -**To remove mortar, dirt, eroded and weak concrete, loose concrete and chemical contamination a water blasting at 3500-4500 psi can be used. Water blasting will not remove oil, laitance, grease or sound old coatings. Although water blasting is dust free, it requires good drainage for disposal of large volume of water.

3. **Acid Etching -** Acid etching is used to dissolve the weak surface layer known as laitance thereby opening the pores, allowing penetration of the sealer coat. A solution of muriatic acid is usually used in acid etching. The type of

concrete mix and finishing of given concrete will decide the required strength of acid which varies from 2% to 20%. The acid will cause bubbling of the solution as it etches the surface concrete. Scrub and rinse the dissolved salts after the reaction of acid stops. Repeat the process if required. If the etching action was effective, then the surface will feel like fine sandpaper.

4. **Sandblasting -** It is the most effective surface preparation method. Here the concrete is light blasted with fine silica sand. The objective of sandblasting is same as acid etching. All form like weak concrete, release agents, dirt, laitance and contamination can be removed with sandblasting. It is more effective on walls and ceilings. However, the only drawback is that It is dust producing and expensive. Sandblasting can't be done in areas containing machinery and equipment or in areas where traffic is heavy and close. Sandblasting is very effective for removing unsound or unwanted old coatings from concrete or masonry surfaces.

4.1.7 Hacking RCC Surface

The process of chiseling or indenting the smooth concrete surface to make it rough, so that the required bond strength can be achieved with all the types of plasterworks or tile work is called hacking.

Importance of Hacking:

Hacking RCC surfaces is an essential step in preparing them for tiling. It helps to ensure a strong bond between the tiles and the surface, which is crucial for the long-term durability of the installation. The key importance of hacking RCC surfaces includes:

- **Enhanced Adhesion:** By roughening the surface, hacking increases the contact area and provides a better grip for the adhesive or mortar used to attach the tiles.

- **Preventing Delamination:** Proper hacking minimizes the risk of tiles delaminating or coming loose over time, which can lead to costly repairs and maintenance.
- **Improved Flatness:** Hacking can also help level out minor irregularities or imperfections in the RCC surface, creating a more even and aesthetically pleasing tile installation.

Process:

- **Surface Preparation: E**nsure that the RCC surface is clean, dry, and free from dust, debris, or any loose material. Remove any existing tiles or adhesive residues if necessary.
- **Safety Measures:** Wear appropriate personal protective equipment (PPE) such as safety goggles and a dust mask to protect yourself from dust and debris generated during the hacking process.
- **Hacking Tools:** Use suitable tools for hacking, such as a hacking machine, chipping hammer, or angle grinder equipped with a diamond-tipped hacking blade or abrasive disk.
- **Hacking:** Start hacking the RCC surface systematically, creating a rough texture across the entire area where tiles will be laid. Make sure to maintain a consistent texture throughout to ensure uniform adhesion.
- **Cleaning:** After hacking, remove all dust and debris from the surface. A vacuum cleaner or a stiff brush can be used to clean the area thoroughly.

4.1.8 Preparation of cement mortar

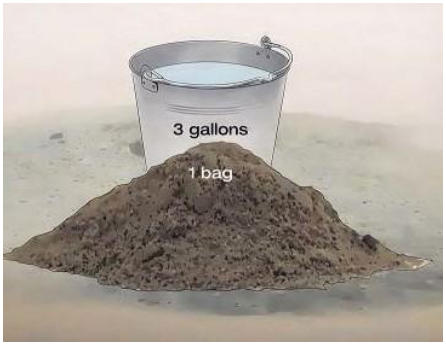
For fixing tiles, sand cement mortar is used.

For preparation of cement mortar following Ingredients are required:

1. Cement;
2. Sand;
3. Water;
4. Bonding agent

Preparing by using barrel cement mixer

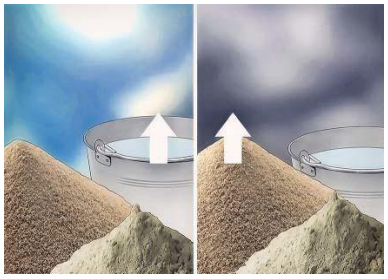
1. **Mix sand & cement.** For mortar mix, you have to mix ingredients in 1:4 ratio. Where in 1 part of cement & 4 part of sand used.



2. **Use the right amount of water.** Add specific amount of clean water to the mortar mix and achieve the consistency of the mortar mix as per requirement. The amount of water added to the mix varies as per the climatic conditions, wetness of sand the variety of blend being utilized.
3. Ambient conditions like temperature and humidity should be considered for making mix as thery effects the workability of mix·
4. Drier mix will not be workable whereas wetter

5. **Use the good quality of sand and cement.** Cement bags free from lumps & good in quality/ grade should be used for mortar mix. Course – grade of sand should be used for the mix. sand should be free from dust & sand used for the mix should be as dry as possible for use.
6. Sand used for mix should be crushed sand or natural sand. It should be free from clay, silt and fine dust.
7. Each brand of tiles may recommend slightly different mixes. But in general, a mix of 1:4 is usually appropriate and effective.

8. **Using additive.** Additive are added to increase the bonding strength of the tile work. Example: mastic, epoxy etc.



9. **Precautions for use of additive in mortar:** Adding additive to your mixture will make the mortar set more quickly. Therefore, either work quickly when using additive in mix. The quantity of additive to be added as per the specification & instruction only.

10. **Make mix in accordance with ambient conditions:** The mortar will behave differently at different temperature. Quantity of water will decide the effectiveness of mix in cold, humid or wet weather. Prior to application attain the right consistency of the mix.

11. **Obtaining right consistency of mix:** Mortar mixed to the right consistency should be able to hold onto a trowel held at right angle. The mix should also be wet enough to work easily and pour in and out of buckets.

12. **Mix in a cold temperature:** If weather is cold or nearly freezing then try to add slightly more hot/ warm water to increase the rate of hydration reaction of cement. Always ensure that the finished product must be prevented from freezing until set.

13. **Wash the mixer, wheelbarrow and/or buckets.** Wash all the mixing equipment before adding dry ingredients, so that mortar will slide easily and reduce wastage. Pour about half the water necessary for the batch into the mixer or tray, and pour some water into the wheelbarrows or buckets.

14. **Add the dry ingredients and start mixing.** First step of working with power mixer is to turn it on and to get the blades churning and then gently adding dry ingredients. Take special care not to dump them and splatter the water out, or to lose too much of the cement by clouding it.

15. Prepare the cement mixer and bucket for screed powder mixing.

16. Place the Screed premix powder in the cement mixer.

17. Add water to the mixer as per recommended by screed powder manufacturer.



18. While using hand held electric mixer, mix it till a mortar of flow able consistency is obtained.


4.1.9 Laying Tile/Stone

Floor Tiling		
S. No.	Method statement	Images
1	Place all tools & tackles near the working location.	
2	Chisel the working area as per re-quirement.	

3	Clean the working area prior to lay the tiles.	
4	Mark the top level in all round the permanent surfaces (400 mm high) & mark a line over it.	
5	Fix the button mark on the ridge point of the floor area (parallel edge slope 10 mm).	
6	Check button mark level with respect to reference line & align it using rubber mallet & straight edge.	

7	Fix the button mark on the valley point of the floor area (parallel edge slope 20 mm).	
8	Fix the button mark on other location (mid edges) of floor area & align using rubber mallet & spirit level.	
9	Check level of button mark using hilti tool.	
10	Spread the mortar in required thickness and ensure the top level is levelled with the help of straight edge and sprit level.	

11	Place levelling (hilti) tool & mark center line along both axis.	
12	Place spacer at the center of the marking.	
13	Apply adhesive & place the tile.	
14	Use rubber mallet to place the tile exactly.	

15	Place nearby tiles in each quadrant using spacer & make a square.	
16	Now place the tiles on the periphery of the square. (Work from inward to outward direction).	
17	Assess final dimension of the tiled floor.	
18	Assess slope of the tiled floor.	
19	Assess level of the tiled floor using tool.	

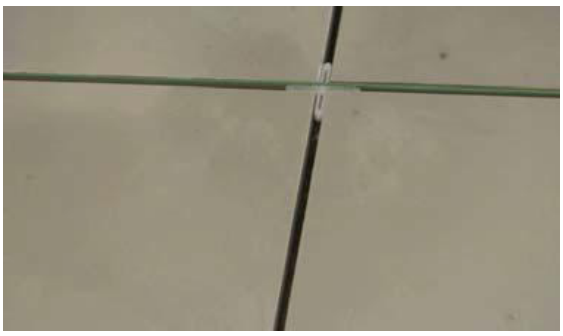
20	Assess tile undulation.	
21	Assess linear line of the tiled floor using line thread.	

Table 4.1.3 Laying of tile/stone

4.1.10 Laying and fixing of tiles/stones on walls/vertical surfaces

S No.	Method statement	Images
1	Clean & chip the wall and wait for it to air-dry completely.	
2	Measure the dimension & mark the level on the wall as per reference.	

3	Install a supporting strip board with the help of tile tracker, below the second last bottom tile course.	
4	Check the level of the supporting board with the help of measuring tape.	
5	Apply adhesive over the tile & place it with reference to button mark.	
6	Now align and placed tile using rubber mallet & plumb bob.	
7	Now place the center line tile & align it with reference to other two tiles.	

8	Now follow the same procedure & place the other tile.	
9	Follow the progressive assessment & check the alignment & verticality of tile work.	
10	Place the remaining tiles on the above courses by following the same pre-set pattern & progressive assessment.	
11	Make a scaffolding arrangement & then place the tile above lintel level.	
12	Check the level & verticality of the tile using spirit level & plumb bob.	

13	Place the other tiles using spacer & align them.	
14	Now place the cut tile & align it.	
15	After completion of above courses re-move the supporting strip board/ tile tracker.	
16	Now start placing cut tiles at the bottom most layer of the wall using spacers.	
17	Check the alignment of the wall using spirit level.	

18	Now place the other bottom most layer tiles & align simultaneously.	
19	Assess the dimension of the wall as per assessment standard.	
20	Assess the verticality of the wall as per assessment standard	
21	Assess the alignment of the wall as per assessment standard.	
22	Assess level of the wall using water tube level.	

23	Use a grout float to spread grout over the entire surface of the wall & fill the gaps.	

Table 4.1.4 Laying and fixing of tiles on walls/vertical surfaces

4.1.11 Tolerance Limit in Tile Laying

Tolerance limits in tile laying refer to the acceptable range of variations or deviations from the specified standards during the installation of tiles. The specific tolerance limits may vary depending on factors such as the type of tiles, the location of installation (e.g., floors, walls, or ceilings), and local building codes.

Some common tolerance limits in tile laying:

Surface Flatness: Typically measured with a straightedge or level.

- For floors: Flatness tolerances often range from 1/8 inch in 10 feet (3 mm in 3 meters) to 1/4 inch in 10 feet (6 mm in 3 meters). More stringent requirements may apply for specialized applications.
- For walls: The vertical alignment should be plumb, with variations generally limited to 1/16 inch in 24 inches (1.5 mm in 600 mm).

Tile Alignment and Spacing:

- Tiles should be laid in alignment with each other, and joints should be straight and evenly spaced.
- The allowable variation for joint width is typically within 1/16 to 1/8 inch (1.5 to 3 mm), depending on the design and tile type.
- Tile edges should align within a tolerance of approximately 1/32 to 1/16 inch (0.8 to 1.5 mm).

Tile Lippage: Lippage refers to the unevenness between adjacent tiles.

- Industry standards often specify lippage tolerances ranging from 1/32 to 1/16 inch (0.8 to 1.5 mm) for tiles with a rectified edge (precisely cut) and 1/16 to 1/8 inch (1.5 to 3 mm) for non-rectified tiles.

Tile Size and Shape:

- Tiles should conform to the manufacturer's stated size specifications.
- Variations in tile size, such as warping or bowing, are generally allowed within a small tolerance range.

Tile Positioning:

- Tiles should be set in a way that aligns with the layout plan and architectural specifications.
- Tolerance for tile positioning may vary but is often within 1/16 inch (1.5 mm) for precise alignment.

Grout Joint Consistency:

- Grout joints should maintain a consistent width, typically within the specified range (1/16 to 1/8 inch or 1.5 to 3 mm).
- Variations in grout joint width should be minimal to maintain an even appearance.

Notes

Scan the QR code to watch the video

https://youtu.be/HaTprFLxWoQ

Types of Tiles

https://youtu.be/gKNRXdDc514

Tools used in Tiling Work

Unit 4.2 Assist in Concreting

Unit Objectives

By the end of this unit, participants will be able to:

- List the basic properties of concrete including weight, slump, etc.
- Explain how to assess if concrete has been mixed as per the appropriate ratio for site requirements.
- Elucidate how to select and use basic tools for tiling, stone laying and concreting, such as measuring tape/ruler, hammer, mallet, spade, bolster chisel, wedges, power wet saws, tile scribes or hand-held tile cutters, screeds, floats, shovels, rakes, vibrators etc.
- Describe the process of batching and mixing materials for concreting.
- Explain how to screed the concrete to correct levels.
- Explain the appropriate technique for pouring concrete in the form of layers as per the construction site requirements.
- Explain how to ensure proper curing.

4.2.1 Concreting

Concreting is a fundamental construction process that involves blending cement, water, and aggregates like sand, gravel, or crushed stone to produce a robust and resilient building material called concrete. This versatile material is widely used in construction due to its durability and strength.

Tools used in Concreting

Tool	Image
Measuring Tape/Ruler: Measuring tapes or rulers are used to precisely measure and mark dimensions on formwork, concrete slabs, and other construction elements. They ensure accurate placement and alignment of concrete forms and structures.	
Hammer: Hammers are employed to secure formwork or molds in place before pouring concrete. They are also used to remove formwork once the concrete has set. Hammers help with the assembly and disassembly of temporary structures.	
Mallet: A mallet is a rubber or wooden-headed tool used for tapping and settling formwork, molds, or concrete blocks into their correct positions. It allows for adjustments without damaging the materials.	

Spade: Spades are used for mixing smaller batches of concrete and for moving materials like sand, gravel, or crushed stone. They help ensure uniform distribution of aggregates during mixing.	
Bolster Chisel: Bolster chisels are used to cut or shape concrete or masonry blocks when necessary. They are especially useful for creating clean edges or openings in concrete.	
Wedges: Wedges are employed to secure formwork or molds in position during the concrete pouring process. They help maintain the desired shape and alignment of the concrete structure.	
Screeds: Screeds are straightedges, often made of wood or metal, used to level and flatten freshly poured concrete. They are drawn across the surface to remove excess material and create a smooth, even finish.	
Floats: Floats are tools with flat surfaces (wooden, magnesium, or steel) used to smooth and finish the surface of the concrete. They help remove imperfections and create a uniform texture on the concrete surface.	
Shovels: Shovels are essential for transporting and distributing concrete from the mixing point to the pouring area. They are used to move larger quantities of concrete efficiently.	

Rakes: Rakes assist in spreading and leveling concrete over a larger area. They help achieve uniform thickness and ensure proper compaction of the concrete.	
Vibrators: Concrete vibrators are used to consolidate or compact freshly poured concrete. They eliminate air bubbles and ensure the concrete is evenly distributed, improving its strength and durability. Vibrators are particularly useful for large or deep concrete pours.	
Concrete Mixers: Concrete mixers are machines used to efficiently mix cement, water, and aggregates (such as sand, gravel, or crushed stone) to create a uniform and consistent concrete mixture.	

4.2.2 Properties of Concrete

Concrete is a composite substance comprising binding materials like lime or cement, aggregates such as sand, gravel, and stone, admixtures, and water in specific ratios. The characteristics of concrete are intricately linked to the mixing proportions.

Numerous factors impact concrete properties, with the most critical being the composition percentages of cement, sand, aggregates, and water in the mixture.

Properties of Concrete:

1. **Weight**: Concrete is a heavy material with a typical density ranging from 2,300 to 2,500 kg/m³ (140 to 156 pounds per cubic foot). Its weight varies depending on its composition and thickness, making it an essential consideration for structural design and transportation.
2. **Slump**: Slump measures the consistency and workability of freshly mixed concrete. It is assessed using the slump test, which involves filling a mold with concrete and measuring the difference in height between the top of the mold and the settled concrete surface. Slump values range from zero (non-slump) to high (approximately 4 to 6 inches), indicating the degree of flowability.

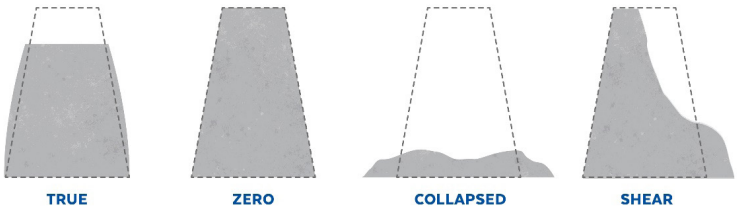


Fig. 4.2.1 Slump Test Result

3. **Strength**: Concrete's strength is its ability to withstand axial loads, such as compression. It is typically measured in megapascals (MPa) or pounds per square inch (psi). Common strength grades range from 20 MPa (2,900 psi) to 70 MPa (10,000 psi) for various structural applications.
4. **Setting Time**: Concrete has an initial and final setting time, which indicate when it begins to harden and becomes firm. The setting times can be adjusted using different types of cement and additives, affecting the workability and curing process.

STANDARD SPECIFICATION

Type/Name Of Cement	Referenced Indian Stanadard	Initial Setting Time, mints (min.)	Final Setting Time, mints (max.)
OPC(33)	IS:269	30	600
OPC(43)	IS:8112	30	600
OPC(53)	IS:12269	30	600
SRC	IS:12330	30	600
PPC	IS:1489,P1	30	600
RHPC	IS:8041	30	600
PSC	IS:455	30	600
High alumina	IS:6452	30	600
Super sulphated	IS:6909	30	600
Low heat	IS:12600	60	600
Masonry cement	IS:3466	90	1440
IRS-T-40	Railway	60	600

5. **Durability**: Concrete's resistance to environmental factors like moisture, chemicals, and freeze-thaw cycles is crucial for its long-term performance. Proper mix design and curing methods are essential to enhance its durability.

4.2.3 Batching of Concrete

Batching involves measuring concrete mix components, either by volume or mass, and introducing them into the mixture. Traditionally, volume batching was common, but most specifications now require mass batching for greater accuracy.

The acceptable percentage of measurement accuracy for concrete materials is as follows:

Weigh Batching

Volume Batching

Fig. 4.2.3 Batching of Concrete

Steps in Batching Concrete:

1. Measuring Proportions: Determine mix proportions based on project specifications and mix design.
2. Batching Equipment: Utilize automated batching plants with storage bins for materials and dispensers for admixtures.
3. Aggregates Batching: Batch aggregates using gates in the plant's bins according to mix design.
4. Cement Batching: Dispense the correct amount of cement as per the mix design.
5. Water Batching: Measure and add water accurately for desired consistency and hydration.
6. Admixture Batching (if needed): Add admixtures for improved properties if specified.
7. Mixing: Combine all ingredients in a mixer for a homogeneous mixture.
8. Transportation: Load mixed concrete into transit mixers for prompt delivery.
9. Placement and Use: Place concrete in its final location with proper techniques.
10. Curing: Ensure proper curing for hydration and strength development.
11. Quality Control and Testing: Conduct tests to maintain quality standards.

1. Cement:

When the cement quantity to be batched is over 30% of the scale capacity, the measurement accuracy should be within 1% of the required mass.

For smaller batches (less than 30% of scale capacity), the measurement accuracy should be within 4% of the required quantity.

2. Aggregates:

If the aggregate measurement exceeds 30% of the scale capacity, the measuring accuracy should be within 1%.

For smaller aggregate batches (less than 30% of scale capacity), the measuring accuracy should be within less than 3%.

3. Water:

Water is measured by volume, with 1 liter equal to 1 kg. For water, the measuring accuracy should be within 1%.

4. **Admixtures:**

   Mineral admixtures should have the same accuracy as cement since they are used as a partial replacement for cement.

   Chemical admixtures should have the same accuracy as water because they are typically liquid or added to water.

   Mineral admixtures are treated like cement due to their role as cement replacements, while chemical admixtures are akin to water in terms of accuracy since they are usually in liquid form or mixed with water.

4.2.4 Mixing of Concrete

The mixing process involves either rotating or stirring to achieve the goal of coating all aggregate particles with cement paste and blending all concrete ingredients into a consistent mass. This uniformity must be maintained throughout the discharge from the mixer.

Batch Mixer: The common mixer type is a batch mixer, meaning that one concrete batch is mixed and discharged before adding more materials to the mixer. There are four types of batch mixers.

Tilting Drum Mixer:

In a tilting drum mixer, the mixing drum is tilted to facilitate discharge. The drum typically has a conical or bowl shape with internal vanes. Discharge is rapid and ensures a uniform mix, making these mixers suitable for low workability mixes and those with large-sized aggregates.

Fig. 4.2.4 Tilting Drum Mixer

Non-Tilting Drum Mixer:

A non-tilting drum mixer maintains a horizontal axis at all times. Discharge is achieved by inserting a chute into the drum or by reversing the drum's rotation direction. Some segregation may occur due to the slower discharge rate.

Fig. 4.2.5 Non-Tilting Drum Mixer

Pan Type Mixer:

A pan type mixer is a forced-action mixer that differs from drum mixers, which rely on the free fall of concrete inside the drum. It consists of a circular pan rotating about its axis with one or two star-shaped paddles rotating about the vertical axis of the pan.

Fig. 4.2.6 Pan Type Mixer

Reversing Drum Mixer:

Reversing drum mixers are like regular mixers, but they can spin in two directions. The drum has two openings: one for adding materials and the other for pouring out the mix. It rotates one way for mixing and the opposite way for discharging. Special blades are used for each purpose. These mixers are ideal for handling dry concrete mixes.

Fig. 4.2.7 Reversing Drum Mixer

4.2.5 Uniformity of Mixing

In every mixer, it's crucial to ensure that there's enough blending of materials throughout the chamber to create a uniform concrete mixture. The effectiveness of the mixer can be gauged by examining the variations in samples taken from the mix. ASTM guidelines recommend taking samples from approximately 1/6 and 5/6 points along the batch discharge, with the requirement that the differences in properties between these two samples should not exceed the following limits:

- Concrete density: 1 lb/ft^3
- Air content: 1%
- Slump: 1" when the average is below 4"; 1.5" when the average is between 4 and 6"
- Percentage of aggregate retained on a No. 4 sieve: 6%
- Compressive strength (7-day test, 3 cylinders): 7.5%

4.2.6 Concrete Pouring

Pouring concrete in layers is a common technique in construction, especially for large or deep concrete placements. This method ensures that each layer of concrete is properly compacted and consolidated before the next layer is added.

Here's an explanation of the appropriate technique for pouring concrete in layers as per construction site requirements:

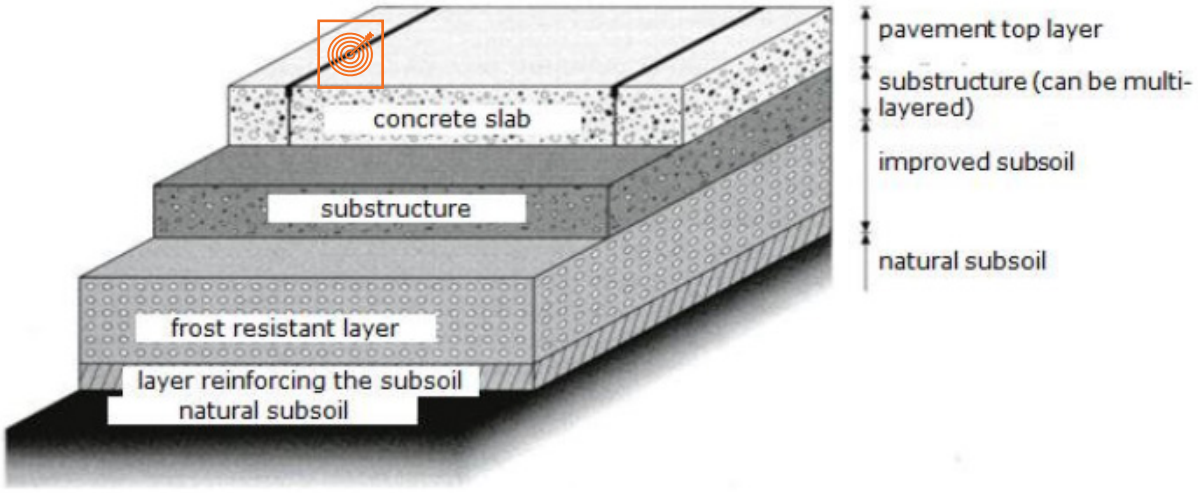


Fig. 4.2.8 Layers of Concrete

1. Prepare Subgrade: Ensure the subgrade is well-prepared and compacted.
2. Set Up Formwork: Erect strong and properly aligned formwork.
3. Place Reinforcement: Position reinforcement if required.
4. Apply Bonding Agent: Apply bonding agent for layer adhesion.
5. Pour First Layer: Spread and consolidate the first concrete layer.
6. Consolidate and Screed: Use a vibrator or screed for a smooth surface.
7. Check Level and Thickness: Verify thickness and level.
8. Wait for Initial Set: Allow partial set without full hardening.
9. Pour Next Layer: Repeat steps for subsequent layers.
10. Finish Top Layer: Finish the top layer as needed.
11. Cure the Concrete: Apply curing methods for hydration.
12. Remove Formwork: Carefully remove formwork.
13. Inspect and Test: Ensure quality and perform tests.
14. Protect the Concrete: Protect from damage until specified strength is achieved

4.2.7 Screeding

1. **Mix the Screed Material:**

   Prepare a screed mix, which is typically a cementitious mortar mix with a 1:3 ratio of cement to sand. Follow the manufacturer's instructions for mixing, adding water gradually to achieve the desired consistency.

2. **Apply Bonding Agent (if needed):**

   Depending on the project specifications, you may need to apply a bonding agent to the concrete surface before applying the screed. This enhances the adhesion between the concrete and the screed layer.

3. **Apply the Screed:**

   Begin applying the screed mix onto the concrete surface, starting from a reference point or edge. Use a trowel, screed board, or a straightedge to spread the screed mix evenly and at the desired thickness.

4. **Screed Leveling:**

   As you spread the screed mix, move the screed board or straightedge across the surface in a back-and-forth motion. This levels the screed to the desired height, filling in any low spots and removing excess material.

Fig. 4.2.9 Concrete Screeding

5. **Check for Levelness:**

   Use a spirit level or a long, straightedge to check the levelness of the screeded surface. Adjust as needed to achieve a flat and even surface. Pay close attention to any areas that will receive tiles.

6. **Allow to Cure:**

   Let the screed layer cure for the recommended time, typically at least 24 hours, or as per the manufacturer's guidelines. Maintain proper curing conditions during this period to prevent cracking and ensure proper strength development.

4.2.8 Concrete Curing

1. **Start Curing Immediately:** Begin promptly after concrete finishing.
2. **Keep Concrete Moist**: Utilize methods like ponding, wet coverings, continuous spraying, or wet fabrics to maintain moisture for at least 7 days.

Ponding: Create shallow ponds of water on the concrete surface and keep them filled.

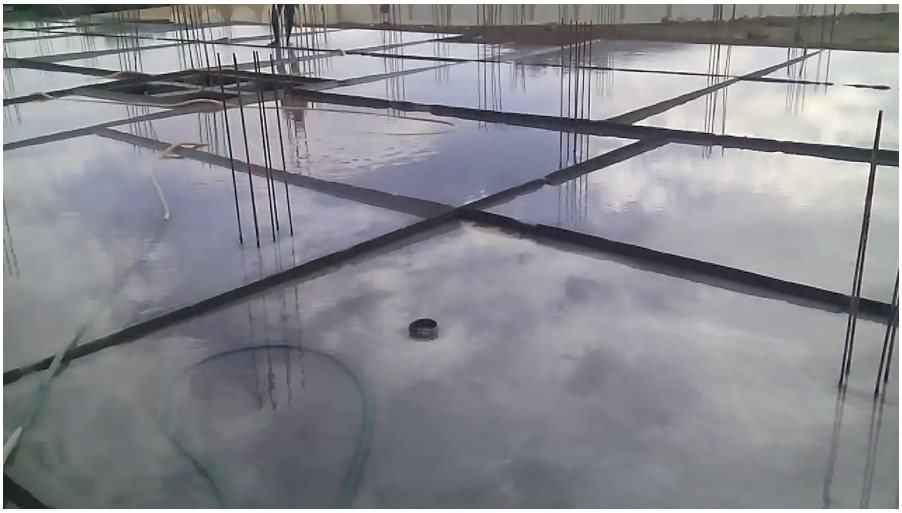


Fig. 4.2.9 Ponding

Wet Coverings: Cover the concrete with wet burlap, wet curing blankets, or wet sand.

Fig. 4.2.10 Wet Covering

Continuous Spraying: Use a fine water mist or sprinkler system to keep the surface wet.

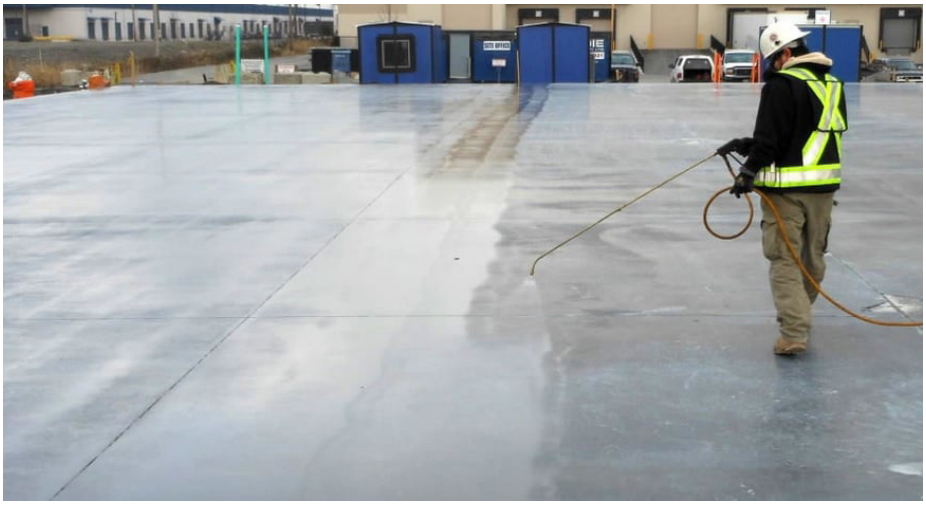


Fig. 4.2.11 Continuous Spraying

Wet Mats or Fabrics: Lay wet mats or fabrics on the concrete and keep them wet.

Fig. 4.2.11 Curing by Wet Fabrics

3. **Avoid Rapid Drying:** Prevent drying due to wind, high temperatures, or direct sunlight.
4. **Maintain Constant Temperature:** Keep the concrete at a consistent temperature during curing, using insulating blankets if needed.
5. **Extend Curing Duration:** Extend curing for high-strength concrete or challenging conditions.
6. **Use Curing Compounds**: Apply compounds to retain moisture, especially in impractical situations.
7. **Monitor Moisture Levels:** Regularly check moisture to ensure adequacy.
8. **Repair Cracks or Damage:** Promptly fix any cracks or damage to maintain moisture retention.

Notes

Scan the QR code to watch the video

https://youtu.be/r--ZbW03-3E

Concreting Tools

Unit 4.3 Assist in Brick Soling and PCC flooring

Unit Objectives

By the end of this unit, participants will be able to:

- Elucidate different types of PCC flooring works.
- Explain the uses of different baton strips.
- Describe the process of brick soling and PCC flooring.

4.3.1 PCC Flooring

PCC, or Plain Cement Concrete, is a mixture of cement, fine or coarse aggregates, and water, without steel reinforcement. Plain cement concrete is laid on the soil surface to avoid direct contact of reinforcement with soil and water.

Fig. 4.3.1 PCC Flooring

4.3.2 Grades of PCC Flooring

The grades of PCC (Plain Cement Concrete) flooring are determined based on their compressive strength, which is tested after 28 days of curing. The “M” in the grade designation stands for “Mix,” and the number following it represents the compressive strength of the concrete mix in megapascals (MPa). These grades indicate the load-carrying capacity and durability of the concrete.

Detailed table describing some common grades of PCC flooring:

Grade	Compressive Strength (MPa)	Typical Applications
M5	5 MPa	Light-duty flooring in residential buildings, pathways, and garden walkways.
M7.5	7.5 MPa	Light to medium-duty flooring in residential buildings, patios, and low-traffic areas.
M10	10 MPa	Medium-duty flooring in commercial and industrial buildings, warehouse floors, and driveways.
M15	15 MPa	Heavy-duty flooring in industrial settings, loading docks, and areas with moderate vehicular traffic.
M20	20 MPa	Heavy-duty industrial floors, road pavements, and areas exposed to heavy loads and frequent traffic.
M25	25 MPa	High-strength concrete for industrial and commercial floors subjected to extremely heavy loads and abrasion.
M30	30 MPa	Specialized applications requiring very high strength, such as high-rise building foundations and bridges.

Table 4.3.1 Grades of PCC Flooring

4.3.3 Components of PCC Flooring

The main components of PCC (Plain Cement Concrete) flooring include:

1. Subgrade or Subbase: The foundation layer supporting the flooring.
2. Baton Strips: Used for leveling and guiding the concrete.
3. Concrete Mix: Composed of cement, sand, aggregates, and water.
4. Cement: The binding agent in the concrete.
5. Aggregates: Fine (sand) and coarse (crushed stone or gravel) materials.
6. Water: Necessary for cement hydration and curing.
7. Admixtures: Chemical additives to modify concrete properties.
8. Reinforcement (Optional): Adds strength, often with steel mesh or bars.
9. Control and Expansion Joints: Prevent cracking and control movement.
10. Finishing Materials: Tools for smoothing and enhancing the surface.
11. Coloring Agents (Optional): Used for decorative or colored finishes.

4.3.4 Baton Strips

Baton strips, also known as screed rails or screed battens, are used in construction for various purposes, primarily in the placement and leveling of concrete or screed.

Types of Baton Strips:

1. Wooden Baton Strips:

- Made from wood, such as pine or plywood.
- Commonly used for leveling surfaces and forming control joints in concrete flooring.
- Easy to work with and cut to size.

2. Metal Baton Strips:

- Typically constructed from materials like aluminum or steel.
- Known for their durability and moisture resistance.
- Used in construction projects requiring precise leveling and straight edges, such as large concrete slabs.

3. Plastic or PVC Baton Strips:

- Lightweight and resistant to moisture.
- Used in concrete work and tiling applications for creating level surfaces and defining edges.
- Suitable for wet environments.

4. Fiberboard or MDF Baton Strips:

- Made from compressed wood fibers.
- Often used as temporary formwork for concrete in non-structural applications.
- Easy to cut and dispose of after use.

5. Composite Baton Strips:

- Made from a combination of materials, such as wood fibers and polymers.
- Offer a balance between durability and cost-effectiveness.
- Used in various construction applications, including concrete placement and leveling.

6. Rubber Baton Strips:

- Flexible and capable of conforming to curved or irregular surfaces.
- Used in construction projects where surfaces need to be shaped or curved, such as creating curved concrete elements.
- Provide flexibility and versatility in shaping the final product.

4.3.5 PCC Flooring Process

Proportioning of Plain Cement Concrete:

- Determine the required mix proportion, commonly 1:2:4 or 1:3:6.
- Measure materials by weight or volume, avoiding compaction when measuring.

Mixing of Plain Cement Concrete: For small projects, mix the components manually.

- Ensure the mixing surface is clean and watertight.
- Mix sand and cement thoroughly, then add coarse aggregate and water gradually.
- Continue mixing until a consistent color and texture are achieved.

Fig. 4.3.2 Manual Mixing

Machine Mixing: For larger projects, use machine mixing.

Fig. 4.3.3 Machine Mixing

- Place dry coarse aggregate, fine aggregate, and cement in respective hoppers.
- Mix the dry materials in a drum, then gradually add the correct amount of water while the drum is in motion.
- Ensure the total water quantity is added within the specified time to achieve the desired water-cement ratio.

The quantity of water to be used for each mix of 50kg cement to give the required consistency shall be as follows:

- Not more than 34 lit – 1:3:6 mix
- Not more than 30 lit – 1:2:4 mix
- Not more than 27 lit – 1:1 ½:3 mix
- Not more than 25 lit – 1:1:2 mix.

Laying of Plain Cement Concrete:

Lay PCC in layers, each not exceeding 150mm in thickness.

Thoroughly vibrate the concrete using mechanical vibrators.

Use wooden tamping rods for hand compaction when needed to fill corners and ensure proper compaction.

Fig. 4.3.4 Laying PCC

Fig. 4.3.5 Finished PCC

Curing of Plain Cement Concrete:

Protect freshly laid concrete from rain and cover it with damp materials.

Start curing after concrete begins to harden (usually 1-2 hours after laying).

Continue curing for a minimum of 14 days to ensure strength and durability.

4.3.6 Soling

Soling involves the arrangement or manual placement of rubble stones or bricks in close proximity to one another. This is done to create a supportive and sturdy subbase for the foundation and footing, prior to the commencement of concrete work.

Based on the type of construction material used, these are of two types:

i. **Brick Soling**

ii. **Rubble Soling**

Brick Soling: Brick soling is a construction technique in which bricks are arranged in a specific pattern to create a stable subbase for various types of structures, such as buildings, roads, or pavements.

Fig. 4.3.6 Brick Soling

Rubble Soling: Rubble soling is a construction technique that involves the use of rough, irregularly shaped stones or rubble to create a sturdy subbase for various types of structures, such as foundations, roads, or pathways. This method is particularly useful in areas where suitable construction materials like bricks or concrete may be scarce or expensive.

Fig. 4.3.7 Rubble Soling

4.3.7 Brick Soling Process

Step 1: Surface Preparation and Compaction:

- Start by preparing the surface where brick soling will be installed. Remove any debris or loose soil.
- Use a hand rammer to compact the prepared surface. This helps create a solid foundation.
- Sprinkle water onto the surface to settle the soil and improve compaction.

Step 2: Brick Placement:

- Begin hand-packing the bricks onto the compacted surface. Ensure that the bricks are placed closely together so that they make contact with each other.
- Keep the frog mark (the depression or emblem on the brick) facing upwards. This helps maintain uniformity in the soling layer.

Step 3: Brick Bond Pattern:

- Arrange the bricks in rows, following an English bond pattern. In this pattern, the bricks in one row have their vertical joints aligned with the center of the bricks in the row above or below.
- Avoid placing joints in the same line to enhance the stability of the soling layer.
- Use any broken bricks at the edge of the soling area to ensure a neat finish.

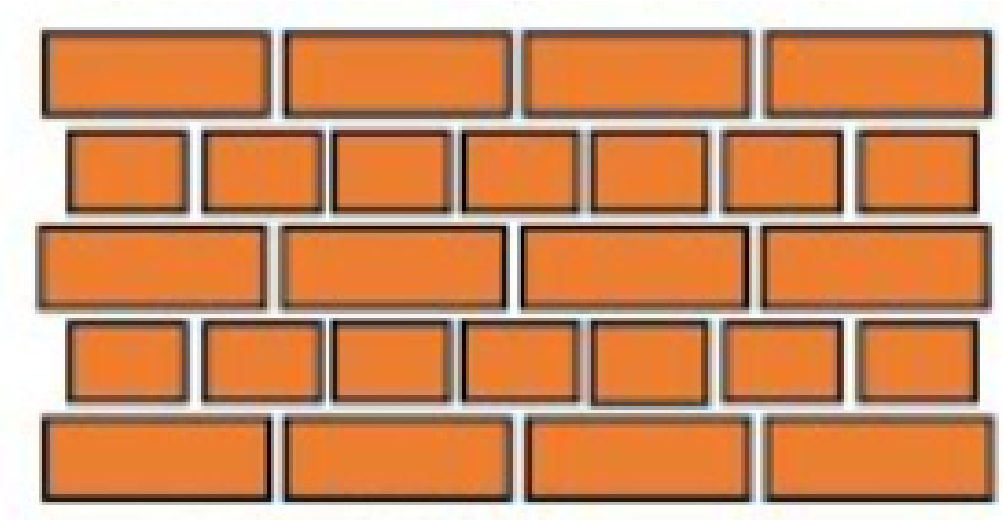


Fig. 4.3.8 Rubble Soling

Step 4: Filling Gaps with Sand:

- Fill the gaps or joints among the bricks with sand. Ensure that the sand has a minimum fineness modulus (FM) of 0.50.
- Use a brush to properly fill the joints with sand, ensuring it is evenly distributed. Do not use water to flush the sand into the gaps. (*The fineness modulus (FM) describes how fine or coarse something like sand is It is determined by adding up the percentages of the material that remains on various sieves in a sequence and then dividing this sum by 100. A high FM means the sand is more like small pebbles, while a low FM means it's like very fine powder.)*

Step 5: Surface Leveling Check:

Finally, inspect the finished surface to ensure it is leveled both longitudinally (along its length) and transversely (across its width). This step is crucial to provide a stable and even subbase for further construction.

Exercise

A. Fill in the blanks

(Hint: Hacking, Tolerance limits, Dry, Sandblasting, Baton strips)

1. _____ in tile laying define acceptable deviations from standards during tile installation.
2. _____ are used in the placement and leveling of concrete or screed.
3. _____ is a method for removing unsound or unwanted old coatings from concrete or masonry surfaces.
4. Reversing drum mixers are ideal for handling _____ concrete mixes.
5. The process of chiseling or indenting the smooth concrete surface to make it rough is called _____.

B. Short Answer Questions

1. List any five tools used in tiling works.
2. Describe the process of brick soling.
3. What do you understand by the term hacking in concreting?
4. Describe the process of batching and mixing materials for concreting.
5. List the different types of tiles.

Notes

Scan the QR code to watch the video

https://youtu.be/rZgJWUUSjCY

Calculate Number of Bricks Required for Brick Flat Soling

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

5. Assist in Brick/Block Work, Plastering Work, and fixing Doors and Windows

Unit 5.1 – Assist in Brick and Block Work

Unit 5.2 – Assist in Plastering Work

Unit 5.3 – Assist in Door and Windows Fixing

(CON/N0107)

Key Learning Outcomes

By the end of this module, participants will be able to:

- Explain the process of assisting in brick/block work.
- Explain the process of assisting in plastering.
- Elucidate ways to fix door and window frames.

Unit 5.1 Assist in Brick and Block Work

Unit Objectives

By the end of this unit, participants will be able to:

- Explain the basics of masonry, including brick and block work.
- Explain the use of relevant tools and equipment, such as measuring tape, trowel, mortar pan, hammer, bolster chisel, spade, rubber/wooden hammers, mallets, wedges, jointers, square, plumb bob, straight edge spirit level, water level tube, line thread, volume box, weighing balance, tile scribes or hand held tile cutters, screeds, floats, power wet saws, electric drills, anglers and grinders, vibrators, wheel barrow, hand operated concrete mixer, etc.
- Explain the use and setting of basic leveling tools, such as plum bob, spirit level, water level.
- Describe the process of transferring levels using basic levelling tools.
- Describe the techniques for cutting different types of bricks to required sizes.
- Describe the process of laying and fixing bricks/blocks in position with correct alignment.
- Explain different types of bonds in brickwork.
- State different mixtures of mortar required for brick/block works.
- Explain the importance of hacking RCC surfaces.
- Describe the process of marking dummy dots for transferring levels.
- Show how to remove loose concrete laitance and roughen the surface before laying brick/block.
- Demonstrate how to sieve fine aggregate as per instructions.
- Show how to mix cement and mortar in the appropriate ratio and quantity.
- Demonstrate ways to assist in setting out layouts as per instructions.
- Demonstrate ways to assist in spreading mortar using a trowel to the required thickness.
- Demonstrate ways to assist in building brick walls using English/Flemish bond.

5.1.1 Masonry

Masonry is a construction technique that involves the arrangement of individual units, typically bricks or concrete blocks, to create walls, structures, or architectural features. It is one of the oldest and most fundamental building methods.

Brickwork

Fig. 5.1.1 Brickwork

- Uses individual units called bricks, typically made of fired clay or concrete.
- Bricks come in various sizes and types, allowing for design flexibility.
- Known for its durability and aesthetic appeal, making it suitable for decorative facades.
- Suitable for load-bearing walls in residential and commercial buildings.
- Commonly used in traditional and historic architecture.

Blockwork

Fig. 5.1.2 Blockwork

- Utilizes precast units known as concrete blocks or concrete masonry units (CMUs).
- Blocks are larger and heavier than bricks, resulting in faster construction progress.
- Well-suited for large-scale projects, such as commercial and industrial buildings.
- Provides exceptional structural strength and load-bearing capacity.
- Offers fire resistance and durability, making it suitable for safety and longevity.
- Commonly used in modern architecture and industrial applications.

5.1.2 Brick

The bricks should have plane smooth rectangular face and sharp right angled corners.

The standard modular size of common building bricks shall be as follows:

Length (L) mm	Width (W) mm	Height (H) mm
190	90	90
190	90	40

The following non-modular sizes of the bricks may also be used.

Length (L) mm	Width (W) mm	Height (H) mm
225	111	70
225	111	44

5.1.3 Types of Bricks

1. Burnt Clay Mix

Fig. 5.1.3 Burnt Clay Mix Bricks

- **Composition:** Made from clay that is fired or baked in a kiln.
- **Color:** Typically red or brown, but can vary.
- **Texture:** Generally rough and porous.
- **Strength:** Moderate compressive strength.
- **Durability:** Suitable for general construction purposes.
- **Insulation:** Offers moderate thermal insulation.
- **Absorption:** Absorbs water, and can be susceptible to weathering in extreme conditions.

2. Concrete Bricks

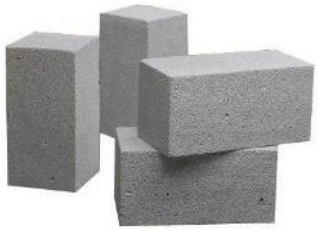


Fig. 5.1.4 Concrete Bricks

- **Composition:** Made from a mixture of cement, sand, aggregate, and water.
- **Color:** Gray, similar to regular concrete.
- **Texture:** Smooth or textured surface, depending on mould.
- **Strength:** High compressive strength.
- **Durability:** Resistant to weathering and moisture, suitable for various applications.

- **Insulation:** Low thermal insulation unless modified.
- **Absorption:** Lower water absorption compared to clay bricks.

Fig. 5.1.5 Sand Lime Bricks

3. Sand Lime Bricks (Calcium Silicate Bricks)

- **Composition:** Made from sand, lime, and a small percentage of cement.
- **Color:** Gray or white.
- **Texture:** Smooth and uniform.
- **Strength:** Moderate to high compressive strength.
- **Durability:** Resistant to weathering, suitable for load-bearing walls.
- **Insulation:** Provides good thermal insulation.
- **Absorption:** Relatively low water absorption.

Fig. 5.1.6 Fly Ash Clay Bricks

4. Fly Ash Clay Bricks

- **Composition:** Made from a mixture of fly ash (a byproduct of coal combustion) and clay.
- **Color:** Can vary, often grey due to fly ash content.
- **Texture:** Smooth or textured.
- **Strength:** Moderate compressive strength.
- **Durability:** Generally durable and resistant to weathering.
- **Insulation:** Provides some thermal insulation.
- **Absorption:** Moderate water absorption.

5. Engineering Bricks

- **Composition:** Made from dense clay, often with additives for increased strength.
- **Color:** Usually red or blue.
- **Texture:** Smooth and dense.
- **Strength:** High compressive strength, designed for structural applications.
- **Durability:** Highly durable, suitable for areas exposed to severe weather conditions.
- **Insulation:** Limited thermal insulation.
- **Absorption:** Very low water absorption, making them resistant to frost and moisture.

5.1.4 Types of Bond Used in Brick Masonry

1. Stretcher Bond

In a stretcher bond pattern, all the bricks are positioned as stretchers along the wall's faces. This particular bond type is most suitable when constructing walls with a thickness of half a brick. In the stretcher bond, the bricks are placed in successive stretcher courses, while attention must be given to stagger the vertical joints.

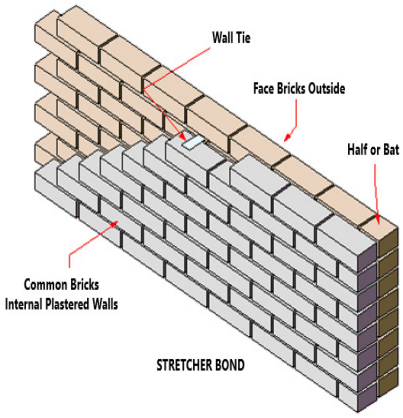


Fig. 5.1.8 Stretcher Bond

2. Header Bond

In a header bond arrangement, all the bricks are positioned with their headers (short ends) facing outwards on the wall's surface. This type of bond is typically well-suited for constructing single-brick walls.

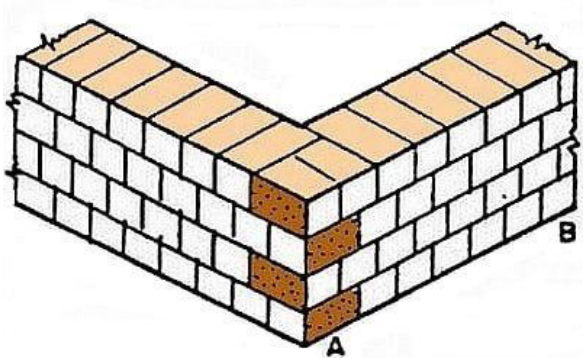


Fig. 5.1.9 Header Bond

3. English Bond

English Bond is a prevalent masonry technique where successive courses consist of alternating headers and stretchers. This bonding pattern is widely utilized and adaptable to various wall widths. Its reputation stems from being one of the sturdiest bonds available.

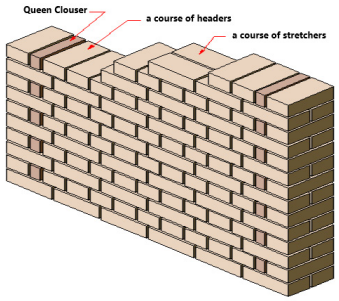


Fig. 5.1.10 English Bond

4. Flemish Bond

In Flemish Bond, every layer of bricks consists of a pattern where a header brick is followed by a stretcher brick, and vice versa. The header bricks in each layer are positioned directly above the stretcher bricks beneath them, with central support. Additionally, each alternating layer begins at the corner with a header brick.

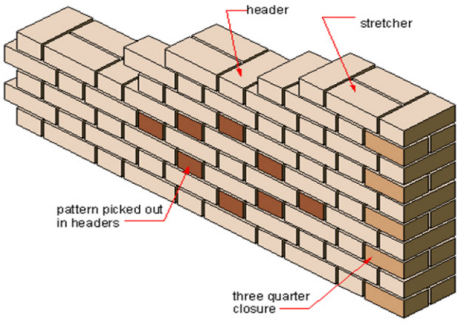


Fig. 5.1.11 Flemish Bond

5.1.5 Water Cement Ratio

Water–cement ratio is the ratio of the weight of water to the weight of cement used in a concrete mix.

- If the water cement ratio is low, it increases the strength and durability, but reduces the workability of the mix.
- Addition of additional water may increase workability but effects the durability and strength of concrete.
- Hence, the use of admixtures named plasticizers and super- plasticizers reduce water requirement and make concrete strong and workable.
- Water-cement ratios of 0.45 to 0.60 are more typically used.
- Plasticizers are added to increase flow ability in high strength concrete where water cement ratio is low.
- Increase in amount of water causes segregation of concrete components like sand and aggregates from the cement paste.
- A concrete mix with too much water reduces the strength of concrete causing shrinkage leading to internal cracks and visible fractures (particularly around inside corners).

5.1.6 Procedures to Construct English Bonds

The procedure is as follows:

Steps	Images
Step 1 Lay the bricks in a stretcher course. • Set the bricks in the mortar bed as headers. • Behind this row, set another row of bricks in the mortar bed as stretchers. • With the handle of the trowel, tap the brick down on the mortar bed, so that it is levelled and parallel to wall and edge is in plumb. • Use the edge of the trowel to cut away the excess mortar that is shoved out from under the brick as you go. • Use the spirit level to check the evenness of the surface.	

Step 2

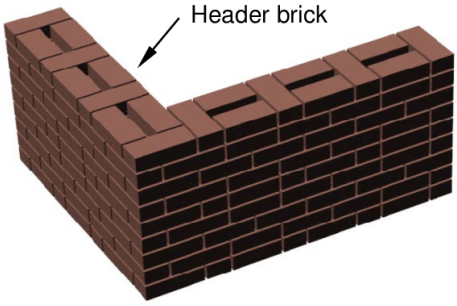
Apply the mortar on the brick layer.

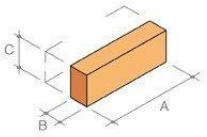
- Pour the mortar on top of the brick layer.
- Flush all the joints.
- Fill the joints with mortar.
- Make sure there are no cavities left in between.
- Use the spirit level to check the evenness of the surface.

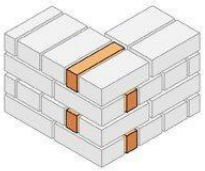
Step 3

Lay the bricks in a header course.

- Set a brick at the beginning of the course as a header. Technically, this is called quoin header.
- Cut a brick into half of its length. These portions are called queen closers.
- Set the queen closer next to the quoin header to develop a face lap.
- Lay the bricks alongside the queen closer in a header course.
- With the handle of the trowel, tap the brick down on the mortar bed, so that it is levelled and parallel to wall and edge is in plumb.
- Using the edge of the trowel, remove excess mortar that comes out from under the brick as one go.
- Use the spirit level to check the evenness of the surface







Type	A	B	C
BD.3	215	46	65

Queen Closure

Step 4

Repeat this process of laying the alternative courses of bricks in stretchers and headers up to 3 feet.

5.1.7 Procedures to Construct Flemish Bonds

Steps	Images
Step 1 Lay the first course as headers alternated by a pair of stretchers. • Set a brick at the beginning of the course as a header. Technically, this is called quoin header. • Cut a brick into half of its length. These portions are called queen closers. • Set the queen closer next to the quoin header. • Lay a pair of stretchers next to this queen closer. • Repeat alternating the header with a pair of stretchers. • Use the mason's square to check the angles of the corners. • Pour the mortar on the brick layer. • Flush all the joints. • Ensure there are no cavities in between the joints. • Level the surface. • Use the spirit level to check the evenness of the surface.	

Step 2 Lay the second course as a pair of stretchers alternated by headers. • Set a pair of stretchers. • Alongside these stretchers, set a header. • Repeat alternating a pair of stretchers with a header. • Remember to use the queen closer at the end of the courses, if required. • Use the plumb to check the edges. • Spread mortar on the brick layer. • Flush all the joints. • Ensure there are no cavities in between the joints. • Level the surface. • Use the spirit level to check the evenness of the surface.	
Step 3 Repeat the pattern in other courses. • Repeat laying the headers and the stretchers with a quoin header and queen closer, followed by another course with just stretchers and headers. • Once you have finished the second course, • Lay the next course as headers alternated by a pair of stretchers, followed by another course with a pair of stretchers alternated by headers. • A 9-inch wall with a Flemish bond has been constructed.	

Table 5.1.2 Procedures to Construct Flemish Bonds

5.1.8 Brick Cutting Techniques

1. Brick Trowel:

- This tool is suitable for rough cutting of bricks.
- Score the two wedges of the brick in the desired position using the trowel.
- Then, cut the brick by giving it a sharp blow between the two nicks.

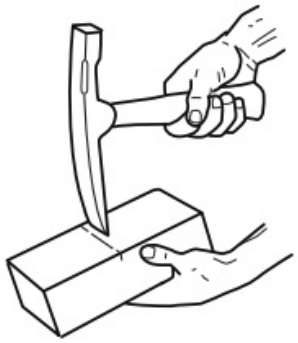


Fig. 5.1.13 Brick Cutting by Hammer

- This method is best for softer bricks, as hard bricks may damage a good trowel.

2. Brick Hammer:

The cutting edge of a brick hammer is useful for rough cuts.

Nick the edges of the brick and then give it a sharp blow between the two nicks.

3. Club Hammer & Bolster:

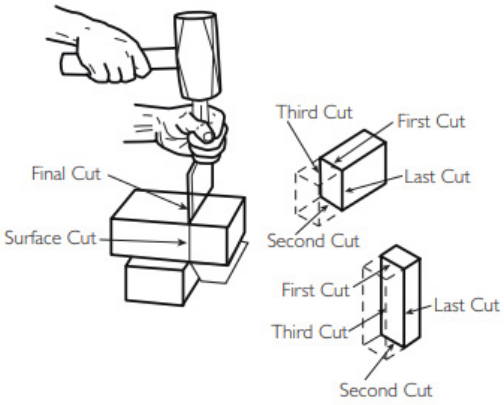


Fig. 5.1.14 Brick Cutting by Club Hammer and Bolster

- These tools are used for precise brick cutting.
- To accurately cut bricks, mark the cut line on all faces of the brick.
- The first cut is typically on the shortest side, and the final cut is on the longest side.

4. Power Saws/Grinders:

Fig. 5.1.15 Brick Cutting by Grinder

- Accurate trimming of bricks can be achieved with a masonry saw, which may be necessary to achieve a specific shape, size, or pattern.
- It is commonly used for laying pavers.
- When accurate cutting is required, especially for pavers, it is recommended to use a wet process. This involves using an appropriate saw equipped with water lubrication and a dust suppressor.
- When using such machinery, always follow the safety instructions provided by the manufacturer.
- Wear necessary personal protective equipment, including approved safety goggles and gloves.
- When cutting pavers, ensure they are fully wetted (soaked with water) to reduce the chance of discoloration from cutting slurry entering the product surface.
- Also, make sure all slurry is washed from any cut product before laying, and prevent slurry from falling onto already laid products, as it can be challenging to clean off.
- Avoid cutting pavers to less than 25% of the whole paver size.

5.1.9 Transferring Levels

The process of marking dummy dots for transferring levels is an important step in construction and surveying to ensure accuracy in leveling across different points or areas.

Materials Needed:

- Leveling equipment (e.g., dumpy level, theodolite)
- Surveyor's staff or leveling rod
- Surveyor's tripod (if using a theodolite)
- Marker (e.g., paint, chalk, or a felt-tip pen)
- Measuring tape (if necessary)
- Notebook and pencil

Steps:

Fig. 5.1.16 Theodolite and Levelling Staff

Set Up Leveling Equipment:

Choose an appropriate leveling instrument, such as a dumpy level or theodolite, depending on the nature of your survey or construction work.

Ensure the leveling instrument is properly calibrated and set up on a stable base. If you're using a theodolite, mount it securely on a surveyor's tripod.

Select Reference Point:

Identify a reference point or benchmark that serves as the starting point for your leveling measurements. This point should have a known elevation or be established through a separate survey.

Position the Leveling Staff:

Position a surveyor's staff or leveling rod at the reference point. The staff should be held vertically and firmly planted into the ground or secured to a stable object.

Take an Initial Reading:

Using the leveling instrument, take an initial reading (sighting) on the leveling staff at the reference point. This reading represents the elevation at the reference point.

Calculate and Note the Height Difference:

Calculate the height difference between the reference point's elevation and the desired elevation at the target location. This is the change in elevation you want to establish.

Select Target Locations:

Identify the locations where you need to transfer the established elevation or level. These are the points where you'll mark dummy dots.

Move to Target Locations:

Move to each target location while carrying the leveling instrument and the leveling staff.

Set Up the Leveling Staff:

At each target location, position the leveling staff vertically and securely. Ensure it is level and at the desired height difference from the reference point's elevation.

Mark Dummy Dots:

Use the marker (paint, chalk, or felt-tip pen) to mark a dot or line on the leveling staff at the precise height difference from the reference point. This marking represents the desired elevation for that location.

Record Data:

In your notebook, record the location's identifier (e.g., point name or number) and the height difference from the reference point. This data will be used to guide subsequent construction or surveying activities.

Verify and Check:

Double-check your markings and measurements to ensure accuracy.

Repeat as Needed:

Repeat this process for all target locations, transferring the established level or elevation to each one.

Notes

Scan the QR code to watch the video

https://youtu.be/iyLCRO5MOWk

Types of Brick Bond

Unit 5.2 Assist in Plastering Work

Unit Objectives

By the end of this unit, participants will be able to:

- Explain the basics of plastering work.
- State different mix of mortar required for plastering works.
- Describe the techniques for surface preparation for plastering work.
- Show how to remove excess mortar from the face of the wall to keep the surface clean.
- Demonstrate how to remove all loose concrete laitance and assist in roughening the surface.
- Demonstrate the process of carrying out pre-wetting of the base surface before plastering.
- Show how to prepare a mix of cement mortar and cement slurry in the required quantity and proportion.
- Show how to remove excess mortar from the face of the wall to keep the surface clean.

5.2.1 Introduction to Plastering

Plastering means applying covering and decorative layers on the walls, ceilings, columns and shelves. The decorative layers are made with a mixture of cement and fine sand, known as 'plaster'. Plastering covers rough walls and other uneven surfaces of a building with a smooth covering coat so that the building's appearance and durability are improved.

Fig. 5.2.1 Mason Plastering

Importance to Plastering

Plastering imparts a covering coat on the unfinished masonry surfaces of a building. The appearance and preservation of the interiors depends on the quality of the plastering. Hence it is important to do plastering with very good workmanship. In this module, you will learn some basic and initial tasks to make the actual job of plastering easier and to get a lasting finish on the surface.

5.2.2 Plastering Tools and Equipment

Tool	Image	Use
Finishing Trowel		A finishing trowel is a rectangular tool used to apply, spread, and smooth plaster. It mostly has aluminium or steel blade and a metal or plastic handle. Standard width of a finishing trowel is 10 inches, while its length can vary between 30 to 50 inches. It can also be used to finish small surfaces.
Plastering Corner Trowel		A plastering corner trowel is a trowel having double sided blades. It is used to prepare corners running along two sides at the same time.
Plastering Trowels		Plastering trowel is a tool used for finishing plaster surfaces on inside corners. It is also used for plastering and scraping. Additionally, it repairs the damage.
Pre-worn Permashape		A pre-worn permashape is similar to a plastering trowel, but its blade is slightly curved (like how it wears during normal use). This helps in applying plaster with ease. Additionally, it helps in removing line and ripple marks.
Plasters Hawk		A hawk is a square, lightweight tool with a vertical central handle used while plastering. It is usually used with a finishing trowel to apply a smooth finish of plaster to a wall. It is also used to carry mortar from the mortar board to where it is to be applied. A hawk is around 10 to 14 inches.
Plastering Float or Floating rule		A float is another flat tool used to fill voids and hollows, while plastering, as well as to level bumps caused due to previous operations. Additionally, it helps to impart a texture to the surface. Some commonly used floats include wood float, angle float and sponge float.

Plastering Feather Edges		Feather Edges are rod like looking tools mostly used for wet plastering. It has a wooden or lightweight metal blade, which is 15 cm wide to 1.2 m to 2.5 m in length. Its blade tapers to a sharp edge and is used to cut in inside corners and to shape sharp, straight lines at outside comers where walls intersect.
Plastering Darbies		Darby is an aluminium scale-like tool, which is about 1.5 m long. It comes along with adjustable handles for manual operations. It is used for further smoothening and levelling after applying base coat. Additionally, it is used to level plaster screeds and to level finish coats.

Table 5.2.1 Plastering Tools and Equipment

5.2.3 Mortar Mix for Plastering

The choice of mortar mix for plastering works depends on various factors, including the type of surface being plastered and the desired finish. Here are some common mortar mixes used for plastering:

Mortar Mix	Components	Common Use
Cement Mortar (1:3)	1 part cement, 3 parts sand	Internal plastering on masonry walls, concrete surfaces, and brickwork. Smooth finish.
Cement Mortar (1:4)	1 part cement, 4 parts sand	Plastering on rougher exterior surfaces. Durable and weather-resistant.
Lime Mortar (1:3)	1 part lime, 3 parts sand	Plastering historical or heritage buildings. Allows breathability and flexibility.
Gypsum Plaster	Gypsum plaster mix (no sand)	Interior plastering, especially on drywall and gypsum board. Quick drying, smooth finish.
Cement-Lime Mortar (1:1:6)	1 part cement, 1 part lime, 6 parts sand	Interior and exterior plastering on various surfaces. Good workability and durability.
Mud Plaster	Mud, straw, sometimes lime/cement	Traditional or eco-friendly construction. Natural and rustic finish.
Exterior Insulation and	Insulation board, synthetic stucco	Exterior insulation and decorative finishes on buildings. Energy-efficient.
Finish System (EIFS)	layers	Range of textures and colors.

Acrylic Plaster	Cement, sand, acrylic resins	Interior and exterior applications. Excellent adhesion, durability, crack resistance.

Table 5.2.2 Mortar Mixes

5.2.4 Concrete Laitance

Concrete laitance refers to a thin layer of weak and powdery material that forms on the surface of freshly poured or recently cured concrete. It consists of fine particles of cement, sand, and other aggregates that rise to the surface due to the upward movement of water within the concrete mix during the curing process.
Removing loose concrete laitance and roughening the surface is important to ensure proper adhesion of plaster or other finishing materials. Here's a demonstration of how to perform this task:

Tools and Materials Needed:

- Stiff wire brush
- Broom
- Power washer (optional)
- Safety gear (gloves, safety glasses, dust mask)

Procedure:

1. Safety Precautions:

   Put on safety gear, including gloves, safety glasses, and a dust mask to protect yourself from dust and debris.

2. Initial Cleaning:

   Start by removing loose dust and debris from the concrete surface.

   Use a broom to sweep away loose dirt, leaves, or any other loose material.

3. Power Washing (Optional):

   If the concrete surface is heavily soiled or has a significant amount of loose material, consider using a power washer.

   Adjust the power washer to a medium-pressure setting and spray the surface evenly to remove loose particles.

   Allow the surface to dry completely before proceeding.

4. Wire Brushing:

   Take a stiff wire brush and begin scrubbing the concrete surface vigorously.

   Focus on areas with visible laitance or any other loose material.

   Brush in both vertical and horizontal directions to ensure thorough cleaning.

   Pay special attention to corners, edges, and any areas where laitance tends to accumulate.

5. Roughening the Surface:

To roughen the surface for better adhesion, continue using the wire brush to create a textured finish.

Apply more pressure to create deeper grooves and ridges in the concrete.

The goal is to create a surface that feels slightly rough to the touch.

6. Clean-Up:

   After roughening the surface, sweep away any loosened particles or debris using a broom.

   Ensure that the surface is clean and free of any remaining laitance or loose material.

7. Final Inspection:

   Inspect the surface to ensure that it has been effectively cleaned and roughened.

   Run your hand over the surface to check for any remaining smooth areas. If you find any, repeat the wire brushing process.

8. Ready for Plastering:

   Once you are satisfied with the cleanliness and roughness of the surface, it is ready for plastering or other finishing materials.

   Be sure to follow the specific instructions for the plaster or finishing material you plan to apply.

5.2.5 Preparation for Plastering Work

Follow these steps to prepare the surface for plastering:

Step 1	Step 2
Wear the safety equipment. One should wear: • Boots • Safety Jacket • Gloves • Helmet 	Gather the materials and tools needed. • One will need mortar to fill up the holes or cavities, if any, on the surface. • One will need these tools: Trowel, Chisel, Wire brush, and Water hose 

Step 3 • Clean the surface and the joints. • Clean the surface and the joints with a wire brush to remove foreign material. Tip: One can also use a wire brush to clean the surface. But, ensure that the surface is free from dirt, oil and grease. A clean and grease-free surface is necessary for the plaster to adhere properly. Preparing the surface ensures that the plastering lasts long and is free from defects. 	Step 4 • Rake the mortar joints. • Drag the trowel along the mortar joints,while keeping it lightly pressed, to rake the joints properly. 

Table 5.2.3 Preparation for Plastering Work

5.2.6 Removing Excess Mortar

Removing excess mortar from the face of the wall is important for achieving a clean and finished appearance.

Materials Needed:

- Masonry brush or broom
- Pointing trowel or jointer (optional)
- Bucket of clean water
- Sponge or cloth

Steps:

1. **Use a Masonry Brush or Broom:**

   Begin by gently brushing the surface of the wall with a masonry brush or broom. This will help loosen and remove any loose or excess mortar.

2. **Check for High Spots:**

   Look for areas where mortar may have been applied too thickly or where it has formed high spots. These areas will need extra attention.

3. **Use a Pointing Trowel or Jointer (Optional):**

   If necessary, you can use a pointing trowel or jointer to carefully scrape away excess mortar from the joints between the bricks or blocks. Be cautious not to damage the surrounding mortar or bricks.

4. **Wipe with a Damp Sponge or Cloth:**

Dip a clean sponge or cloth into a bucket of clean water and wring it out so that it is damp but not dripping.

Gently wipe the surface of the wall, focusing on areas with excess mortar. The moisture will help soften and remove the mortar.

5. **Repeat as Needed:**

   If there are stubborn areas with dried or hardened mortar, you may need to repeat the process. Continue to dampen the area with a sponge or cloth and gently scrub until the excess mortar is removed.

6. **Final Rinse:**

   After removing excess mortar, rinse the entire wall with clean water. This will help wash away any remaining residue and leave the surface looking clean.

7. **Inspect the Wall:**

   Once the wall has dried, inspect it to ensure that all excess mortar has been successfully removed. Pay close attention to joints and any textured or decorative surfaces.

8. **Dispose of Waste Properly:**

   Dispose of any excess mortar or debris in accordance with local regulations. Do not allow it to accumulate on the construction site.

5.2.7 Importance of Pre-wetting

Carrying out pre-wetting of the base surface before plastering is crucial to ensure proper bonding and prevent rapid drying of the plaster. Here's a demonstration of the process:

Tools and Materials Needed:

- Clean water source
- Sprinkling can or hose with a spray nozzle
- Safety gear (gloves, safety glasses)

Procedure:

1. **Safety Precautions:**

   Begin by wearing the necessary safety gear, including gloves and safety glasses, to protect yourself from splashes and potential hazards.

2. **Inspect the Surface:**

   Before starting, examine the surface to be plastered. Ensure it is clean and free from dust, dirt, and loose debris.

3. **Prepare the Water Source:**

   Have a clean water source ready, such as a hose with a spray nozzle or a sprinkling can filled with water.

4. **Start Pre-Wetting:**

   Begin pre-wetting the base surface by gently spraying or sprinkling water evenly over the entire

area to be plastered.

Ensure that the water is applied uniformly, covering all portions of the surface.

5. Control Moisture Levels:

   Pay attention to the moisture level of the surface. It should be damp but not overly saturated.

   The surface should absorb the water without forming puddles or becoming too wet.

6. Allow Absorption:

   Give the surface some time to absorb the moisture. This helps prevent rapid suction of water from the plaster mix when applied.

7. Reapply if Necessary:

   If the surface starts to dry quickly, reapply a light mist of water to keep it damp.

   This may be particularly important in hot or dry conditions.

8. Check for Evenness:

   Confirm that the moisture is evenly distributed across the entire surface.

   Ensure that there are no dry spots or areas that are excessively wet.

9. Wait for Absorption:

   Allow the surface to absorb the moisture for a sufficient amount of time, typically around 15-30 minutes, depending on the temperature and humidity.

Notes

Scan the QR code to watch the video

https://youtu.be/U_1huBQtD-o

Plastering Tools

Unit 5.3 Assist in Door and Windows Fixing

Unit Objectives

By the end of this unit, participants will be able to:

- State the standard size of doors/windows and the types of materials and fittings used in them.
- Explain how to align the frames and check the holdfast position.
- Describe the process of anchoring frames to walls and filling gaps between walls and frames.
- Demonstrate how to mark and set out the location for fixing doors and windows as per the supervisor's instructions.
- Demonstrate how to anchor window frames in frames/openings in the wall using nails and secure the frame.
- Demonstrate ways to assist in fixing standard sections for wooden/metal windows, doors, and vent frames.
- Demonstrate how to measure the dimensions of rooms/floors/walls, right angles, and surface planes under supervision.

5.3.1 Door and Window Fixing

Door and window fixing in construction is a crucial phase that involves the installation of doors and windows into the structural openings of a building. This process requires precision and attention to detail to ensure that doors and windows function properly, provide security, and maintain energy efficiency.

Fig. 5.3.1 Door Fixing

5.3.2 Standard Sizes for Doors and Windows

Standard Sizes for Doors:

Fig. 5.3.2 Standard Sizes for Doors

1. **Single Exterior Door:** Typically, a standard single exterior door in residential construction measures 36 inches (3 feet) in width and 80 inches (6 feet 8 inches) in height. However, variations exist, such as 32 inches in width for some older homes.
2. **Double Exterior Door**: A standard double exterior door usually measures 72 inches (6 feet) in width and 80 inches (6 feet 8 inches) in height. Like single doors, variations may exist.
3. **Interior Door:** Standard interior doors vary in width but are commonly 30 inches, 32 inches, or 36 inches wide, with a height of 80 inches (6 feet 8 inches).

Standard Sizes for Windows:

1. **Single-Hung Window:** Common sizes for single-hung windows are 24 inches by 36 inches, 30 inches by 48 inches, and 36 inches by 54 inches, among others.
2. **Double-Hung Window:** Double-hung windows often come in sizes like 24 inches by 36 inches, 30 inches by 48 inches, and 36 inches by 54 inches, but custom sizes are also available.
3. **Sliding Window:** Standard sliding window sizes include 36 inches by 24 inches, 48 inches by 36 inches, and 72 inches by 48 inches, among others.

There are some standard sizes of windows that are commonly used in the house,

Location	Width(In)	Height (In)
Hall, Living Room & Drawing Room	48", 60", 72" ft,	48"
Bedroom & Study Room	48", 60"	48"
Kitchen Room	36", 48", 60"	48"
Bathroom (Ventilation)	18", 24", 30" ft	18", 24"

Table 5.3.1 Standard Sizes for Windows

5.3.3 Procedure to Frame Windows/Doors in Brick Wall

Door and window openings consist of three basic parts: head, sill and jamb. This also includes a lintel placed above the opening which acts as support for bricks over the open space.

Steps to frame window/door in brick wall are:

1. Wear the safety equipment.
2. Gather the materials.
3. Prepare the frame
4. For preparation of sill surface, a bed of mortar needs to be spread on the surface where frame is to be placed.
5. Fix the frame and hold it in position supporting it with braces when wall reaches window height or at floor level for a door.
6. Check for line, level and plumb.
7. After laying each course or two courses of bricks, check the line, level and plumb. Walls along the frame exert pressure on frame keeping it in posistion.
8. Prior to fixing bricks over the lintel, the lintel id provided support with a mullion (a wooden post 5 to 10 cm wide). This mullion should be left in palce till the completion of wall.

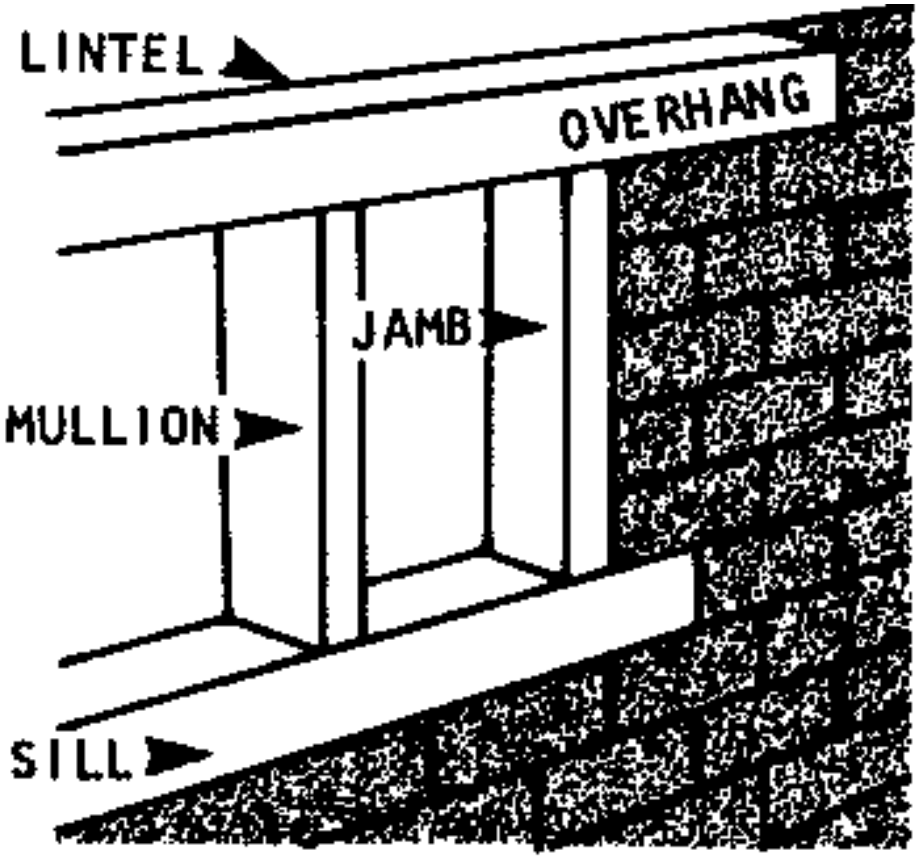


Fig. 5.3.3 Framing windows and doors in brick wall

5.3.4 Aligning Frames

Proper alignment of frames and meticulous checking of the holdfast position during door and window installation are pivotal procedures in the construction and renovation realm.

To align frames and check the holdfast position in door and window fixing:

- Place the frame in the opening, center it, and check for level and plumb with a spirit level.

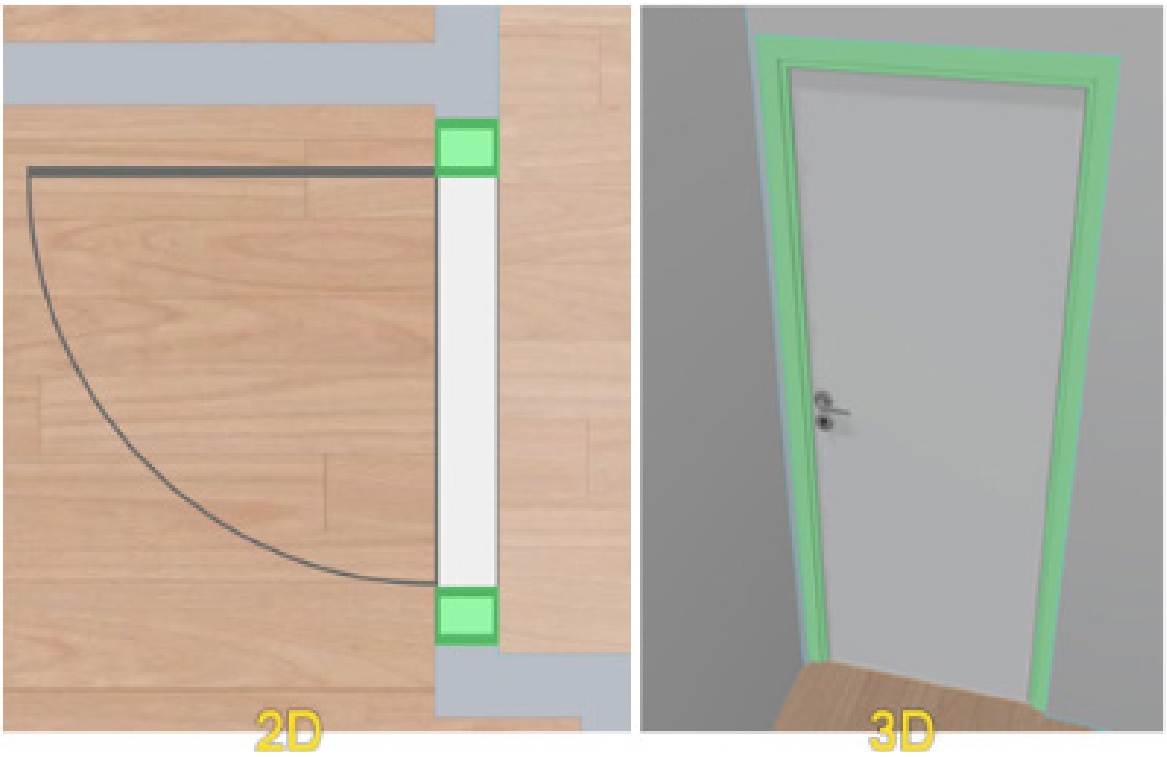


Fig. 5.3.4 Door Frame

- Mark where screws or fasteners will go.
- Optionally, pre-drill holes for the screws.
- Secure the frame by driving screws into the marked positions, starting at the top and bottom.
- Recheck alignment with the level and make adjustments if needed.
- Continue fastening the frame at all marked positions.
- Inspect for proper alignment and gaps.

Exercise

A. Fill in the Blanks

(Hint: Strength, Concrete Block, Concrete laitance 90, Durability, 90, sill, 19)

1. Blockwork utilizes precast units known as _____.
2. The standard modular size of common building bricks is _____ mm in length, _____ mm in width, and _____ mm in height.
3. The water-cement ratio in concrete affects its _____ and _____.
4. _____refers to a thin layer of weak and powdery material that forms on the surface of freshly poured or recently cured concrete.
5. Door and window openings consist of three basic parts: head, _____ and jamb.

B. Short Answer Questions

1. What are the techniques for cutting bricks to the required sizes in masonry?
2. What are the different types of bonds used in brickwork, and how do they differ?
3. Explain the mixtures of mortar required for brick and block works.
4. What is the significance of removing all loose concrete laitance and roughening the surface before masonry work?

Notes

Scan the QR code to watch the video

https://youtu.be/CZZCvNQWx_E

Types of Windows

https://youtu.be/xUW3-luLv28

Types of Doors and Windows

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

6. Work effectively in a Team to deliver Desired Results at the Workplace

Unit 6.1 – Effective Communication and Teamwork

Unit 6.2 – Working Effectively and Maintaining Discipline at Work

Unit 6.3 – Maintaining Social Diversity at Work

(CON/N8001)

Key Learning Outcomes

At the end of this module, you will be able to:

- Elucidate own roles and responsibilities.
- Explain the importance of effective communication.
- Elucidate the consequence of poor teamwork on project outcomes, timelines, safety at the construction site, etc.
- Demonstrate how to pass on work related information/ requirement clearly to the team members.
- Explain different modes of communication used at workplace.
- Explain the importance of creating healthy and cooperative work environment among the gangs of workers.
- Show how to report any unresolved problem to the supervisor immediately.
- Elucidate applicable techniques of work, properties of materials used, tools and tackles used, safety standards that co-workers might need as per the requirement.
- Demonstrate ways to hand over the required material, tools, tackles, equipment and work fronts timely to interfacing teams.
- Explain the importance of proper and effective communication and the expected adverse effects in case of failure relating to quality, timeliness, safety, risks at the construction project site.
- Explain the importance and need of supporting co-workers facing problems for the smooth functioning of work.
- Demonstrate ways to work together with co-workers in a synchronized manner.
- Discuss the fundamental concept of gender equality.
- Explain how to recognise and be sensitive to issues of disability, culture and gender.
- Discuss legislation, policies, and procedures relating to gender sensitivity and cultural diversity including their impact on the area of operation.
- Demonstrate effective implementation of gender neutral practices at workplace.
- Demonstrate ways to address discriminatory and offensive behaviour in a professional manner as per organizational policy.

Unit 6.1 - Effective Communication and Teamwork

Unit Objectives

By the end of this unit, participants will be able to:

- Elucidate own roles and responsibilities.
- Explain the importance of effective communication.
- Explain different modes of communication used at the workplace.
- Elucidate the consequence of poor teamwork on project outcomes, timelines, safety at the construction site, etc.
- Demonstrate how to pass on work-related information/requirements clearly to the team members.
- Show how to report any unresolved problem to the supervisor immediately.

6.1.1 Communication at Workplace

The communication process refers to the steps involved in the exchange of information, ideas, thoughts, or messages between individuals or groups. It is a dynamic process that involves a sender, a receiver, a message, and various channels to convey the information effectively. The communication process typically follows these steps:

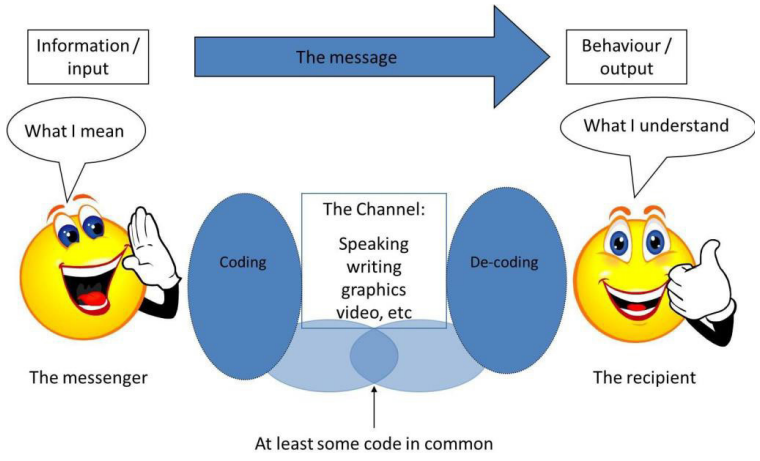


Fig. 6.1.1 Effective Communication – Two-way Process

Sender: The person or entity starting the communication.

Message: The information that the sender wishes to share.

Encoding: Choosing the medium to send a message.

Channel: The medium used to send a message.

- Receiver: The person or entity to whom the message is sent.
- Decoding: Understanding the message received.
- Feedback: The receiver's response to the message.

The 7Cs of communication are essential principles to follow for effective and impactful communication:

- Clear: Be assertive about what needs to be communicated, whether verbally or in writing
- Concise: Use simple words and say only what's needed
- Concrete: Use exact words, phrases, Use facts and figures
- Correct: Use correct spellings, language and grammar
- Coherent: Words should make sense and should be related to the main topic
- Complete: A message should have all the needed information
- Courteous: Be respectful, friendly and honest

Fig. 6.1.2 C's of Communication

6.1.2 Type of Communication at Construction Worksite

Communication at a construction worksite is crucial for ensuring efficiency, safety, and coordination among workers, supervisors, and other stakeholders.

Several types of communication are utilized to facilitate smooth operations and enhance safety at construction sites.

Some common communication methods include:

- **Verbal Communication:** This involves face-to-face conversations, discussions, and instructions between workers, supervisors, and managers on the site. Verbal communication is essential for conveying immediate instructions and clarifications.
- **Hand Signals:** Hand signals are commonly used in noisy construction environments where verbal communication may be difficult. Workers use specific hand gestures to communicate instructions or warnings to each other.

Fig. 4.1.3 Communication at Construction

- **Written Communication:** Written communication includes various documents, such as construction plans, safety guidelines, work permits, and daily progress reports. Written communication helps in conveying detailed information and serves as a reference for all stakeholders.
- **Radios and Walkie-Talkies:** Two-way radios and walkie-talkies are popular communication tools at construction sites, especially for larger projects. They allow instant communication between workers and supervisors across different areas of the site.
- **Visual Communication:** Visual aids, such as signs, symbols, and safety posters, are used to convey important information and warnings. These aids help in reminding workers of safety protocols and hazard awareness.
- **Digital Communication:** Construction sites may use digital communication platforms like mobile apps or messaging services to facilitate real-time communication, share updates, and coordinate tasks.
- **Meetings and Toolbox Talks:** Regular meetings and toolbox talks are conducted to discuss project progress, safety updates, and address any concerns or questions raised by workers.
- **Project Management Software:** Construction companies often use project management software that enables seamless communication between project teams, provides updates, and tracks tasks and schedules.
- **Emergency Communication Systems:** In case of emergencies, construction sites may have emergency communication systems like alarms or sirens to alert workers and initiate evacuation procedures.

Effective communication at construction sites plays a vital role in preventing accidents, minimizing delays, and ensuring the successful completion of projects. It is essential for all team members to be well-versed in the various communication methods used to maintain a safe and productive worksite.

Fig. 6.1.4 Coordination during Construction Work

5.1.3 Adverse Effects of Poor Communication

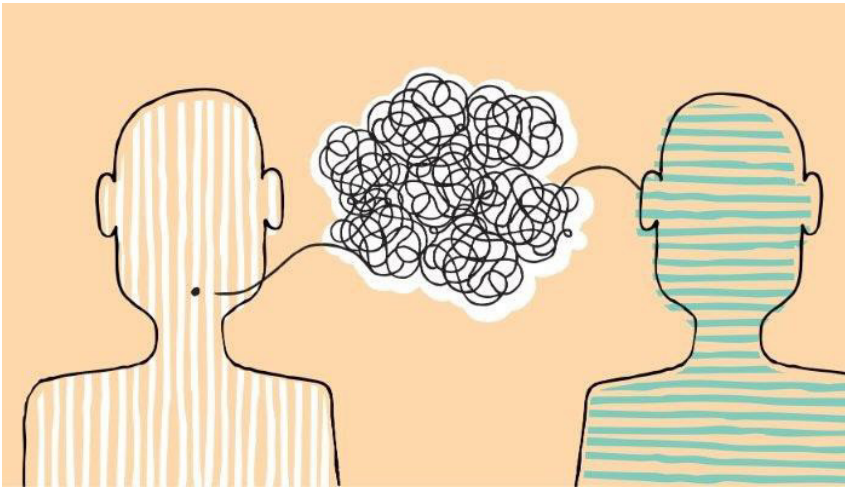


Fig. 6.1.5 Adverse Effects of Poor Communication

Poor communication at a construction workplace can lead to various adverse effects, some of which include:

1. **Safety Risks:** Inadequate communication about safety protocols, hazards, and instructions can increase the risk of accidents and injuries at the construction site.
2. **Misunderstandings:** Miscommunication among workers, supervisors, and managers can lead to misunderstandings about tasks, timelines, and project requirements, resulting in errors and delays.
3. **Inefficiencies:** Poor communication can cause delays in project progress, resource allocation, and decision-making, leading to inefficiencies and increased project costs.
4. **Decreased Productivity:** Lack of clear communication can hinder workers' ability to perform their tasks efficiently, reducing overall productivity at the construction site.
5. **Cost Overruns:** Miscommunication about project budgets, timelines, and scope can lead to cost overruns and financial losses for the construction project.
6. **Quality Issues:** Inadequate communication regarding construction specifications and standards may result in quality issues and subpar workmanship.
7. **Safety Violations:** Poor communication about safety guidelines and procedures may lead to safety violations and non-compliance with safety regulations.
8. **Increased Conflicts:** Communication gaps can create conflicts and tensions among workers and teams, negatively impacting the construction site's working environment.
9. **Lack of Coordination:** Insufficient communication between different construction teams and subcontractors can lead to a lack of coordination, hindering the seamless progress of the project.
10. **Client Dissatisfaction:** Poor communication with clients can lead to misunderstandings, unmet expectations, and client dissatisfaction with the construction project.
11. **Project Delays:** Miscommunication about project timelines and tasks can result in delays, affecting project completion dates and potentially leading to contract disputes.

1. **Reputation Damage:** Repeated instances of poor communication at a construction site can damage the reputation of the construction company, impacting future projects and business opportunities.
2. **Health and Environmental Concerns:** Lack of proper communication about hazardous materials, waste disposal, and environmental regulations can result in health and environmental risks.

To mitigate these adverse effects, construction companies should prioritize effective communication strategies, ensure clear and consistent information flow, and foster a culture of open and transparent communication among all stakeholders involved in the construction project.

6.1.4 Teamwork at Workplace

Teamwork is of utmost importance in various aspects of life, whether it's in the workplace, sports, education, or personal relationships.

Fig. 6.1.3 Communication at Construction

Here are some key reasons highlighting the importance of teamwork:

- **Achievement of Common Goals:** Teamwork brings together individuals with diverse skills and expertise to work collectively towards a shared objective. When team members collaborate effectively, they can accomplish more than what could be achieved individually.
- **Enhanced Creativity and Innovation:** Working in a team allows for the exchange of different perspectives and ideas. This diversity fosters creativity and innovative problem-solving, leading to better solutions and approaches.
- **Improved Productivity:** Team members can divide tasks based on their strengths and expertise, leading to improved efficiency and productivity. This distribution of workload ensures that each aspect of a project is handled by the most suitable team member.

- **Shared Responsibility and Accountability:** In a team, each member has a specific role and responsibility. This sense of accountability motivates individuals to perform their best and take ownership of their contributions.
- **Effective Decision Making:** Teams can pool their knowledge and insights to make well-informed decisions. When diverse viewpoints are considered, the decisions tend to be more balanced and comprehensive.
- **Support and Motivation:** Team members can provide emotional support and motivation to each other, boosting morale during challenging times and celebrating achievements together.
- **Learning and Skill Development:** Teamwork allows individuals to learn from one another, acquire new skills, and improve existing ones. This continuous learning enhances personal and professional growth.
- **Building Trust and Camaraderie:** Effective teamwork strengthens the bond between team members, fostering trust, respect, and camaraderie. This positive team dynamic contributes to a harmonious work environment.
- **Adaptability and Resilience:** Teams are often better equipped to handle changes and uncertainties as they can brainstorm strategies and adapt collectively to new situations.
- **Efficient Problem Solving:** When faced with complex challenges, teamwork enables the pooling of resources and expertise, leading to more comprehensive and efficient problem-solving.
- **Synergy and Performance:** The collective efforts of a high-performing team create a synergy where the overall performance is greater than the sum of individual contributions.
- Improved Work-Life Balance: Effective teamwork can distribute workloads and responsibilities, reducing the burden on individual team members and promoting a better work-life balance.

In conclusion, teamwork is vital for achieving success, fostering innovation, and creating a positive and supportive work culture. Emphasizing the importance of teamwork enables organizations and individuals to harness the full potential of collaboration, leading to remarkable achievements and overall well-being.

6.1.5 The 5Cs of Teamwork

The 5Cs of teamwork are fundamental principles that contribute to effective and successful collaboration within a team. These principles help create a positive team dynamic and foster a cohesive and high-performing group.

Fig. 6.1.7 Effective and Successful Collaboration

The 5Cs of teamwork are:

1. **Co-operation**

   Without cooperation between team members, no group will survive. Cooperation is intimately linked to effective communication and self-assurance. Better communication and a transparent and healthy work environment necessitate some degree of clarity and trust.

2. **Compromise**

   Work relationships are not exempt from the necessity of reaching compromises on particular issues. If our peers' or managers' argument is valid and can contribute to greater performance, we may be required to concur. It is acceptable that not everyone can be on the same page at all times. To manage such circumstances, we must examine the situation and consider potential outcomes.

3. **Communication**

   Considered vital for organising the individual and group efforts of the team. Communication is essential for conflict resolution and problem-solving, and companies must support healthy communication within and between teams. Communication must be open, honest, and timely so that every team member knows what to do and how to do it.

4. **Confidence**

   Team members should have confidence in their skills. The leader must provide the team with a clear and simple explanation of the project, each member's responsibilities, and the final objective. It is essential to remember that confidence does not develop in the blink of an eye. It must be constructed step by step.

5. **Commitment**

The demands and interests of the team take precedence above individual concerns. Every action should contribute to the overall corporate objective.

By embracing the 5Cs of teamwork, teams can cultivate an environment of trust, respect, and collaboration, leading to enhanced performance and achievement of shared objectives.

6.1.6 Consequence of Poor Teamwork

Poor teamwork at a construction site can have significant consequences that impact project outcomes, timelines, safety, and overall project success.

Some of the key consequences of poor teamwork include:

Delayed Project Completion: Lack of effective collaboration and coordination among team members can lead to delays in project progress. When tasks are not properly assigned or synchronized, the project timeline may be extended, resulting in increased costs and client dissatisfaction.

Fig. 6.1.8 Poor Teamwork

Reduced Productivity: Poor teamwork can result in inefficiencies and a decrease in overall productivity. Team members may duplicate efforts, make mistakes due to miscommunication, or lack the support needed to perform their tasks efficiently.

- **Lower Quality Work:** Inadequate teamwork can lead to a decline in the quality of work performed. Without effective collaboration and accountability, errors and defects may go unnoticed, compromising the final deliverables.
- **Increased Rework:** Miscommunication and lack of coordination can result in rework and additional costs. Correcting mistakes and addressing issues that arise due to poor teamwork can be time-consuming and financially burdensome.
- **Safety Hazards:** Construction sites are inherently hazardous environments, and poor teamwork can exacerbate safety risks. When team members fail to communicate effectively or work together safely, it can lead to accidents, injuries, and even fatalities.
- **Conflict and Tension:** Poor teamwork may create a negative work environment characterized by conflict, tension, and lack of trust among team members. This can hamper communication and cooperation, further hindering progress.
- **Budget Overruns:** When teamwork is lacking, projects may experience cost overruns due to inefficiencies, rework, and delays. This can strain the project budget and negatively impact the overall financial performance.
- **Missed Opportunities:** Poor teamwork can result in missed opportunities for innovation, improvement, and optimization. Team members may not leverage their collective expertise and diverse perspectives to identify and capitalize on potential opportunities.
- **Client Dissatisfaction:** Clients expect a well-coordinated and smoothly executed project. Poor teamwork can lead to client dissatisfaction due to missed deadlines, quality issues, and breakdowns in communication.
- **Reputation Damage:** Repeated instances of poor teamwork on construction projects can damage the reputation of the construction company, leading to a loss of trust among clients and stakeholders.

In summary, poor teamwork at a construction site can have serious consequences on project outcomes, timelines, safety, and overall project success. It is essential for construction teams to prioritize effective collaboration, communication, and coordination to mitigate these adverse effects and ensure the successful completion of projects.

Notes

Unit 6.2 - Working Effectively and Maintaining Discipline at Work

Unit Objectives

By the end of this unit, participants will be able to:

- Explain the importance of creating healthy and cooperative work environment among the gangs of workers.
- Elucidate applicable techniques of work, properties of materials used, tools and tackles used, safety standards that co-workers might need as per the requirement.
- Explain the importance of proper and effective communication and the expected adverse effects in case of failure relating to quality, timeliness, safety, risks at the construction project site.
- Explain the importance and need of supporting co-workers facing problems for the smooth functioning of work.
- Demonstrate ways to hand over the required material, tools, tackles, equipment and work fronts timely to interfacing teams.
- Demonstrate ways to work together with co-workers in a synchronized manner.

6.2.1 Discipline at Work

Discipline at work refers to the adherence to rules, policies, and professional standards within a workplace. It involves employees maintaining a responsible and focused approach to their work duties, following established protocols, and upholding ethical principles.

Here are some key aspects of discipline at work:

1. **Punctuality:** Being punctual is a fundamental aspect of discipline. Employees are expected to arrive at work and meetings on time, ensuring smooth operations and respect for others' time.
2. **Following Policies and Procedures:** Employees must follow the company's policies, procedures, and guidelines related to various aspects of work, such as safety, communication, and data privacy.

Fig. 6.2.1 Discipline at Work

3. **Professional Conduct:** Discipline at work involves maintaining professional conduct and demeanor in all interactions with colleagues, clients, and stakeholders.
4. **Meeting Deadlines:** Adhering to deadlines and delivering work on time is a critical aspect of discipline, as it ensures the timely completion of projects and tasks.
5. **Respect for Authority:** Discipline requires showing respect for supervisors, managers, and leadership, following their directions, and seeking guidance when needed.
6. **Self-Discipline:** Individual employees should possess self-discipline to stay focused on their tasks, avoid distractions, and prioritize their responsibilities.
7. **Quality of Work:** Disciplined employees take pride in their work and strive for excellence, ensuring the delivery of high-quality output.
8. **Compliance with Company Values:** Employees should align their actions with the company's values and ethical standards, promoting a culture of integrity and trust.
9. **Conflict Resolution:** Handling conflicts and disagreements in a respectful and constructive manner is an essential part of discipline, maintaining a harmonious work environment.
10. **Accountability:** Disciplined employees take ownership of their actions, admit mistakes, and work towards rectifying any errors they may make.
11. **Adherence to Dress Code:** Following the organization's dress code and appearance guidelines contributes to maintaining a professional and cohesive image.
12. **Attendance and Leave Management:** Discipline includes managing attendance and leave in accordance with company policies and providing prior notice when taking time off.
13. **Use of Resources:** Disciplined employees use company resources responsibly and efficiently, avoiding wastage and abuse.

Discipline at work is crucial for creating a productive and positive work environment. It fosters a sense of responsibility, reliability, and accountability among employees, leading to improved performance and overall organizational success. Employers should also provide clear expectations, guidance, and support to encourage and reinforce a culture of discipline within the workplace.

6.2.2 Time Management

Time management is not about working harder; rather, it is about working smarter so that employees do not overburden themselves and create unnecessary strain.

By effectively managing their time, employees will meet deadlines, increase their effectiveness, become more productive, and produce superior work.

Fig. 6.2.2 Time Management

By effectively managing their time, employees will meet deadlines, increase their effectiveness, become more productive, and produce superior work. They will also have a higher degree of job satisfaction because they will experience less stress, which will help them advance in their careers and reduce your company's staff turnover.

Time management at construction by workers is essential for ensuring that individual tasks and responsibilities are completed efficiently, contributing to the overall success of the project. Here are some time management tips that construction workers can follow to optimize their productivity:

1. **Daily Planning:** Begin each workday with a clear plan of tasks to be completed. Prioritize the most critical tasks and allocate time accordingly.
2. **Set Goals and Deadlines:** Set specific and achievable goals for each workday or week. Establish personal deadlines for completing tasks to stay focused and motivated.
3. **Minimize Distractions:** Limit distractions during work hours, such as personal phone use or excessive socializing. Stay dedicated to tasks at hand to maximize productivity.
4. **Use Tools and Equipment Efficiently:** Familiarize yourself with the tools and equipment required for each task and use them efficiently to avoid wasted time.
5. **Organize Work Area:** Keep your work area clean and organized. A well-organized workspace minimizes the time spent searching for tools or materials.
6. **Time Tracking:** Track the time spent on each task to identify areas where efficiency can be improved and to better estimate future project timelines.
7. **Collaborate with Team Members:** Communicate and coordinate with other team members effectively to ensure a smooth workflow and prevent delays caused by miscommunication.
8. **Break Tasks into Smaller Steps:** For larger tasks, break them down into smaller, manageable steps. This approach helps in maintaining focus and progress.
9. **Take Short Breaks:** Incorporate short breaks into your workday to recharge and avoid burnout. However, ensure that the breaks are kept within reasonable limits to maintain productivity.
10. **Adapt to Changes:** Construction projects often encounter unforeseen challenges or changes. Be flexible and adaptable to adjust your schedule as needed without compromising quality.
11. **Avoid Multitasking:** Instead of trying to tackle multiple tasks simultaneously, focus on completing one task at a time to ensure better quality and efficiency.
12. **Learn Time-Saving Techniques:** Seek out and learn time-saving techniques specific to your tasks or trade. Efficiency comes with experience and knowledge.

1. **Seek Feedback:** Ask for feedback from supervisors or experienced colleagues on ways to improve your time management skills.
2. **Reflect and Improve:** Regularly assess your time management and productivity. Identify areas for improvement and actively work towards refining your approach.

By implementing these time management practices, construction workers can optimize their work efficiency, meet project deadlines, and contribute to the overall success of the construction project.

6.2.3 Interpersonal Conflicts at Construction by Workers

Interpersonal conflicts among construction workers can arise due to various reasons, and if left unaddressed, they can negatively impact the work environment, team morale, and project progress.

Some common causes of interpersonal conflicts at construction sites include:

- Communication Issues: Miscommunication, misunderstandings, or poor communication skills can lead to conflicts among workers, especially when instructions are unclear or not effectively conveyed.
- Differences in Work Styles: Workers may have different approaches to completing tasks, leading to clashes in how work should be performed.
- Competition for Resources: Limited resources, such as tools, equipment, or materials, can create tensions and conflicts when workers need to share or prioritize their use.
- Personal Differences: Diverse backgrounds, personalities, and work habits can lead to clashes in values, beliefs, and interpersonal dynamics.
- Role Ambiguity: Unclear or overlapping roles and responsibilities can cause conflicts between workers who are unsure about their tasks or areas of authority.
- Working Conditions: Challenging working conditions, tight deadlines, and long hours can contribute to stress and tensions among workers.
- Safety Concerns: Differences in safety practices or attitudes towards safety can lead to conflicts, especially when one worker perceives another's actions as risky.
- Leadership Issues: Conflicts can arise when workers feel their supervisors or managers are not effectively leading or addressing issues.
- Past Conflicts or Grudges: Lingering issues from past conflicts that were not adequately resolved can resurface and escalate over time

Fig. 6.2.3 Interpersonal Conflicts

To manage and resolve interpersonal conflicts at construction sites, the following steps can be taken:

Open Communication: Encourage open and honest communication among workers to address concerns and resolve misunderstandings promptly.

- **Conflict Resolution Training:** Provide conflict resolution training to workers to equip them with skills to address and resolve conflicts constructively.
- **Establish Clear Roles and Expectations:** Clearly define roles, responsibilities, and performance expectations to reduce ambiguity and prevent conflicts.
- **Promote Team Building:** Organize team-building activities to foster better understanding and collaboration among workers.
- **Mediation and Third-Party Intervention:** Utilize mediation or involve a neutral third party to help facilitate discussions and find solutions when conflicts are difficult to resolve within the team.
- **Encourage Respect and Empathy:** Foster a culture of respect and empathy where workers understand and appreciate each other's perspectives and backgrounds.
- **Address Safety Concerns:** Ensure that safety protocols are well-communicated and followed to reduce safety-related conflicts.
- **Regular Feedback and Performance Reviews:** Provide regular feedback and conduct performance reviews to address any performance-related conflicts.

By proactively addressing interpersonal conflicts and promoting a positive work culture, construction teams can maintain a harmonious work environment, improve collaboration, and enhance overall project outcomes.

Fig. 6.2.4 Positive Work Culture

Unit 6.3 - Maintaining Social Diversity at Work

Unit Objectives

By the end of this unit, participants will be able to:

- Discuss the fundamental concept of gender equality.
- Explain how to recognise and be sensitive to issues of disability culture and gender.
- Discuss legislation, policies, and procedures relating to gender sensitivity and cultural diversity including their impact on the area of operation.
- Demonstrate effective implementation of gender-neutral practices at the workplace.
- Demonstrate ways to address discriminatory and offensive behaviour in a professional manner as per organizational policy.

6.3.1 Gender Sensitivity

Gender sensitivity is the act of being sensitive towards people and their thoughts regarding gender. It ensures that people know the accurate meaning of gender equality, and one's gender should not be given priority over their capabilities.

Women are an important source of labour in many sectors, yet they have limited access to resources and benefits. Women should receive the same benefits and access to resources as men. A business can improve its productivity and quality of work by providing better support and opportunities to women.

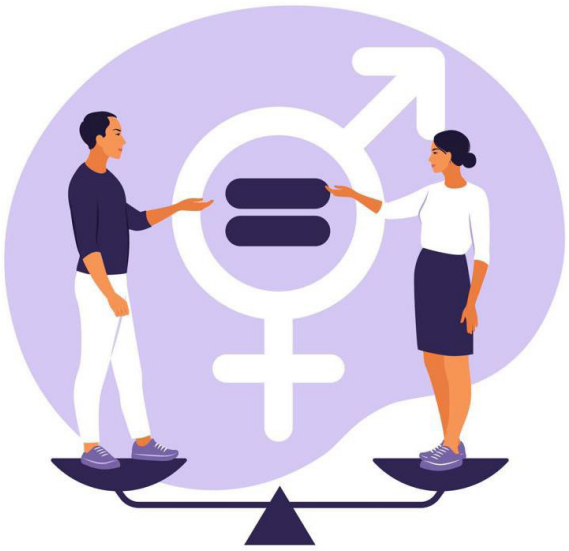


Fig. 6.3.1 Gender Equality

Important Terms

Gender Sensitivity-Gender sensitivity is the act of being sensitive to the ways people think about gender.

Gender Equality - It means persons of any gender enjoy equal opportunities, responsibilities, and rights in all areas of life.

Gender Discrimination – It means treating an individual unequally or disadvantageously based on their gender, e.g. paying different wages to men and women for similar or equal job positions.

Fig. 6.3.2 Gender Discrimination

Strategies for Enhancing Gender Equity

To enhance gender equity, one should:

- Follow gender-neutral practices at all levels at work.
- Participate together in decision-making.
- Help in promoting women's participation in different forums.
- Assist women in getting exposure to relevant skills and practices.
- Assist women in capacity building by mentoring, coaching or motivating them, as appropriate.
- Assist in the formation and operation of women support groups.
- Assist in the implementation of women-centric programmes.
- Combine technical training with reproductive health and nutrition for coffee farming households.
- Assist in making a work environment that is healthy, safe, and free from discrimination.

Bridging Gender Differences

Men and women react and communicate very differently. Thus, there are some work differences as both genders have their style and method of handling a situation.

Although, understanding and maturity vary from person to person, even between these genders, based on their knowledge, education, experience, culture, age, and upbringing, as well as how one's brain functions over a thought or problem.

In order to bridge the gap, one should:

- Not categorize all men and women in one way.
- Be aware of the verbal and non-verbal styles of communication of every gender to avoid any miscommunication and work better.
- Be aware of partial behaviour and avoid it.
- Encourage co-workers of different genders to make room by providing space to others.
- Ways to reduce Gender Discrimination
- Effective steps against sexual harassment by the concerned authorities and general public.
- Gender stereotypes are how society expects people to act based on their gender. This can only be reduced by adopting appropriate behaviour and the right attitude.
- Objectification of females must be abolished.

Fig. 6.3.3 Promoting Gender Sensitivity at Workplace

Ways to Promote Gender Sensitivity in the Workplace

- Practices that promote gender diversity should be adopted and promoted.
- All genders should receive equal responsibilities, rights, and privileges.
- All genders should have equal pay for similar or the same job roles/ positions.

- Strict and effective workplace harassment policies should be developed and implemented.
- An open-minded and stress-free work environment should be available to all the employees, irrespective of their gender.
- Women should be encouraged to go ahead in every field of work and assume leadership roles.
- Follow appropriate measures for women's empowerment.
- Men should be taught to be sensitive to women and mindful of their rights.

6.3.2 PwD Sensitivity

Some individuals are born with a disability, while others may become disabled due to an accident, illness or as they get old. People with Disabilities (PwD) may have one or more areas in which their functioning is affected. A disability can affect hearing, sight, communication, breathing, understanding, mobility, balance, and concentration or may include the loss of a limb. A disability may contribute to how a person feels and affect their mental health.

Fig. 6.3.3 Promoting Gender Sensitivity at Workplace

Important Terms

- Persons with Disabilities (PwD) – Persons with Disabilities means a person suffering from not less than 40% of any disability as certified by a medical authority.
- Types of Disability:
  a. Blindness – Visually impaired
  b. Low Vision

c. Leprosy Cured

d. Hearing impairment

e. Locomotor disability

f. Mental retardation

g. Mental illness

PwD Sensitivity

PwD sensitivity promotes empathy, etiquette and equal participation of individuals and organizations while working with individuals with a disability, e.g. sensory, physical or intellectual.

Ways to be PwD Sensitive

To be sensitive to PwD, one should:

- Be respectful to all Persons with Disabilities (PwD) and communicate in a way that reflects PwD sensitivity.
- Always be supportive and kind towards a PwD with their daily chores.
- Be ready to assist a PwD to help them avail of any benefit/ livelihood opportunity/ training or any kind that helps them grow.
- Encourage and try to make things easier and accessible to PwD so that they can work without or with minimum help.
- Protest where feasible and report any wrong act/behaviour against any PwD to the appropriate authority.
- Learn and follow the laws, acts, and policies relevant to PwD.

Appropriate Verbal Communication

As part of appropriate verbal communication with all genders and PwD, one should:

- Talk to all genders and PwD respectfully, maintaining a normal tone of voice with appropriate politeness. It is important to ensure one's tone of voice does not have hints of sarcasm, anger, or unwelcome affection.
- Avoid being too self-conscious concerning the words to use while also ensuring not to use words that imply one's superiority over the other.
- Make no difference between a PwD and their caretaker. Treat PwD like adults and talk to them directly.
- Ask a PwD if they need any assistance instead of assuming they need it and offering assistance spontaneously.

Appropriate Non-verbal Communication

Non-verbal communication is essentially the way someone communicates through their body language. These include:

- **Facial expressions** - The human face is quite expressive, capable of conveying many emotions without using words. Facial expressions must usually be maintained neutral and should change according to the situation, e.g. smile as a gesture of greeting.
- **Body posture and movement** - One should be mindful of how to sit, stand, walk, or hold their head. For example - one should sit and walk straight in a composed manner. The way one moves and carries self, communicates a lot to others. This type of non-verbal communication includes one's posture, bearing, stance, and subtle movements.
- **Gestures** - One should be very careful with their gestures, e.g. waving, pointing, beckoning, or using one's hands while speaking. One should use appropriate and positive gestures to maintain respect for the other person while being aware that a gesture may have different meanings in different cultures.
- **Eye contact** - Eye contact is particularly significant in non-verbal communication. The way someone looks at someone else may communicate many things, such as interest, hostility, affection or attraction. Eye contact is vital for maintaining the flow of conversation and for understanding the other person's interest and response. One should maintain appropriate eye contact, ensuring not to stare or look over the shoulders. To maintain respect, one should sit or stand at the other person's eye level to make eye contact.
- **Touch** - Touch is a very sensitive type of non-verbal communication. Examples are - handshakes, hugs, pat on the back or head, gripping the arm, etc. A firm handshake indicates interest, while a weak handshake indicates the opposite. One should be extra cautious not to touch others inappropriately and avoid touching them inadvertently by maintaining a safe distance.

Rights of PwD

PwD have the right to respect and human dignity. Irrespective of the nature and seriousness of their disabilities, PwD have the same fundamental rights as others, such as:

- Disabled persons have the same civil and political rights as other people
- Disabled persons are entitled to the measures designed to enable them to become as self-dependent as possible
- Disabled persons have the right to economic and social security
- Disabled persons have the right to live with their families or foster parents and participate in all social and creative activities.
- Disabled persons are protected against all exploitation and treatment of discriminatory and abusive nature.

Making Workplace PwD Friendly

- One should not make PwD feel uncomfortable by giving too little or too much attention
- One should use a normal tone while communicating with a PwD and treat them as all others keeping in mind their limitations and type of disability
- Any help should be provided only when asked for by a PwD
- One should help in ensuring the health and well-being of PwD.

Expected Employer Behaviour

Some of the common behavioural traits that employees expect from their employers are:

- Cooperation: No work is successful without cooperation from the employer's side. Cooperation helps to understand the job role better and complete it within the given timeline.
- Polite language: Polite language is always welcomed at work. This is a basic aspect that everybody expects.
- Positive Attitude: Employers with a positive attitude can supervise the work of the employees and act as a helping hand to accomplish the given task. A person with a positive attitude looks at the best qualities in others and helps them gain success.
- Unbiased behaviour: Employers should always remain fair towards all their employees. One should not adopt practices to favour one employee while neglecting or ignoring the other. This might create animosity among co-workers.
- Decent behaviour: The employer should never improperly present oneself before the employee. One should always respect each other's presence and behave accordingly. The employer should not speak or act in a manner that may make the employee feel uneasy, insulted, and insecure

Fig. 6.3.5 Ramp for PwD Persons

Exercise

Answer the following Questions:

A. Short Questions:

1. Why is effective communication important in construction job roles?
2. What are the consequences of poor teamwork on project outcomes and safety at a construction site?
3. How can you pass on work-related information clearly to your team members?
4. What are some different modes of communication used in the workplace?
5. Why is creating a healthy and cooperative work environment important among gangs of workers?

B. Fill-in-the-Blanks Questions:

1. _____ (Effective / Limited) communication ensures that project goals and tasks are understood by everyone.
2. Poor teamwork can lead to delays, compromised _____ (Quality / Efficiency), and increased safety risks.
3. To ensure clarity, it's essential to provide work-related information to team members in a _____ (Concise / Detailed) manner.
4. Communication modes include verbal, written, visual, and _____ (Digital / Auditory) forms.
5. Creating a cooperative work environment fosters efficient collaboration and _____ (Unity / Isolation) among workers.

C. True/False Questions:

1. Effective communication is only important for supervisory roles. (True/False)
2. Poor teamwork rarely affects project timelines or safety on a construction site. (True/False)
3. Passing on work-related information is not necessary if everyone has their own tasks. (True/False)
4. Communication modes in the workplace are limited to verbal and written forms. (True/False)
5. A cooperative work environment can enhance productivity and worker morale. (True/False)

Notes

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7. Work according to Personal Health, Safety and Environment Protocols at Construction Site

Unit 7.1 – Hazards and Emergency Situations

Unit 7.2 - Safety Drills, PPEs and Fire Safety

Unit 7.3 - Hygiene and Safe Waste Disposal Practices

Unit 7.4 - Infectious Disease and Its Cure

(CON/N9001)

Key Learning Outcomes

1. Explain the importance of following safety norms as defined by the organization.
2. Explain the need to adopt healthy & safe work practices.
3. Describe the process of implementing good housekeeping and environment protection process and activities.
4. Explain the importance of following infection control guidelines as per applicability

Unit 7.1 Reinforcement Tools and Equipment

Unit Objectives

By the end of this unit, participants will be able to:

- Understand the types of hazards at the construction sites and identify the hazards specific to the domain related works.
- Recognize the safety control measures and actions to be taken under emergency situation.
- Know the reporting procedure to the concerned authority in case of emergency situations.

7.1.1 Hazards at Workplace

Hazards versus Risk: A hazard possesses the potential to induce harm, whereas risk pertains to the probability of harm occurring as a result of being exposed to that hazard.

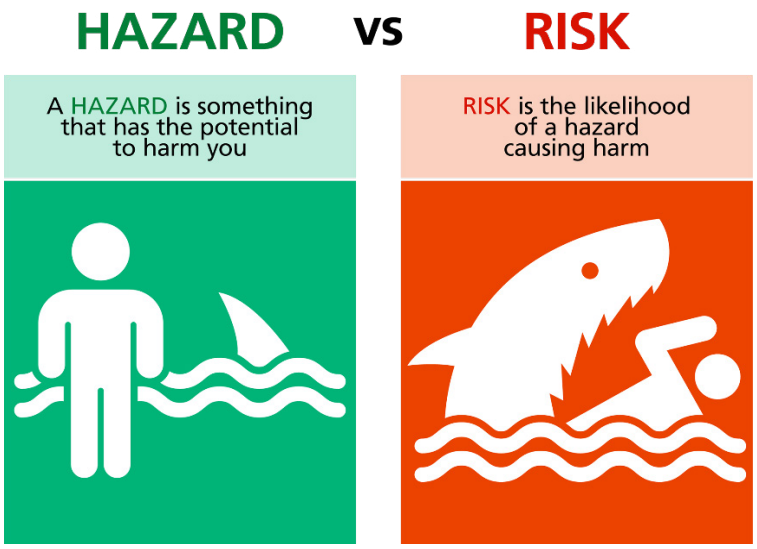

Fig. 7.1.1 Hazards versus Risk

Fig. 7.1.2 Workplace Hazards

Here are some common types of workplace hazards that can be found in various workplaces:

Fig. 7.1.3 Risk Associated with Hazards

- **Physical Hazards:**
  - Slips, trips, and falls
  - Falling objects or materials
  - Contact with moving machinery or equipment
  - Noise and vibration
  - Extreme temperatures (hot or cold)
  - Poor ergonomics leading to musculoskeletal disorders
- **Electrical Hazards:**
  - Electrical shock or electrocution
  - Short circuits or electrical fires
  - Fire and Explosion Hazards:
  - Combustible materials
  - Electrical equipment malfunctions
  - Inadequate fire safety measures
- **Vehicle-Related Hazards:**
  - Accidents involving vehicles or heavy machinery
  - Forklift incidents in warehouses and industrial settings
  - Chemical Hazards:
  - Exposure to toxic or hazardous substances (e.g., chemicals, fumes, gases)
  - Skin contact with irritants or corrosive materials

- Chemical spills or leaks

- **Psychosocial Hazards:**
  - Workplace stress and pressure
  - Bullying or harassment
  - Job insecurity
  - Long working hours and inadequate rest breaks

Identifying and mitigating workplace hazards is essential to ensuring the health and safety of employees. Employers should conduct regular risk assessments and implement appropriate safety measures and training to minimize the risks associated with these hazards.

7.1.2 Hazard Identification and Risk Assessment (HIRA):

Hazard Identification and Risk Assessment (HIRA) is a systematic process used to identify potential hazards in a workplace or any activity and assess the associated risks.

The primary goal of HIRA is to proactively identify and evaluate potential dangers to prevent accidents, injuries, and adverse health effects. It is a fundamental component of occupational health and safety management.

Fig. 7.1.4 Risk Assessment

The HIRA process typically involves the following steps:

- Conduct a comprehensive site survey to identify potential hazards at the construction site.
- Involve workers, supervisors, and safety personnel in the hazard identification process.
- Prioritize hazards based on their severity and likelihood of occurrence.
- Assess the risks associated with each identified hazard, considering potential consequences and exposure frequency.
- Implement appropriate control measures to reduce or eliminate the identified risks.
- Use the hierarchy of controls (elimination, substitution, engineering controls, administrative controls, and PPE) to address hazards effectively.

- Provide necessary training and awareness programs for workers on identified hazards and safety protocols.
- Regularly review and update the hazard identification and risk assessment as the construction progresses.
- Maintain proper documentation of the hazard identification and risk assessment process.
- Foster a culture of safety and encourage workers to report any new hazards or safety concerns.

HIRA is an ongoing process that requires the involvement and cooperation of all stakeholders, including workers, supervisors, safety officers, and management.

It helps create a safer work environment, reduces the likelihood of accidents, and contributes to improved overall occupational health and safety

Fig. 7.1.5 Risk Management Process

Hazards Specific to Domain-Related Works in Construction:

1. Roofing Hazards: Roofers face the risk of falls from heights, especially if proper fall protection measures are not in place.
2. Demolition Hazards: Demolition work involves risks of flying debris, structural collapses, and exposure to hazardous materials.
3. Welding and Cutting Hazards: Welders are exposed to sparks, fumes, and electrical hazards during welding and cutting processes.
4. Crane and Heavy Equipment Hazards: Improper operation of cranes and heavy machinery can lead to struck-by and caught-in accidents.
5. Scaffolding Hazards: Improperly assembled/unstable scaffolding poses fall risks for workers.
6. Concrete and Masonry Hazards: Workers involved in concrete pouring and masonry work face risks of heavy lifting injuries and ergonomic issues.
7. Highway and Roadwork Hazards: Road construction workers are at risk of being struck by vehicles passing through the work zone.
8. Electrical Installation Hazards: Electricians face the dangers of electric shocks and arc flashes during installation and maintenance work.
9. Painting Hazards: Painters may encounter risks from working at heights, using chemicals in paints, and exposure to fumes.
10. Tunneling Hazards: Workers involved in tunnel construction face risks of collapse, flooding, and exposure to harmful gases.

Different domain-related works have their unique risks, and it's essential to tailor safety measures accordingly to ensure a safe work environment for all employees.

7.1.3 Workplace Warning Signs:

Workplace warning signs are essential visual cues used in various environments to convey important information, instructions, or potential hazards.

These signs play a crucial role in promoting safety, providing guidance, and preventing accidents.

Safety signs are essential visual cues used to convey critical safety information and promote safety awareness in various environments.

Safety Signs are generally divided into 4 Categories along with their Colour Codes:

Fig. 7.1.6 Workplace Warning Signs

- Red
- Blue
- Yellow
- Green

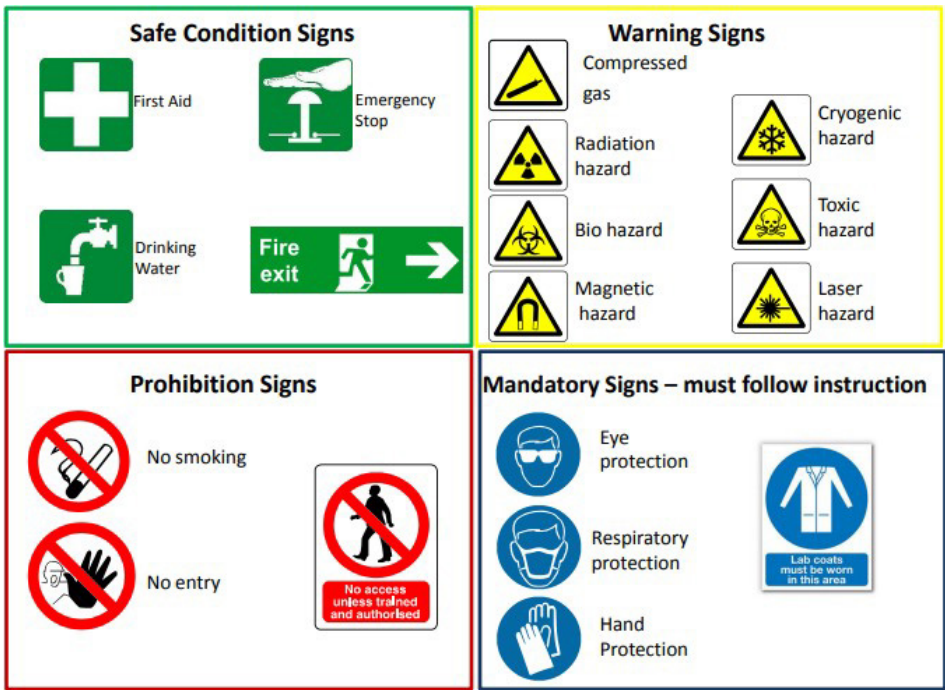

Fig. 7.1.7 Four Types of Safety Signs and their Colour

7.1.4 Emergency Response Plan (ERP)

An Emergency Response Plan (ERP) is a comprehensive document that outlines procedures, protocols, and responsibilities to be followed in the event of emergencies or critical incidents.

The ERP is designed to ensure the safety and well-being of individuals, property, and the environment during emergencies.

Fig. 7.1.8 Emergency Response Plan (ERP)

7.1.5 Reporting Emergency

Reporting procedures in case of emergency situations at a construction site play a crucial role in ensuring the safety of workers and facilitating a swift and coordinated response. The specific reporting procedure may vary depending on the construction site's policies and the type of emergency.

Fig. 7.1.9 Emergency Situations

However, here are general steps to follow when reporting an emergency situation at a construction site in India:

1. **Assess the Situation:** Quickly assess the nature and severity of the emergency while ensuring your safety and the safety of others, if possible.
2. **Activate the Alarm:** If the construction site has an alarm or emergency alert system, activate it to alert other workers and personnel about the emergency.
3. **Call Emergency Services:** Dial the appropriate emergency services number in India, which is 112, to connect to Police, Fire, and Medical emergency services.
4. **Provide Essential Information:** When calling emergency services, provide the operator with the following information:
    - The type of emergency (e.g., fire, collapse, injury).
    - The exact location of the construction site, including the address or nearby landmarks.
    - Any specific hazards or risks present at the site.
    - The number of people involved or injured (if known).
5. **Notify On-Site Personnel:** Inform the on-site supervisor, safety officer, or designated emergency response team members about the emergency.
6. **Follow the Construction Site's Emergency Response Plan:** Comply with the specific reporting procedures outlined in the construction site's Emergency Response Plan. This may involve contacting a specific individual or department responsible for handling emergencies.
7. **Cooperate with Authorities:** Once emergency services arrive at the construction site, cooperate fully with the authorities and follow any instructions provided by them.
8. **Inform Contractors or Site Management:** If the construction site involves multiple contractors or has site management, inform them about the emergency situation.

1. **Document the Incident:** After the emergency has been addressed, document the incident thoroughly, including the details of the emergency, response actions taken, and any injuries or damages incurred.
2. **Review and Improve Procedures:** After the emergency situation has been resolved, review the response and reporting procedures to identify any areas for improvement and make necessary adjustments to the Emergency Response Plan.

It is essential for all personnel working at the construction site to be familiar with the site's specific emergency response procedures and protocols. Regular training, drills, and awareness programs can help ensure that everyone knows how to respond effectively in case of emergencies, reducing the risk of injuries and minimizing damage to property.

Fig. 7.1.10 Reporting Emergency Situations

Notes

Unit 7.2 - Safety Drills, PPEs and Fire Safety

Unit Objectives

By the end of this unit, participants will be able to:

- Explain the classes of fire and types of fire extinguishers.
- Demonstrate the operating procedure of the fire extinguishers.
- Explain the importance of participation of workers in safety drills.
- List out basic medical tests required for working at construction site.
- Explain the purpose and importance of vertigo test at construction site.
- Explain the types and benefits of basic ergonomic principles, which should be adopted while carrying out specific task at the construction sites.
- Demonstrate use of PPEs as per work requirements.

7.2.1 Fire Triangle & Fire Types

Fire is a chemical reaction that occurs when a substance combines with oxygen and releases heat, light, and various combustion products.

It is a rapid oxidation process that can lead to destructive consequences if not controlled.

The fire triangle is a simple model used to illustrate the three essential components necessary for a fire to occur. These three components must be present simultaneously for a fire to ignite and sustain itself.

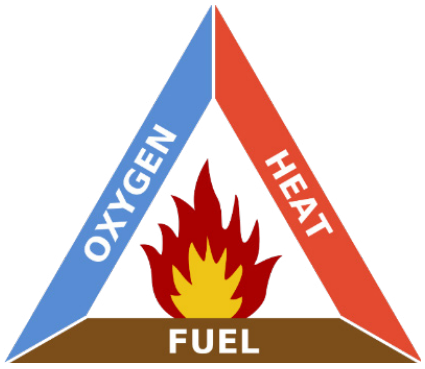

Fig. 7.2.1 Fire Triangle

There are several types of fires, categorized based on the fuel involved. The four main classes of fires are:

A		Ordinary Combustibles	Wood, Paper, Cloth, Etc.
B		Flammable Liquids	Grease, Oil, Paint, Solvents
C		Live Electrical Equipment	Electrical Panel, Motor, Wiring, Etc.
D		Combustible Metal	Magnesium, Aluminum, Etc.
K		Commercial Cooking Equipment	Cooking Oils, Animal Fats, Vegetable Oils

Fig. 7.2.2 Types of Fires

It is essential to use the appropriate extinguishing agents and follow proper fire safety protocols based on the type of fire to ensure effective firefighting and minimize risks to life and property. Fire safety training and understanding the different types of fires are crucial for individuals to respond safely and efficiently in the event of a fire emergency.

7.2.2 Fire Safety

Fire safety is a set of actions aimed at reducing the amount of damage caused by fire.

Fire safety procedures include both those that are used to prevent an uncontrolled fire from starting and those that are used to minimise the spread and impact of a fire after it has started. Developing and implementing fire safety measures in the workplace is not only mandated by law but is also essential for the protection of everyone who may be present in the building during a fire emergency.

Fig. 7.2.3 Fire at Construction Site

The basic Fire Safety Responsibilities are:

- To identify risks on the premises, a fire risk assessment must be carried out.
- Ascertain that fire safety measures are properly installed.
- Prepare for unexpected events.
- Fire safety instructions and training should be provided to the employees.

Prevention of a Workplace Fire:

- Workplace fire drills should be conducted regularly.
- If one has a manual alarm, one should raise it.
- Close the doors and leave the fire-stricken area as soon as possible. Ensure that the evacuation is quick and painless.
- Turn off dangerous machines, and don’t stop to get personal items.
- Assemble at a central location. Ascertain that the assembly point is easily accessible to the employees.
- If one’s clothing catches fire, one shouldn’t rush about it. They should stop, descend on the ground, and roll to smother the flames if their clothes catch fire.

7.2.3 Fire Extinguisher

A fire extinguisher is a portable firefighting device designed to control and extinguish small fires. It is an essential tool for fire safety, allowing individuals to respond quickly to fires before they become unmanageable.

Fire extinguishers work by discharging a firefighting agent onto the fire, either by cooling the fuel, smothering the flames, or interrupting the chemical reaction required for combustion. Each fire extinguisher is specifically designed to combat certain classes of fires.

The most common types of fire extinguishers are:

1. Water Fire Extinguisher (Class A):
    - Suitable for Class A fires involving ordinary combustible materials such as wood, paper, cloth, plastics, and rubber.
2. Foam Fire Extinguisher (Class A and Class B):
    - Effective for Class A fires (ordinary combustibles) and Class B fires (flammable liquids and gases).
3. Dry Powder Fire Extinguisher (Class A, Class B, and Class C):
    - Versatile extinguisher suitable for Class A, B, and C fires.
4. Carbon Dioxide (CO2) Fire Extinguisher (Class B and Class C):
    - Suitable for Class B fires (flammable liquids and gases) and Class C fires (energized electrical equipment).
5. Wet Chemical Fire Extinguisher (Class K):
    - Specifically designed for Class K fires involving cooking oils and fats.

Fig. 7.2.4 Types of Fire Extinguishers

Fire extinguishers should be placed in easily accessible locations throughout buildings, construction sites, vehicles, and other facilities. Regular maintenance, inspection, and employee training on how to use fire extinguishers properly are essential components of fire safety programs. Remember, fire extinguishers are designed for small fires only. For larger fires or situations beyond your control, evacuate the area immediately and call the appropriate emergency services.

Using Fire Extinguisher:

Using a fire extinguisher properly can be instrumental in quickly extinguishing small fires and preventing them from spreading. When using a fire extinguisher, remember the acronym "PASS," which stands for Pull, Aim, Squeeze, and Sweep.

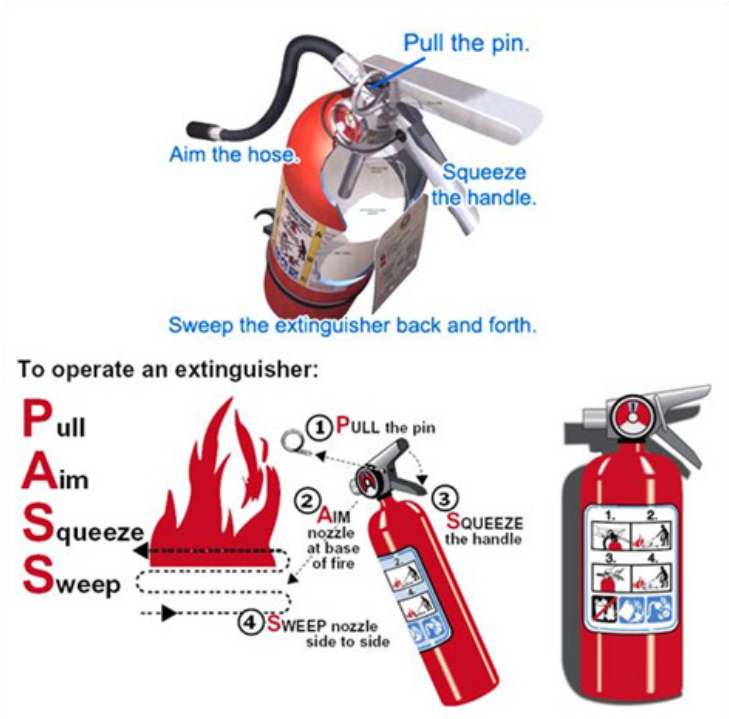

Fig. 7.2.5 Using a Fire Extinguisher

Remember the following important tips:

- Only use a fire extinguisher on small fires that are contained and not spreading rapidly.
- Make sure you are using the right type of fire extinguisher for the specific class of fire (e.g., Class A, B, C, K).
- Always maintain a safe distance from the fire and avoid getting too close to the flames.
- Never turn your back on a fire, and be prepared to evacuate if the fire becomes too large or uncontrollable.
- If the fire does not respond to the extinguisher or starts to grow rapidly, evacuate the area immediately and call the fire department.

7.2.4 Safety Drills and Its Importance for Workers

The participation of workers in safety drills at a construction site is of utmost importance to ensure a safe working environment and reduce the risk of accidents or incidents. Construction sites are inherently hazardous places, and safety drills play a crucial role in preparing workers to respond effectively to emergencies.

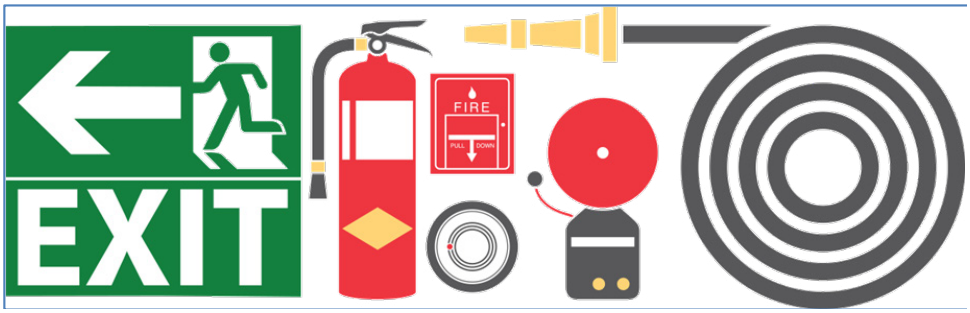

Fig. 7.2.6 Components related to Safety Drill

Here are some specific reasons why worker participation in safety drills is vital in a construction site setting:

1. **Familiarization with Site-Specific Procedures:** Construction sites can have unique layouts and hazards. Safety drills allow workers to become familiar with site-specific emergency procedures, such as evacuation routes, muster points, and the location of emergency equipment.
2. **Practicing Response to Common Construction Hazards:** Safety drills provide an opportunity to practice responding to emergencies related to common construction hazards, such as falls, structural collapses, confined space incidents, and electrical accidents.
3. **Building Muscle Memory for Critical Tasks:** By participating in safety drills, workers develop muscle memory for critical safety tasks, such as donning personal protective equipment (PPE), using fire extinguishers, or performing emergency rescues. Muscle memory helps workers react quickly and instinctively during real emergencies.
4. **Testing Effectiveness of Emergency Plans:** Safety drills allow construction site managers to assess the effectiveness of the site's emergency response plans and identify any gaps or weaknesses that need to be addressed.
5. **Boosting Confidence and Reducing Panic:** Regular participation in safety drills can boost workers' confidence in their ability to handle emergencies, making them less likely to panic and more likely to respond calmly and rationally.
6. **Team Coordination and Communication:** Safety drills encourage teamwork and coordination among workers. It helps them practice effective communication during emergencies, which is essential for a coordinated and efficient response.

7. Compliance with Regulations: Construction sites are subject to various safety regulations and standards. Worker participation in safety drills ensures that the construction site is compliant with safety requirements.
8. Preventing Injuries and Fatalities: The ultimate goal of safety drills is to prevent injuries and save lives. Properly trained and prepared workers are more likely to respond effectively to emergencies, reducing the severity of incidents.
9. Emergency Response Performance Evaluation: Safety drills provide an opportunity to evaluate how well workers respond to emergencies and identify areas that need improvement or additional training.
10. Promoting a Safety Culture: Encouraging worker participation in safety drills sends a strong message about the importance of safety at the construction site. It fosters a safety-first culture and instills a sense of responsibility for safety among all workers.

By actively involving workers in safety drills, construction site management can significantly enhance the site's emergency preparedness, improve response capabilities, and create a safer working environment for everyone involved.

Evacuation:

Evacuation at a construction workplace/site is a crucial aspect of ensuring the safety of all workers and visitors in case of emergencies. Construction sites can be hazardous environments with various potential risks, making preparedness and efficient evacuation procedures essential.

Fig. 7.2.7 Emergency Evacuation

7.2.5 Medical Examination for Construction Workers

The government has mandated that industrial enterprises undertake annual health checkups on their employees. In accordance with the Factories Act of India from 1948, both contractual and permanent employees in manufacturing businesses are required to undergo periodic health examinations. These examinations aim to protect the health and safety of factory workers.

The type of medical examination varies according to an employee's job description or the nature of the industrial process in which he is involved. For instance, if an employee works in the food

business, their hands are routinely inspected for skin disorders. If someone is involved in a hazardous manufacturing process, chest X-rays may be part of the medical checkup.

Consequently, depending on the nature of the production process and the job profile, an employee may be subjected to all standard and specific tests.

In addition, the frequency of medical examinations varies. According to the Maharashtra Plant Rules, for instance, if the factory is involved in the production of lead, workers are inspected once every month.

Medical Check-up Prior to Employment: A young person must have a pre-employment medical examination by a Certifying Surgeon to determine and confirm his fitness to work in a factory, according the Factories Act of 1948. The certificate of fitness is only valid for one year from the date it was issued.

Fig. 7.2.8 Medical Examination for Construction Workers

Medical Examinations for Workers in Hazardous Occupations: According to the Factories Act, a plant that engages in hazardous procedures is required to have its employees examined by a competent medical professional prior to employment and on a recurrent basis thereafter. Workers employed in a "hazardous process" are medically tested once before to employment by a Factory Medical Officer to determine their physical fitness and appropriateness for employment in a hazardous process.

Once every six months, the health status of all workers exposed to occupational health hazards must be determined.

Form 7 is completed, and if the medical findings reveal any abnormality or unsuitability of a person employed in the hazardous process, or if the worker has manifested signs and symptoms of a notifiable disease (as specified in the Third Schedule of the Factories Act), the worker must be removed from the process for health protection and cannot be employed in the same process. Alternatively, if the worker is totally handicapped, he or she will receive appropriate rehabilitation. Only after obtaining a Fitness Certificate from the Certifying Surgeon and Form 7 in accordance with the Factories Act may a withdrawn employee be rehired for the same process.

List of Recommended Medical Tests under the Factories Act:

1. Complete Physical Examination
2. Blood Group, Rh factor
3. Blood CBC, ESR, RBS
4. Urine Test (Routine & Microscopic)
5. Creatinine
6. Electrocardiogram (Computerised ECG)

7. Chest X-Ray (Standard Size)
8. Lung Function Test
9. Vision Test (Screening)
10. Audiometric Test
11. HIV & HBS Tests

7.2.6 Vertigo Test

Vertigo is a symptom, not a condition in and of itself. Vertigo is a sort of dizziness that is frequently described as the sensation that one is spinning or that the world is spinning around them, especially when they alter their position.

Vertigo affects people of all ages. Middle ear pathology is typically the culprit in younger patients. The danger of falls and associated sequelae necessitates a specialised assessment of the elderly. The key to arriving at a diagnosis is distinguishing vertigo from other causes of dizziness or imbalance, as well as distinguishing central causes of vertigo from peripheral causes.

Vertigo is a symptom that is associated with numerous medical disorders. Your doctor may require one or more tests or procedures to better understand your underlying issue. Numerous of these tests require specialised equipment and experienced personnel.

Fig. 7.2.9 Vertigo Test for Construction Workers

Some exams are brief and painless, while others are lengthy and unpleasant Your doctor can recommend the relevant tests for your condition

7.2.7 Basic Ergonomic Principles

Basic ergonomic principles involve designing and arranging workspaces, equipment, and tasks to optimize efficiency, productivity, and worker well-being.

Ergonomics aims to reduce the risk of musculoskeletal disorders (MSDs) and other work-related injuries by ensuring that the work environment fits the worker's capabilities and needs.

Fig. 7.2.10 Basic Ergonomic Principles

Construction sites can be physically demanding and involve various tasks that may lead to musculoskeletal disorders (MSDs) and other injuries if not properly addressed. Here are some basic ergonomic principles to consider at a construction site:

- Proper Lifting Techniques:
  - Train workers in proper lifting techniques to avoid back injuries. Encourage the use of mechanical lifting aids, such as cranes or hoists, for heavy or awkward loads.
- Worksite Organization:
  - Arrange tools, equipment, and materials to minimize excessive reaching or bending.
  - Keep frequently used items within easy reach to reduce unnecessary movement.
- Tool Selection:
  - Provide ergonomic tools with appropriate grips and handles that reduce hand and wrist fatigue.
  - Choose tools that require less force to operate to prevent overexertion.

By applying these basic ergonomic principles at construction sites, employers can create a safer and more comfortable working environment, reduce the risk of work-related injuries, and improve the overall well-being and productivity of construction workers.

7.2.8 First Aid

First aid refers to the immediate and initial care given to an injured or ill person before professional medical help arrives. It is crucial in emergencies to stabilize the injured or sick individual and prevent their condition from worsening.

First aid aims to preserve life, alleviate pain, and promote recovery.

Here are some key points about first aid:

Objectives of First Aid:

- **Preserve Life:** The primary objective of first aid is to assess the situation and provide immediate care to save lives.
- **Prevent Further Harm:** First aid measures aim to prevent the injured person's condition from worsening.
- **Relieve Pain:** First aid techniques can provide pain relief to the injured or ill person.
- **Promote Recovery:** Properly administered first aid can help promote the person's recovery and reduce the severity of injuries or illnesses.

Fig. 7.2.11 First Aid to Injured Person

Common First Aid Procedures:

- Assessment: Assess the situation and the injured or ill person's condition. Ensure your safety and the safety of others.
- CPR (Cardiopulmonary Resuscitation): If the person is not breathing or their heart has stopped, perform CPR to maintain blood flow and provide oxygen.
- Bleeding Control: Apply pressure to stop bleeding from wounds and injuries.
- Wound Care: Clean and dress wounds to prevent infection and aid healing.
- Fracture and Sprain Care: Immobilize fractures and provide support for sprains to prevent further damage.
- Burn Care: Cool burns with running water and cover with a clean, non-stick dressing.
- Choking Response: Perform abdominal thrusts (Heimlich maneuver) on a choking person to clear their airway.
- Seizure Management: Keep the person safe during a seizure and provide comfort afterward.

First Aid Kits:

A well-stocked first aid kit is essential in homes, workplaces, and vehicles. It should contain items such as adhesive bandages, gauze pads, antiseptic wipes, adhesive tape, scissors, tweezers, CPR mask, disposable gloves, and pain relievers, among others.

Note: While first aid can be lifesaving, it is not a substitute for professional medical care. In emergencies, call for professional help (e.g., emergency services) as soon as possible, especially for serious injuries or illnesses.

Fig. 7.2.12 First Aid Kit

It is crucial to receive formal first aid training to effectively administer first aid and respond appropriately in emergency situations. Proper training ensures that you can provide the most appropriate care and support to those in need until professional help arrives.

7.2.9 Ensure Electrical Safety at Construction Sites

Electrical safety is important because hazards such as arc flash and shock can result in death if you are exposed to them.

Fortunately, the likelihood of this occurring is relatively low

However, the control measures that prevent these hazards require careful management, attention to detail and technical competence.

Fig. 7.2.13 Electrical Hazards

- Conduct regular inspections of electrical equipment and wiring to identify any potential hazards or defects.
- Ensure all electrical installations and equipment meet relevant safety standards and codes.
- Provide proper training to construction workers on electrical safety practices and procedures.
- Clearly label electrical panels, switches, and outlets for easy identification.
- Use ground fault circuit interrupters (GFCIs) to protect against electric shock in wet or damp environments.
- Avoid overloading electrical circuits and outlets by distributing loads evenly.
- Keep electrical cords and cables away from heavy machinery, sharp objects, or areas with high foot traffic.
- Store electrical tools and equipment properly when not in use to prevent damage and accidents.
- Use insulated tools and personal protective equipment (PPE) when working with electricity.
- Have a clear emergency plan in place in case of electrical accidents or incidents and ensure workers are familiar with it.

Fig. 7.2.14 Electrical Safety

7.2.10 PPE and Its Importance

Personal Protective Equipment (PPE) plays a crucial role in the construction industry to protect workers from potential hazards and ensure their safety on the job. PPE is designed to shield workers from various risks, such as falling objects, electrical hazards, chemical exposure, noise, and more.

Fig. 7.2.15 PPEs in Construction Industry

Importance of PPE in Construction Industry:

1. Hazard Protection: PPE serves as a barrier between workers and potential workplace hazards, preventing injuries and illnesses.
2. Legal Compliance: Regulatory authorities require the use of appropriate PPE in construction to meet safety standards and comply with regulations.
3. Injury Prevention: PPE can significantly reduce the risk of injuries and accidents, protecting workers' health and well-being.
4. Risk Reduction: PPE mitigates the risk of exposure to harmful substances, noise, dust, and other occupational hazards.
5. Enhanced Productivity: When workers feel safe and protected, their confidence and efficiency increase, leading to improved productivity.

Types of PPE in Construction Industry:

Injury Protection	Description	PPE
Head Injury Protection	Head injuries can occur due to falling or flying objects, stationary objects, or contact with electrical wires. Hard hats provide protection against such injuries by shielding the head. Electrician's hard hat is commonly made of nonconductive plastic. It is accompanied by safety goggles for additional eye protection.	

Foot and Leg Injury Protection	Safety shoes, especially those made of leather, provide essential foot protection. They offer protection against various risks, including falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards. Proper use of safety shoes enhances safety measures for workers in hazardous environments like construction sites.	
Eye and Face Injury Protection	Spectacles and goggles provide protection against hazards like flying fragments, large chips, hot sparks, radiation, and splashes from molten metals. Special helmets or shields offer additional protection for the face and eyes in hazardous environments. Spectacles with side shields and face shields enhance eye safety by preventing exposure to various risks. These protective gears also safeguard against particles, sand, dirt, mists, dust, and glare, promoting overall eye health and safety.	
Protection against Hearing Loss	Hearing protection can be achieved through earplugs or earmuffs. Prolonged exposure to high noise levels can lead to permanent hearing loss, physical strain, and mental stress. Self-forming earplugs made of materials like foam, waxed cotton, or fibreglass wool are commonly used as they offer a good fit. For better fit and protection, workers should be fitted with moulded or prefabricated earplugs by a specialist.	
Hand Injury Protection	Hand protection is crucial for workers exposed to hazardous substances through skin absorption, serious wounds, or thermal burns. Gloves are commonly used as protective gear for hands. Electricians often use leather gloves with rubber inserts when working on electrified circuits. Kevlar gloves are employed when stripping cable with a sharp blade to prevent cuts and injuries.	

Whole Body Protection	Full-body protection is essential for workers to safeguard against heat and radiation hazards. Whole-body PPE includes materials like rubber, leather, synthetics, plastic, fire-retardant wool, and cotton. Maintenance staff working with high-power sources like transformer installations and motor-control centers are often required to wear fire-resistant clothes for added safety.	

Fig. 7.2.16 A Construction Worker with proper PPEs

Care and Maintenance of PPE:

- Regular Inspection: PPE should be inspected before each use to ensure it is in good condition and free from damage.
- Proper Storage: Store PPE in a clean, dry, and designated area away from direct sunlight and chemical exposure.
- Cleaning: Clean PPE regularly according to the manufacturer's guidelines to maintain its effectiveness.
- Replacement: PPE should be replaced when damaged, worn out, or beyond its usable life as specified by the manufacturer.
- Training: Provide training to workers on the proper use, care, and limitations of PPE.
- Comfort and Fit: Ensure that PPE fits properly and is comfortable for the worker to encourage consistent use.

PPE is essential for protecting workers from harm, but it is also the last line of defence.

Care and Maintenance of Tools & Equipment:

- Regularly inspect tools and equipment for signs of damage or wear.
- Keep tools and equipment clean and free from dirt and debris after each use.
- Store tools and equipment in a dry and secure location, protected from weather elements.
- Follow manufacturer's instructions for battery-operated tools regarding charging and storage.
- Train workers on proper tool usage, care, and maintenance to ensure safe and efficient operation

Notes

Unit 7.3 - Hygiene and Safe Waste Disposal Practices

Unit Objectives

By the end of this unit, participants will be able to:

- Follow the practices to maintain personal hygiene, workplace hygiene and site/ workplace sanitization
- Understand the importance of housekeeping works
- Keep an eye on safe housekeeping practices
- Understand different types of waste at construction sites and their disposal method
- Know safe waste disposal practices followed at construction site

7.3.1 Personal Hygiene and Cleanliness

Personal hygiene and cleanliness are essential practices that involve maintaining cleanliness and taking care of one's body to prevent the spread of germs, illnesses, and maintain overall well-being. These practices are crucial for promoting good health and preventing the transmission of infectious diseases.

Fig. 7.3.1 Personal Hygiene

Here are some key aspects of personal hygiene and cleanliness:

- **Regular Bathing or Showering:** Regular bathing or showering helps to keep the body clean and remove dirt, sweat, and bacteria from the skin.
- **Handwashing:** Proper handwashing with soap and water is one of the most effective ways to prevent the spread of germs and infections.

- **Oral Hygiene:** Brushing teeth twice a day and flossing regularly help maintain good oral health and prevent dental problems.
- **Trimming Nails:** Keeping nails clean and trimmed prevents the accumulation of dirt and germs under the nails.
- **Hair Care:** Regularly washing and maintaining hair cleanliness can prevent scalp issues and promote healthy hair.
- **Wearing Clean Clothes:** Wearing clean clothes helps prevent the spread of germs and keeps the body fresh.
- **Proper Use of Personal Protective Equipment (PPE):** In certain situations, such as during a pandemic or when handling hazardous materials, using appropriate PPE like masks, gloves, and safety gear is crucial for personal protection and hygiene.
- **Handling Food Safely:** Properly handling, preparing, and storing food helps prevent foodborne illnesses.
- **Cough and Sneezing Etiquette:** Covering the mouth and nose with a tissue or elbow when coughing or sneezing helps prevent the spread of respiratory droplets containing germs.
- **Managing Menstrual Hygiene:** Properly managing menstrual hygiene is essential for women's health and well-being.
- **Cleaning and Disinfecting Surfaces:** Regularly cleaning and disinfecting frequently-touched surfaces, such as doorknobs and handles, helps prevent the spread of germs.
- **Managing Personal Waste:** Properly disposing of waste and using clean and sanitary facilities help prevent the spread of infections.

Maintaining personal hygiene and cleanliness is not only important for individual health but also for public health. It is essential for reducing the risk of contagious diseases and maintaining a hygienic living and working environment. By practicing good personal hygiene and cleanliness, individuals can contribute to a healthier and safer community.

Importance of Informing on Personal Health Issues

The importance of reporting to the designated authority about infectious diseases and injuries are:

- The infectious diseases can spread and affect the health of other workers at the farm.
- The infectious diseases can be spread to the consumers if the bacteria and viruses spread through the produces.
- The injuries should be timely reported and should be taken care of immediately. If not timely reported it may worsen and may cause severe diseases and even death.

Fig. 7.3.2 Infectious Disease

7.3.2 Workplace Cleanliness and Sanitization

Workplace cleanliness and sanitization are crucial for creating a safe, healthy, and productive work environment.

Clean and sanitized workplaces not only reduce the risk of the spread of infections and illnesses but also contribute to employee well-being and morale.

Fig. 7.3.3 Workplace Cleanliness

Here are some important aspects of workplace cleanliness and sanitization:

1. Regular Cleaning Routine: Establish a regular cleaning schedule for the workplace, including workstations, common areas, restrooms, and shared equipment. Cleaning should be done daily or as needed, depending on the nature of the workplace.
2. Surface Disinfection: Regularly disinfect frequently-touched surfaces, such as doorknobs, light switches, keyboards, and shared equipment. Use EPA-approved disinfectants that are effective against viruses and bacteria.
3. Hand Sanitizing Stations: Place hand sanitizing stations at convenient locations throughout the workplace to encourage employees and visitors to maintain hand hygiene.
4. Restroom Hygiene: Maintain clean and well-stocked restrooms with proper sanitation supplies. Regularly clean and disinfect restroom surfaces to prevent the spread of germs.
5. Waste Management: Provide clearly marked waste disposal bins and ensure proper waste segregation. Regularly empty trash bins and dispose of waste appropriately.
6. Kitchen and Break Areas: Maintain cleanliness in kitchen and break areas by regularly cleaning countertops, sinks, and shared appliances. Encourage employees to clean up after themselves.
7. Ventilation and Air Quality: Ensure proper ventilation to improve indoor air quality. Clean air filters regularly to remove dust and allergens from the air.
8. Personal Protective Equipment (PPE): Provide appropriate PPE, such as masks and gloves, for employees when needed, especially during pandemics or when handling hazardous materials.

1. Educate Employees: Educate employees about the importance of workplace cleanliness and hygiene practices. Encourage them to follow hygiene guidelines and protocols.
2. Workplace Signage: Display hygiene-related signage, such as handwashing instructions, cough etiquette, and reminders about cleaning protocols, to reinforce good practices.
3. Cleaning and Sanitization Training: Train cleaning staff and employees responsible for workplace cleanliness on proper cleaning and sanitization techniques and the correct use of disinfectants.
4. Workplace Wellness Initiatives: Implement workplace wellness programs that promote good health and hygiene practices among employees.

By prioritizing workplace cleanliness and sanitization, employers can create a healthier and safer environment for their employees, clients, and visitors. Regular cleaning and sanitation efforts help prevent the spread of infections, reduce absenteeism, and foster a positive work culture focused on employee well-being and productivity.

7.3.3 Implement Good Housekeeping Practices at Construction Site

Implementing good housekeeping practices at a construction site is essential to maintain a safe, organized, and efficient working environment. Proper housekeeping helps prevent accidents, reduces the risk of injuries, and enhances productivity.

Here are some effective ways to promote good housekeeping practices at construction sites:

1. Designate Storage Areas:

Fig. 7.3.4 Designated Areas

Assign specific areas for storing tools, equipment, and materials. Keep these areas organized and ensure that items are returned to their designated places after use.

2. Regular Cleanup:

Fig. 7.3.5 Clean-up Debris and Waste

Schedule regular cleanup sessions throughout the workday to remove debris, waste, and hazards from the construction site. Encourage all workers to participate in keeping the site clean.

3. **Dispose of Waste Properly:** Provide clearly marked waste disposal bins and containers. Train workers to segregate waste materials correctly, including hazardous materials, to ensure safe disposal.

Fig. 7.3.6 Disposing of Waste

4. **Keep Walkways Clear:** Ensure that walkways, access routes, and emergency exits are clear of obstructions at all times. Remove trip hazards and obstacles to prevent accidents.

Fig. 7.3.7 Clear Walkways

5. **Store Flammable Materials Safely:** Store flammable materials, such as fuel, solvents, and gases, in designated storage areas away from potential ignition sources. Follow safety guidelines for their storage and handling.

Fig. 7.3.8 Store Flammable Safely

6. **Prevent Slips, Trips, and Falls:** Regularly inspect the site for slippery surfaces, loose debris, and uneven terrain. Address potential hazards promptly to reduce the risk of slips, trips, and falls.

Fig. 7.3.9 Prevent Hazards

7. **Control Dust and Debris:** Use dust control measures, such as wetting down surfaces, using dust collectors, or providing personal protective equipment (PPE), to reduce airborne dust and debris.

Fig. 7.3.10 Wetting Down Dust

8. **Proper Material Handling:** Train workers on proper material handling techniques to prevent injuries caused by lifting, carrying, or moving heavy objects.

Fig. 7.3.11 Material Handling with Safety

9. **Secure Tools and Equipment:** Ensure that tools and equipment are properly stored, secured, and maintained when not in use. Avoid leaving them unattended or in precarious positions.

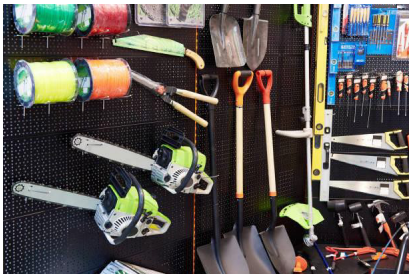

Fig. 7.3.12 Securing Tools & Equipment

10. **Inspect and Maintain Equipment:** Regularly inspect machinery, vehicles, and equipment to identify potential issues or defects. Perform maintenance and repairs promptly to ensure their safe operation.

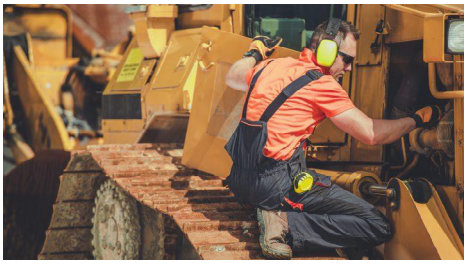

Fig. 7.3.13 Inspect and Maintain Equipment

Fig. 7.3.14 Good Housekeeping and Safety relevance

Remember that good housekeeping is an ongoing effort and requires the commitment and cooperation of all workers and management. By prioritizing cleanliness and organization at the construction site, you can create a safer and more productive work environment for everyone involved.

7.3.4 Handwashing

Handwashing is a simple yet highly effective practice that involves cleaning one's hands with soap and water to remove dirt, germs, and other harmful microorganisms.

Proper handwashing is one of the most important measures to prevent the spread of infectious diseases, including common colds, flu, gastrointestinal infections, and respiratory illnesses.

Proper Handwashing Technique:

- Wet Hands: Wet your hands with clean, running water (warm or cold).
- Apply Soap: Apply enough soap to cover all hand surfaces.
- Rub Hands Together: Rub your hands palm to palm to create lather. Continue rubbing the backs of your hands, between your fingers, and under your nails.
- Scrub for at least 20 Seconds: Scrub your hands for at least 20 seconds. Singing "Happy Birthday" twice is a useful timer.
- Rinse Thoroughly: Rinse your hands thoroughly under clean, running water.
- Dry Hands: Dry your hands using a clean towel or air dry them. If possible, use a paper towel to turn off the faucet to avoid recontamination.

Fig. 7.3.15 Handwashing

When to Wash Hands:

- Before preparing or eating food
- After using the restroom
- After coughing, sneezing, or blowing your nose
- After touching surfaces in public places
- After handling garbage or waste
- After caring for someone who is sick
- Before and after tending to wounds or injuries

Fig. 7.3.16 Wash Hands Properly

7.3.5 Avoid Bad Habits

Avoiding bad habits like smoking, drinking alcohol, and addiction to tobacco and gutkha is essential for maintaining good health and well-being. These habits can have severe negative impacts on physical health, mental health, and overall quality of life.

Here are some reasons to avoid these habits:

- Understand the health risks associated with smoking, drinking alcohol, and using tobacco and gutkha.
- Seek support from family, friends, or support groups to help quit these habits.
- Replace bad habits with healthier alternatives, such as exercise, hobbies, or mindfulness practices.
- Set specific and achievable goals to gradually reduce and eliminate these habits.
- Avoid triggers or situations that may tempt you to engage in these bad habits.
- Practice stress management techniques to cope with stress without turning to harmful substances.

Fig. 7.3.17 Avoid Bad Habits

- Stay informed about the benefits of quitting and the negative impacts of these habits.
- Use nicotine replacement therapies or medications to aid in quitting smoking.
- Find healthy ways to socialize and relax without relying on alcohol or tobacco.
- Celebrate small milestones and successes in your journey to quit these bad habits.

7.3.6 Waste Types at Construction Sites

Construction sites generate various types of waste during the building process.

Some common types of waste found at construction sites include:

1. Concrete and Bricks Waste: Excess or damaged concrete, bricks, blocks, and precast elements.
2. Wood Waste: Includes timber offcuts, pallets, and packaging materials.
3. Metal Waste: Scrap metal from structural elements, reinforcement bars, and metal packaging.
4. Plastic Waste: Packaging materials, plastic sheets, and pipes.
5. Cardboard and Paper Waste: Packaging materials and documents.
6. Glass Waste: Broken or excess glass from windows, doors, and mirrors.

7. Asphalt Waste: Leftover asphalt from road or pavement construction.
8. Paints and Chemicals: Unused or leftover paints, solvents, adhesives, and other construction chemicals.
9. Electrical Waste: Old or damaged electrical components, cables, and wiring.
10. Insulation Materials: Unused or waste insulation materials.
11. Hazardous Waste: Materials containing asbestos, lead, mercury, or other hazardous substances.
12. Packaging Waste: Cardboard boxes, plastic wraps, and other packaging materials.

Fig. 7.3.18 Construction Wastes

Proper waste management and disposal methods are crucial to handle these various types of waste responsibly and minimize their impact on the environment. Recycling, reusing, and responsible disposal in designated landfills or waste treatment facilities are some of the ways to manage construction site waste effectively.

7.3.7 Waste Management

The collection, disposal, monitoring, and processing of waste materials is known as waste management. These wastes affect living beings' health and the environment. For reducing their effects, they have to be managed properly. The waste is usually in solid, liquid or gaseous form.

- Waste management is important because it decreases waste's impact on the environment, health, and other factors. It can also assist in the reuse or recycling of resources like paper, cans, and glass. The disposal of solid, liquid, gaseous, or dangerous substances is the example of waste management.
- When it comes to trash management, there are numerous factors to consider, including waste disposal, recycling, waste avoidance and reduction, and garbage transportation. Treatment of solid and liquid wastes is part of the waste management process. It also provides a number of recycling options for goods that aren't classified as garbage during the process.

Fig. 7.3.19 Waste Management

7.3.8 Methods of Waste Management

Construction waste management is crucial for reducing environmental impact and promoting sustainable practices in the construction industry. The 5Rs framework offers a systematic approach to managing construction waste, focusing on reducing waste generation and maximizing resource efficiency. The 5Rs stand for: Reduce, Reuse, Recycle, Recover, and Residuals. Here's how each of these methods is applied in construction waste management:

1. **Reduce:**
    - Design for Minimal Waste: Employ design strategies that aim to minimize waste generation during the construction phase. This includes accurate quantity estimation, optimizing material use, and choosing construction methods that generate less waste.
    - Prefabrication: Prefabrication and modular construction techniques can significantly reduce on-site waste by producing components off-site with precise measurements and minimal material wastage.
    - Waste Audits: Conduct waste audits to identify the major sources of waste and implement measures to reduce waste generation.
2. **Reuse:**
    - Salvage and Reuse Materials: Salvage and reuse materials from demolition or renovation activities that are still in good condition and can be repurposed in other projects. This includes

doors, windows, fixtures, and lumber.

- Temporary Structures: Utilize temporary structures and materials that can be disassembled and reused in other projects to reduce waste.

3. **Recycle:**

- On-Site Recycling: Set up on-site recycling facilities to process construction waste, such as concrete, wood, metal, and plastics, into reusable materials like aggregates, mulch, or recycled content products.
- Use Recycled Content: Incorporate recycled content materials, such as recycled concrete aggregate or reclaimed wood, in new construction to reduce the demand for virgin resources.

4. **Recover:**

- Energy Recovery: Some non-recyclable construction waste can be converted into energy through waste-to-energy processes, helping to minimize landfill disposal and generate electricity or heat.
- Anaerobic Digestion: Organic waste can be processed through anaerobic digestion to produce biogas, which can be used as a renewable energy source.

5. **Residuals Management:**

- Landfill Diversion: For waste that cannot be reduced, reused, recycled, or recovered, focus on diverting it from landfills and explore alternative disposal methods that have a lower environmental impact.
- Responsible Disposal: Ensure that waste that ends up in landfills is disposed of responsibly, adhering to local regulations and guidelines.

Fig. 7.3.20 Waste Bin Types and their Colour

By implementing the 5Rs framework, construction companies can minimize waste generation, conserve resources, reduce environmental pollution, and move towards a more sustainable and environmentally friendly approach to construction waste management.

7.3.9 Waste Management on a Construction Site

On the construction site, one must be mindful of how they handle waste and garbage. Having a plan for managing these goods is necessary to protect the safety of both workers and the general public. Here are some waste management strategies:

- Before disposing of them in the dumpster, place any hand tools in containers with lids.
- Place empty paint cans in the trash instead than spilling them down drains or onto pavements.
- Rinse disposable cups and other food containers before placing them in a recycling bin. This will help prevent litter from being blown onto the property during windy or rainy weather.
- Recycle equipment and other metal objects by utilising a magnet or air compressor to remove all non-metal components, such as nails, screws, nuts, bolts, electrical wiring, etc. These are then segregated by category prior to proper recycling.
- Insulation should be disposed of in the garbage as opposed to being poured down drains or onto pavements, as it can clog sewer systems.
- Use a tarp to pile dirt, rocks, bricks, and other heavy things into the bed of a truck before hauling them away when the work is complete. This will make future clean-up easier.
- Instead of discarding excess lumber, wrap it in plastic to prevent it from becoming wet and infected with termites.
- Use a leak-proof container or urn to transfer hazardous liquids away for proper disposal; this will keep the workers and others on-site dry and healthy.
- Regularly cleaning up will reduce the amount of debris.
- Using trash cans with lids to prevent rubbish from falling to the ground.
- On your site, provide workers with safety vests for simple identification and protection from concealed threats such as electrical cables and sharp instruments.
- Ensure that there is a designated space for recyclable materials such as glass, plastic, cardboard, and metal containers so that they may be sorted later

It is necessary to have a plan for waste management on construction sites, which are typically untidy places.

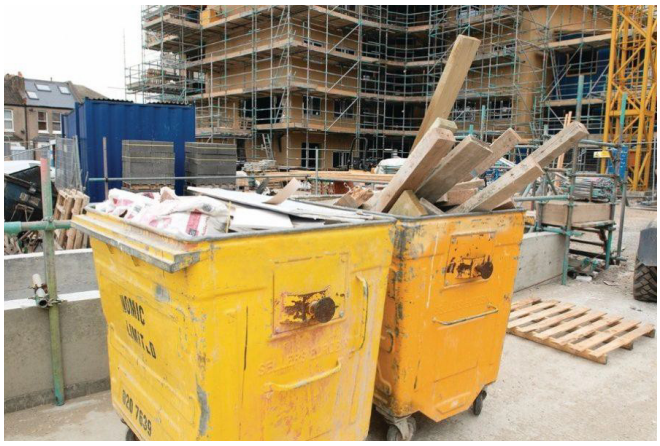

Fig. 7.3.21 Waste Management on a Construction Site

Notes

Unit 7.4 - Infectious Disease and Its Cure

Unit Objectives

By the end of this unit, participants will be able to:

- Know different types of infectious disease that can spread/ originate at a construction site
- Understand the ways of transmission of the various infectious disease.
- Recognize the methods to check the spread of the infectious disease.
- Understand the symptoms and cure of the various infectious disease.
- Apprehend the procedure to report to the concerned authority regarding the outbreak/ hazard of any infectious disease/ pandemic.

7.4.1 Infectious Diseases

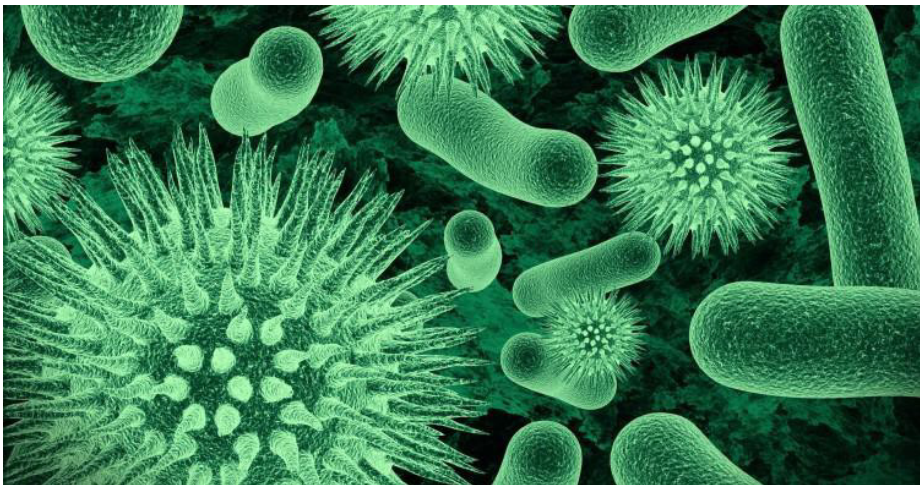

Fig. 7.4.1 Infectious Diseases

Viruses, bacteria, parasites, or fungi can cause infectious diseases. Additionally, uncommon viral disorders known as transmissible spongiform encephalopathies exist (TSEs).

- **Viral infections**
- **Bacterial infections**
- **Fungal infections**
- **Parasitic infections**
- **Transmissible spongiform encephalopathies (TSEs/prion diseases)**

Infectious diseases are extremely common worldwide, but some are more common than others.

Some of the most common infectious diseases are listed here by type.

Common infectious diseases caused by viruses:

- Common cold.
- The flu (influenza).
- COVID-19.
- Stomach flu (gastroenteritis).
- Hepatitis.
- Respiratory syncytial virus (RSV).

Common infectious diseases caused by bacteria:

- Strep throat.
- Salmonella.
- Tuberculosis.
- Whooping cough (pertussis).
- Chlamydia, gonorrhea and other sexually transmitted infections (STIs).
- Urinary tract infections (UTIs).
- E. coli.
- Clostridioides difficile (C. diff).

Common infectious diseases caused by fungi:

- Ringworm (like athlete's foot).
- Fungal nail infections.
- Vaginal candidiasis (vaginal yeast infection).
- Thrush.

Common infectious diseases caused by parasites:

- Giardiasis.
- Toxoplasmosis.
- Hookworms.
- Pinworms.

7.4.2 Prevention of Infectious Diseases

There are numerous simple strategies to minimise the chance of contracting an infectious disease and even prevent certain diseases entirely. While each of them reduces your chance of contracting and transmitting infectious diseases, there is typically no single method that is 100 percent effective. Therefore, it is essential to have several risk-reduction behaviours.

Vaccines

Vaccines lessen the likelihood of contracting an infectious disease by preparing the immune system to recognise and combat dangerous invaders.

Vaccinated individuals may occasionally still get an illness, although their symptoms are typically milder than they would have been without vaccination.

Fig. 7.4.2 Vaccines for Infectious Diseases

Vaccines are available for a number of common infectious diseases, such as:

- **Chickenpox:** Highly contagious viral infection causing itchy skin rash and fever.
- **COVID-19:** Respiratory illness caused by the novel coronavirus, leading to a wide range of symptoms from mild to severe.
- **Diphtheria, tetanus, and whooping cough (whooping cough):** Bacterial infections with symptoms like severe throat inflammation, muscle stiffness, and persistent cough.
- **Hepatitis A:** Liver infection caused by the hepatitis A virus, transmitted through contaminated food and water.
- **Hepatitis B:** Viral infection affecting the liver, transmitted through blood and body fluids, leading to acute or chronic liver disease.
- **Human papillomavirus (HPV):** Common sexually transmitted infection, linked to cervical and other cancers.
- **Influenza:** Viral respiratory infection causing fever, body aches, and respiratory symptoms.
- **Malaria:** Mosquito-borne infectious disease characterized by fever, chills, and flu-like symptoms.
- **Rubella, measles, and rubella:** Viral infections causing rashes, fever, and respiratory symptoms, with potential complications.
- **Polio:** Highly contagious viral infection affecting the nervous system, leading to paralysis in severe cases.
- **Rotavirus:** Common cause of severe diarrhea in young children.
- **Rabies:** Deadly viral disease affecting the nervous system, transmitted through animal bites.
- **Shingles:** Painful viral rash caused by the reactivation of the chickenpox virus.
- **Tuberculosis:** Bacterial infection primarily affecting the lungs, causing persistent cough and fatigue.

- The CDC provides current vaccination recommendations for children, adolescents, and adults. Before you travel, ensure that you have had all of the necessary vaccines for your location.
- Other methods of infectious illness prevention:
- In addition to immunisations and appropriate food handling procedures, you can lower your risk of contracting or transmitting an infectious disease by a few common actions.
- Hands should be washed with soap and water. Before making a meal or eating, after using the restroom, after contact with faeces (human or animal), and after gardening or dealing with dirt, it is essential to wash hands thoroughly.
- When you sneeze or cough, cover your nose and mouth.
- Sanitize regularly touched surfaces in your home and place of business.
- Avoid contact with infectiously ill individuals and the exchange of personal goods with them.
- While suffering from an infectious ailment, you should avoid contact with others.
- Do not drink or swim in potentially contaminated water.
- When sick or as recommended by the CDC, you should wear a mask in public.
- Always use a condom during sexual activity.
- To limit the risk of tick or mosquito bites, apply tick- and mosquito-approved insect repellent, cover as much exposed skin as possible with clothing, and check for ticks after spending time in wooded or grassy areas.

Fig. 7.4.3 Mask and Hand wash during Infectious Disease

7.4.3 General Health Issues and their Symptoms & Cure

General health issues like fever, cough, and cold can affect construction workers, especially when working in diverse weather conditions and exposed to various environmental factors.

Fig. 7.4.4 Symptoms of Fever, Cough and Cold

Here are their symptoms and some recommendations on what construction workers can do to manage these health issues:

Fever:

- Symptoms: Elevated body temperature, chills, body aches, fatigue.
- To-Do:
  - Rest and avoid strenuous physical activity.
  - Stay hydrated by drinking plenty of fluids.
  - Use over-the-counter fever-reducing medications if necessary.
  - Seek medical attention if the fever persists or becomes severe.

- **Cough:**
  - Symptoms: Persistent coughing, irritation in the throat, chest discomfort.
  - To-Do:
    - Avoid exposure to irritants like dust and fumes as much as possible.
    - Stay well-hydrated to soothe the throat.
    - Use a mask or respirator to protect the airways from particles and pollutants.
    - Seek medical advice if the cough worsens or is accompanied by other symptoms.
- Cold:
  - Symptoms: Runny or stuffy nose, sneezing, sore throat, mild body aches.
  - To-Do:
    - Rest and take sufficient breaks to recover.
    - Keep warm and dress appropriately for the weather.
    - Drink warm fluids like soups and herbal teas.
    - Use over-the-counter cold remedies to alleviate symptoms.

General Health Tips for Construction Workers:

- Stay hydrated throughout the day, especially in hot weather.
- Wear appropriate protective gear such as safety shoes, gloves, and helmets.
- Take regular breaks and rest when needed to prevent fatigue.
- Practice proper hand hygiene to reduce the risk of infections.
- Use masks or respirators when working in dusty or polluted environments.
- Eat a balanced diet to maintain overall health and immunity.
- Get regular medical check-ups and vaccinations as recommended.

It's important for construction workers to prioritize their health and safety, as their job often involves physical exertion and exposure to potential health hazards. If any health issue persists or worsens, it is advisable for them to seek medical attention promptly.

7.4.4 Reporting an Outbreak or Hazard of any Infectious Disease or Pandemic

Reporting an outbreak or hazard of any infectious disease or pandemic is crucial for prompt action and preventing further spread of the illness. The specific reporting procedure may vary based on the organization, industry, or country. Here's a general procedure to report such incidents to the concerned authority:

1. Identify the signs and symptoms of the infectious disease or pandemic hazard.
2. Isolate affected individuals to prevent further spread.
3. Inform immediate supervisors or managers about the situation promptly.
4. Contact the appropriate health authorities or public health department.
5. Cooperate with contact tracing efforts and provide necessary information.
6. Implement preventive measures recommended by health authorities.
7. Communicate updates and preventive measures to employees to maintain transparency.

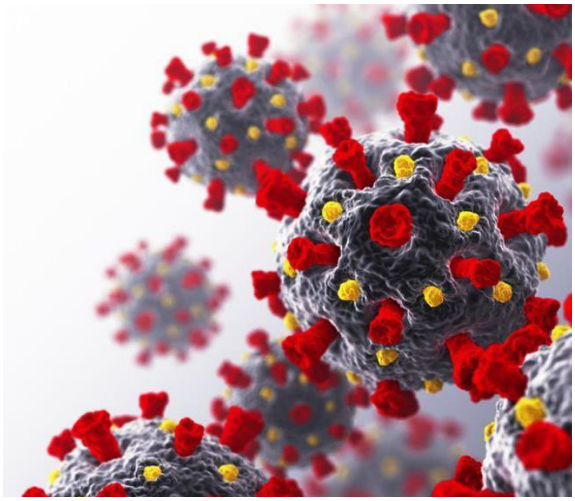

Fig. 7.4.5 Spread of Disease

Remember that reporting an outbreak or hazard of any infectious disease or pandemic promptly is essential for quick containment and mitigation. Cooperate with healthcare professionals, follow their advice, and work together to protect the health and safety of your community and workplace.

Exercise

Answer the following questions.

- Describe the different types of hazards commonly found in the construction industry.
- What are the key steps in handling emergency situations at a construction site, and how should incidents be reported to the concerned authority?
- What are the basic principles of first aid, and how can employees be trained in administering first aid?
- Explain the fire safety measures that should be implemented at a construction site, including fire extinguisher usage and evacuation procedures.
- Why is personal protective equipment (PPE) important in the construction industry, and what are the essential care and maintenance practices for PPE?
- How can good housekeeping practices be effectively implemented at a construction site to improve safety and organization?
- What are safe waste disposal practices that should be followed in the construction industry to protect the environment and prevent health hazards?

Notes

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Notes

Annexure

Annexure of QR Codes for Assistant Mason

Chapter Name	Unit Name	Topic Name	URL	Page no.	QR Code
Chapter 1: Introduction to the Job Role of an Assistant Mason	UNIT 1.1: Introduction to Construction Industry	Types of Construction	https://youtu.be/1WVzo2U-Fyo8	9	Types of Construction
	UNIT 1.2: Role and Responsibilities of an Assistant Mason	Role and Responsibilities of an Assistant Mason	https://youtu.be/B82slHh-nUrQ	14	Role and Responsibilities of an Assistant Mason
Chapter 2: Erect and Dismantle Temporary Scaffolding	Unit 2.1: Basics of Scaffolding	Scaffolding Components Size	https://youtu.be/Qi-GqH-XYo94	21	Scaffolding
	Unit 2.2: Concept of Conventional Scaffolding	Types of Scaffold	https://youtu.be/YuBFUtGG-cbk	29	Types of Scaffold
	Unit 2.3: Concepts of Modular Scaffolding Systems	Staging with Cuplock System	https://youtu.be/fIEaRC07D1M	39	Staging with Cuplock System
	Unit 2.4: Erecting and Dismantling Modular Scaffolding System	Scaffolding Safety Erection and Dismantle Procedure	https://youtu.be/OKawvyUhUkA	46	Scaffolding Safety Erection and Dismantle Procedure

Chapter 3: Hand and Power Tools Relevant to Masonry	UNIT 3.1: Introduction to Construction Industry	Common Masonry Tools	https://youtu.be/PCVIAvs5c88	71	Common Masonry Tools
Chapter 4: Assist in Tiling, Stone Laying and Concrete Masonry	Unit 4.1: Assist in Tiling Work and Stone Laying	Types of Tiles	https://youtu.be/HaTprFLx-WoQ	104	Types of TilesTypes
		Tools used in Tiling Work	https://youtu.be/gKNRXd-Dc514	104	Tools used in Tiling Work
	Unit 4.2: Assist in Concreting	Concreting Tools	https://youtu.be/r--ZbW03-3E	117	Concreting Tools
	Unit 4.3: Assist in Brick Soling and PCC flooring	Calculate Number of Bricks Required for Brick Flat Soling	https://youtu.be/rZgJWUUS-jCY	127	Calculate Number of Bricks Required for Brick Flat Soling

Chapter 5: Assist in Brick/Block Work, Plastering Work, and fixing Doors and Windows	Unit 5.1: Basics of Scaffolding	Types of Brick Bond	https://youtu.be/iyLCRO-5MOWk	144	Types of Brick Bond
	Unit 5.2: Concept of Conventional Scaffolding	Plastering Tools	https://youtu.be/U_1huBQtD-o	153	Plastering Tools
	Unit 5.3: Concepts of Modular Scaffolding Systems	Types of Windows	https://youtu.be/CZZCvNQWx-_E	159	Types of Windows
		Types of Doors and Windows	https://youtu.be/xUW3-luLv28	159	Types of Doors and Windows

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