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Construction Skill Development Council

Participant Handbook

Sector
Construction Skill Development Council of India

Sub - Sector
Real Estate and Infrastructure Construction

Occupation
Surveying

Reference ID: **CON/Q0901, Version 3.0**

NSQF Level 2

Assistant Surveyor

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Email: standards@csdcindia.org
Website: www.csdcindia.org
Phone: 0124-4513915-18 Ext-22

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> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

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Certificate

COMPLIANCE TO
QUALIFICATION PACK- NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CONSTRUCTION SKILL DEVELOPMENT COUNCIL OF INDIA

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Ocupational Standards of

Job Role/Qualification Pack: **'Assistant Surveyor'** QP No. **'CON/Q0901, Version 3.0 NSQF Level 2'**

Date of Issuance: Aug. 16th 2019
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Authorised Signatory
(Construction Skill Development Council)

Acknowledgements

This participant's handbook meant for Assistant Surveyor 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 Assistant Surveyor. 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 Surveyor. 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 Surveyor. 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 Surveyor QP:

Compulsory NOS:

- **CON/N0901:** Handle and store tools and instruments used in surveying work as per the instructions
- **CON/N0902:** Provide support in various surveying works
- **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/N0102:** Employability Skills 60 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.

Symbols Used


Key Learning Outcomes


Exercise


Notes


Unit Objectives


Activity

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It is recommended that all trainings include the appropriate Employability skills Module. Content for the same can be accessed https://www.skillindiadigital.gov.in/content/list

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1. Introduction to the Job Role of an Assistant Surveyor

Unit 1.1 - Introduction to Construction Industry
Unit 1.2 -Role and Responsibilities of an Assistant Surveyor

Bridge Module

Key Learning Outcomes

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

1. Explain the role and responsibilities of Assistant Surveyor.
2. Identify the career progression for Assistant Surveyor.

Unit 1.1: Introduction to Construction Industry

Unit Objectives

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

1. Give an overview of the construction sector.

1.1.1 Construction Industry

The construction industry is the oldest and one of the largest in the world, with a market size of over 10 trillion dollars. Construction has traditionally been a contracting sector, and the industry consists of a huge number of small businesses. Currently, the building industry is one of the main economic sectors. It contributes significantly to the national economy and employs a substantial number of people.

Construction Industry in India

During the forecast period, India's construction market is expected to grow at a CAGR greater than 10%. (2022–2027). As COVID-19 spread over the country in April 2020, the Indian construction sector, which was already struggling with poor management and a lack of labour force tracking, totally lost its central grip, bringing an end to the business. COVID-19 caused havoc on all levels and scales of the value chain.

- The availability of building supplies and the rate of price rise were major concerns. The lack of timely implementation due to lockdowns led to cost overruns, significant delays, and even the cancellation of projects.
- Many MSMEs were compelled to close their doors or restrict their activities as a direct result of the cancellation and postponement of projects. This was a major concern because the majority of construction firms and design studios are small and specialise in a certain style of structure.
- Despite the impact of COVID-19 restrictions and lockdowns on construction activity, India experienced 45 million square feet of new supply in 2020, with 36 million square feet coming from tier I cities and 8.9 million square feet from tier II and III cities.
- The 3PL and e-commerce sectors, which accounted for 62 percent of total absorption in 2020, continued to drive warehouse demand in 2021, with the manufacturing sector accounting for 14 percent. Delhi-NCR had the highest absorption rate among India's major cities in 2021, at 18%, followed by Pune at 15%. 14 percent and 11 percent absorption rates were recorded in Mumbai and Bangalore, respectively, with 20 percent in tier II and tier III cities.
- In 2021, industrial and logistics sector investments surpassed USD 1.5 billion, making it the second-largest receiver of such money after the office sector. This asset category has maintained its popularity due to its strong growth rate and regular returns.

The commercial real estate subsector is poised for growth as individuals return to the workplace and organisations adopt hybrid work arrangements. As more companies send their employees back to work, the demand for commercial office space gradually increases.

1.1.2 Types of Construction

The following are the types of construction:

a. Building construction:

Building construction is the act of adding a structure to undeveloped ground and adapting it for various uses, including residences, commercial buildings, garages, etc. The bulk of building construction projects involve minor improvements, such as adding a room, renovating a bathroom, enhancing a porch, etc.

There are differences between building construction projects, but there are some aspects and procedures that are universal. For example: design considerations, a budgetary estimate, and ethical and legal factors.

In the case of commercial building construction, multiple strategies are utilised. They consist of Design & Build, Cost Estimating, Competitive Bidding, Contract Management, Construction Management, and Design-Build Bridging (will be explained in detail later).

The governments of all states and nations have enacted laws and regulations governing the construction of both commercial and residential buildings. During the designing and building processes, these norms and regulations must be properly adhered to. The materials required for the construction process should be readily accessible at the construction site. Brick construction is the most common technique of house construction in India.

b. Industrial Construction:

Industrial construction represents a minor portion of the construction sector. Even so, it is regarded as quite vital. Planning the layout of an industry, establishing industrial sectors, installing heavy machinery, and planning and constructing the size of an industry are the procedures involved in industrial construction.

Fig. 1.1.1 Industrial Construction Site Plan

Infrastructure, power transmission and distribution, metallurgy and material handling, medicine, petroleum, chemical, power generation, manufacturing, etc. are the primary aspects to be considered.

This form of building requires extremely specific knowledge of planning, cost estimation, design, and construction. When a large construction business launches a project, it typically assigns the task of ensuring the project's success and safety to a team. Architects and civil engineers are employed to assist in the planning of construction projects. In this instance, construction entails the construction or assembly of infrastructure.

Large-scale building projects necessitate the completion of several jobs by a large number of individuals. Different jobs are provided to different teams. For instance, a Project Manager is responsible for Project management, while a Construction Manager oversees Project construction.

Additional examples include Design engineer, Project architect, and Financial Advisor. If a project is to be conducted successfully, the following must be ensured: Effective planning, successful scheduling, budgeting, construction site safety, availability of building materials, and logistics are essential for a successful construction project (that is transport of raw materials, etc).

c. Infrastructure Construction

Infrastructure, often known as heavy civil or heavy engineering, consists of massive public works, dams, bridges, highways, railroads, water or wastewater systems, and utility distribution. Civil engineering encompasses the design, building, and maintenance of the physical and naturally built environment, such as roads, bridges, canals, dams, tunnels, airports, water and sewage systems, pipelines, and railways.

Fig. 1.1.2 under Construction Bridge

The infrastructure sector is an important economic driver in India. The sector is largely responsible for driving India's overall growth, and the government has placed a great deal of emphasis on implementing laws that will expedite the establishment of world-class infrastructure in the country. The infrastructure sector consists of power, bridges, dams, highways, and the development of urban infrastructure. In other words, the infrastructure sector functions as a catalyst for India's economic growth by driving the expansion of associated industries such as townships, housing, built-up infrastructure, and construction development projects.

1.1.3 Market Segment of Construction Industry

Fig. 1.1.3 Market segments of construction industry

Notes

QR Codes

Scan the QR code to watch the video

https://youtu.be/yhjDhav4Pfw

Overview of Construction Sector in India

Unit 1.2: Role and Responsibilities of an Assistant Surveyor

Unit Objectives

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

1. Discuss the roles and responsibilities of an Assistant Surveyor.
2. Explain expected personal attributes required in surveying occupation.
3. Discover future possible progression and career development options of an Assistant Surveyor

1.2.1 Role of an Assistant Surveyor

An Assistant Surveyor is an individual tasked with offering assistance and support to a surveyor in a variety of surveying tasks conducted on-site prior to and during construction projects. The primary responsibilities of an Assistant Surveyor include aiding the surveyor in the execution of land and site surveys, gathering accurate measurements, and recording relevant data. This role involves collaborating closely with the surveyor to ensure that the surveying activities are carried out efficiently and accurately.

Fig. 1.2.1 Theodolite Surveying

1.2.2 Responsibilities of an Assistant Surveyor

An Assistant Surveyor assists the surveying team in ensuring accurate measurements, maintaining equipment, and facilitating the smooth progression of surveying activities during construction projects. The primary responsibilities are:

- **Handle Tools and Instruments:** Safely operate and manage various tools and instruments employed at the surveying site under the guidance and instructions of the surveyor. This involves ensuring the correct usage and proper maintenance of equipment to achieve accurate results.
- **Store Tools and Instruments:** Adhere to established standard procedures for the storage and maintenance of surveying tools and instruments. Proper storage ensures that equipment remains in good working condition and is readily accessible for future use.
- **Preparatory Works for Measurement:** Participate in preparatory tasks essential for measurement activities. These tasks might involve setting up equipment, arranging markers, and organizing the site to facilitate efficient data collection.
- **Assist in Linear Measurements:** Provide support in measuring distances and lengths accurately. This could include assisting with positioning measurement devices, recording measurements, and contributing to the collection of precise data.
- **Assist in Angular Measurement and Leveling:** Aid in the process of measuring angles and performing leveling tasks. This support could involve holding instruments steady, assisting with angle readings, and ensuring the instrument remains appropriately calibrated.
- **Assist in Setting Out:** Contribute to the execution of setting out activities according to the project's layout or work plan. This may entail marking reference points, ensuring alignment, and helping establish the groundwork for construction based on surveyed data.

1.2.3 Technical Skills for Job Role of Assistant Surveyor

A range of technical abilities are necessary for an Assistant Surveyor to properly contribute to surveying tasks on construction sites. The following technical abilities are necessary for an Assistant Surveyor:

- **Equipment Proficiency:** Skilled operation of surveying tools like total stations and GPS devices.
- **Measurement Techniques:** Accurate execution of linear, angular measurements, and leveling.
- **Data Collection and Recording:** Precise gathering and organized recording of survey data.
- **Spatial Awareness:** Understanding the layout and relationships within a construction site.
- **Map Reading and Interpretation:** Proficiency in reading and understanding construction plans and maps.
- **Basic Geodesy and Coordinate Systems:** Grasping foundational geodesy principles and coordinate systems.

- **CAD Software:** Familiarity with using CAD software for drawing and mapping.
- **Safety Regulations:** Adherence to safety rules specific to surveying and construction.
- **Mathematical Proficiency:** Strong mathematical skills for accurate calculations.

1.2.4 Personal Attributes for Job Role of Assistant Surveyor

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

- **Physical Fitness and Adaptability:** An Assistant Surveyor needs physical fitness for diverse conditions and the stamina to work outdoors while enduring extreme weather.
- **Resilience and Adaptation:** An Assistant Surveyor demonstrates resilience in unpredictable construction sites, staying focused amid challenges for continued positive contributions.
- **Team-Oriented:** Collaboration is vital; an Assistant Surveyor communicates, cooperates, and contributes within the construction team for accurate results.
- **Attention to Detail:** Precision matters; an Assistant Surveyor's keen eye prevents errors in measurements and data collection.
- **Problem-Solving Skills:** An Assistant Surveyor adeptly solves challenges on-site, enhancing surveying accuracy despite unexpected issues.
- **Communication Skills:** Effective communication - verbal and written - enables clear instruction, reporting, and collaboration.
- **Time Management:** Adhering to schedules, an Assistant Surveyor optimizes tasks and teamwork for productive surveying.
- **Safety Consciousness:** An Assistant Surveyor adheres to strict safety protocols, minimizing risks in hazardous construction environments.

1.2.4 Career Progression of Assistant Surveyor

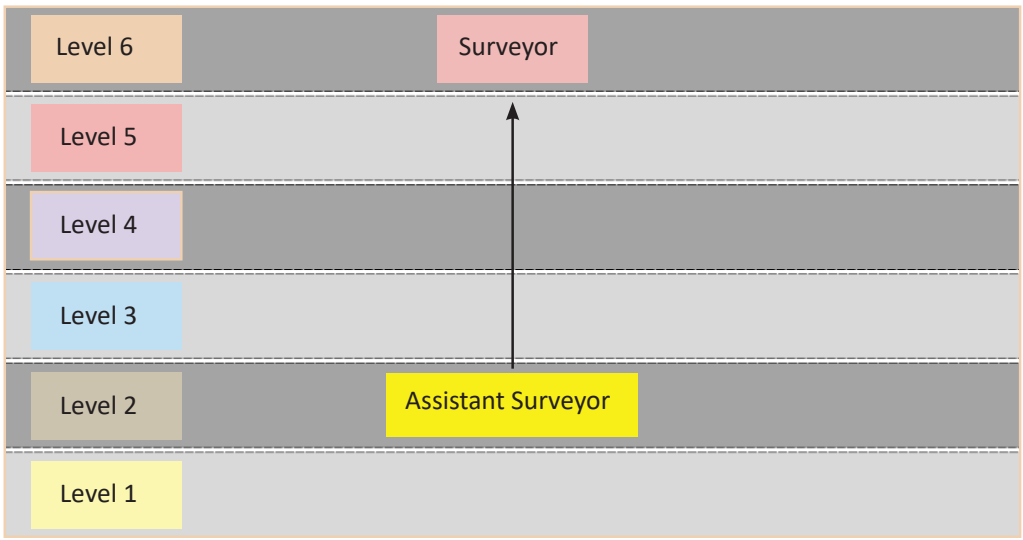

Fig 1.2.1 Career progression of an Assistant Surveyor

Exercise

Answer the following questions:

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

i. An Assistant Surveyor assists in various surveying tasks on construction sites.

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

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

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

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

B. Fill in the blanks

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

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

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

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

iv. An Assistant Surveyor 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

1. Show the career path of an Assistant Surveyor.

2. What are the roles and responsibilities of an Assistant Surveyor?

3. State few personal attributes required by Assistant Surveyor.

Notes

QR Codes

Scan the QR code to watch the video

https://youtu.be/T0fjjRmZ1DE

Assistant Surveyor Job and their responsibility

https://youtu.be/UipJHJrBf9A

Career In Land Surveying

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2. Handle and Store Surveying Tools and Instruments

Unit 2.1 - Linear Measurement Instruments I
Unit 2.2 - Levelling and Angle Measurement Instruments
Unit 2.3 - Miscellaneous Survey Tools and Instruments

CON/N0901

Key Learning Outcomes

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

1. Identify and handle various tools and instruments used in surveying.
2. Demonstrate handling, storing and stacking of surveying tools, instruments and materials.

Unit 2.1: Linear Measurement Instruments

Unit Objectives

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

1. List various tools and accessories such as chains, tapes, offsets, poles, compass, pegs etc. used in chain and compass surveying.
2. Explain the purpose and area of applications of linear measurement instruments.
3. Classify various instruments types of surveying instruments such as linear, level and bearing measurement instruments etc.
4. Explain the process and use of levelling accessories such as arrows and pegs.
5. Demonstrate handling of chains and tapes for precise reading.
6. Demonstrate handling of offsets, levelling equipment, angles, and angle measuring instruments and other tools and accessories used in surveying works.

2.1.1 Surveying

Surveying refers to the systematic process of measuring, mapping, and analyzing the physical characteristics of a piece of land or an existing structure. The primary goal of surveying in construction is to establish accurate and reliable data about the land, its features, and its surroundings. This data is then used for planning, designing, and implementing construction projects.

2.1.2 Types of Surveying

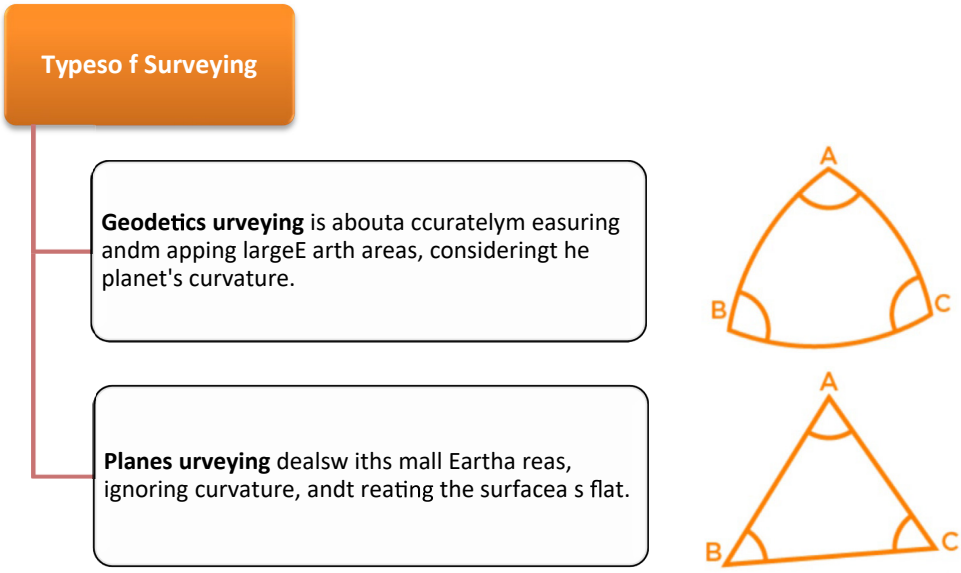


Fig. 2.1.1 Types of Surveying

2.1.3 Classification of Surveying

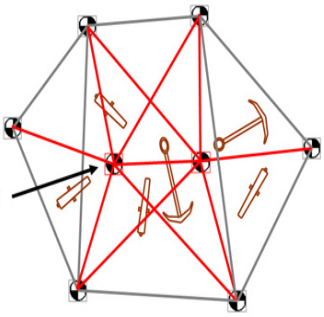
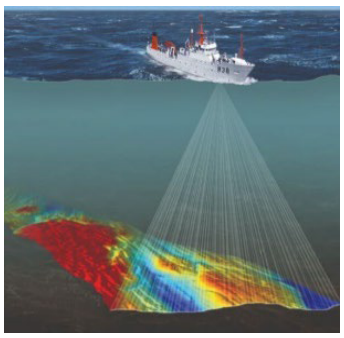
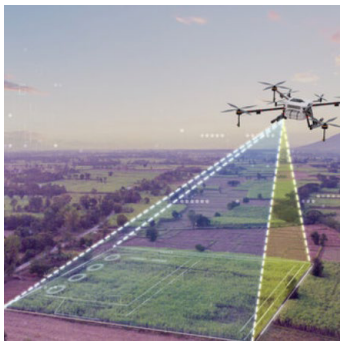
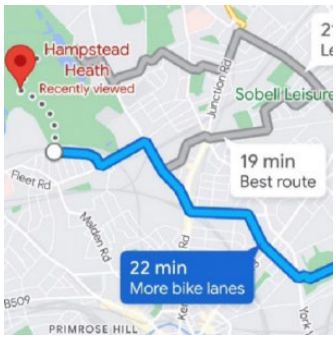
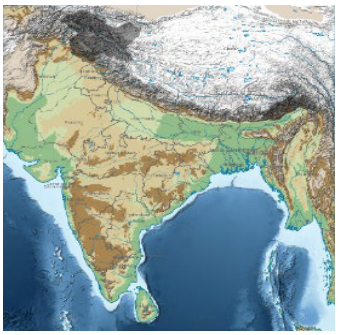
Based on Method or Nature of the Survey		
Astronomical	Boundary	Construction
		
Control	Hydrographic	Mining
		
Photogrammetric	Route	Topographic
		

Fig. 2.1.1 Types of Surveying Based on Nature of the Survey

Based on Survey Instruments		
Chain	Compass	Photographic
		

Plane Table	Theodolite	Tacheometer	Total Station
			

Fig. 2.1.2 Types of Surveying Based on Survey Instruments

2.1.3 Linear Measurements

Surveying is a critical field of study that involves precise measurements of various parameters on the Earth's surface. Linear measurement enables engineers and surveyors to determine the straight-line distances between two points on the Earth's surface.

Application of Linear Measurements:

Land Surveying	•Boundary establishment. •Property line delineation. •Creating accurate maps and surveys.
Construction	•Foundation layout. •Structural component dimensions. •Alignment during construction.
Engineering	•Infrastructure projects. •Meeting design and safety standards
Manufacturing	•Quality control of machined parts. •Ensuring product standards
Agriculture	•Crop spacing and field layout. •Land management practices.
Geology and Earth Sciences	•Studying geological features. •Fault lines and rock layers.
Architecture	•Creating detailed building plans. •Blueprint design.
Navigation and Cartography	•Accurate map and chart creation. •Navigational aids
Education and Research	•Teaching geometry, trigonometry, and surveying. •Supporting scientific experiments.
Sports	•Event course setup. •Measuring athletic performances.

Fig 2.1.3 Application of Linear Measurements

Pacing: Pacing in surveying is a way to quickly estimate distances between two points. The surveyor walks from one point to the other and counts their steps. They know how long each step is, so multiplying the number of steps by this length gives an approximate measurement of the distance between the two points. It's a handy method for rough measurements when precision isn't critical.

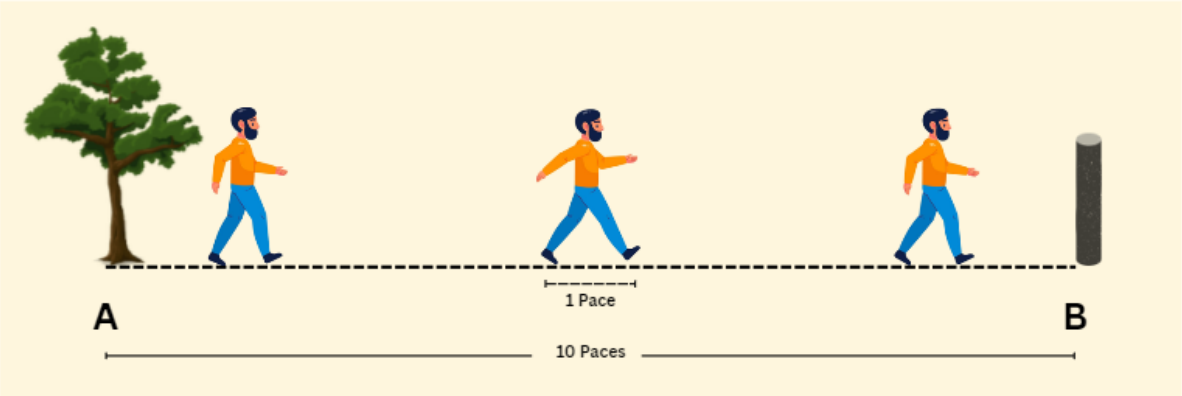


Fig 2.1.3 Pacing

2.1.4 Linear Measurement Instruments

Linear distance measuring tools are categorized on their accuracy. Different tools are available, like Pedometers, odometers, Survey chains, etc., which measure linear distance between objects. The primary purpose of linear measurement instruments is to accurately determine distances in a straight line between two points.

1. **Odometer:** An odometer is a tool used in surveying to measure distances. It works by counting the number of times a wheel connected to a handle revolves as the surveyor pushes it forward. The odometer displays the total number of wheel revolutions. The surveyor already knows the wheel's circumference. To figure out the distance covered, the surveyor simply multiplies the number of wheel revolutions by the known circumference.

Fig 2.1.4 Odometer

2. **Pedometer:** Pedometer is an electronic instrument used by the Surveyor for direct measurement while pacing. The Pedometer shows the number of steps taken during pacing. The Surveyor need not keep counting the steps taken while using a Pedometer. The number of steps shown in the Pedometer is multiplied by the distance which gives the required measurement.

Fig 2.1.5 Odometer

3. **Survey Chain:** The chain is a vital measuring instrument in land surveying and engineering, consisting of 100 links of 20 meters and 150 links of 30 meters, all constructed from 4mm diameter mild steel wire. Each link measures 20 centimeters and is connected by three circular rings to provide flexibility. Brass handles with swivel joints at the ends of the chain enable easy maneuvering without twisting.

Fig 2.1.6 Survey Chains

2.1.5 Chain Surveying

Chain surveying is a traditional method of land surveying that involves measuring distances and angles between locations on the ground with a chain or tape and a compass or theodolite.

It is mostly used in smaller mapping and field surveying projects to precisely locate land features. The distance between the points is computed using a chain or tape, and the angles are determined using a compass or theodolite.

The two most important equipment used extensively in Chain Surveying are

i. Chain

ii. Tape

The most common accessories used in chain surveying are:

i. Arrows

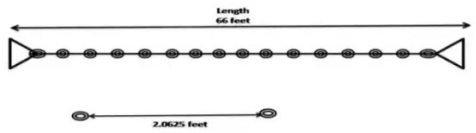
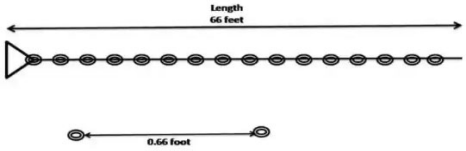
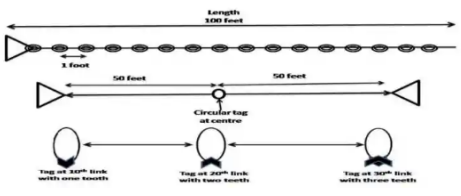
ii. Ranging Rod

iii. Wooden Pegs

iv. Offsets

2.1.6 Surveying Chain

A Surveying Chain, or simply a chain, is widely used for measuring distances where precision is not necessary. A chain is made up of several massive links composed of galvanised mild steel wire with a diameter of 4mm.

S.No.	Type of chain	Image	Length of chain	Number of links
1.	Revenue chain		33 ft	16 links
2.	Gunter's or Surveyor's chain		66 ft	100 links
3.	Engineer's chain		100 ft	100 links

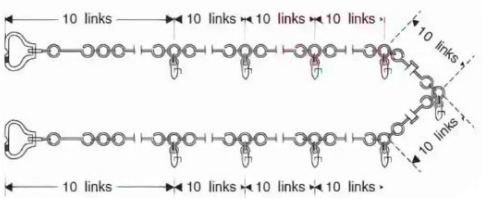
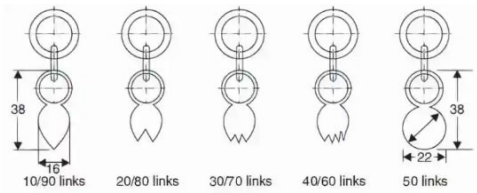
4.	Metric chain		20 m	100 links
			30 m	150 links

Table 2.1.1 Types of Survey Chains

2.1.7 Tapes

Tape is a flexible ruler used in surveying. It is used for measuring horizontal, vertical and slope distances. Tapes are available in different lengths. They are graduated in metres. Tapes are classified into four types according to the material. The different types of tapes are as follows:

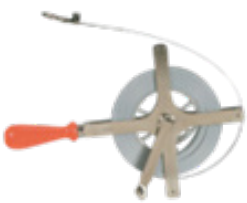
S.No.	Type of chain	Image	Composition/ Features	Length Range	Main Applications
1.	Linen/Cloth Tape		Linen or cloth material with brass handle at zero end	Variable	Subsidiary measurements like offsets
2.	Invar Tape		Steel (64%) and nickel (36%) alloy, 6mm width	30m, 50m, 100m	High-precision work
3.	Metallic Woven Tape		Varnished linen with brass, copper, and bronze wires	Variable	General surveying
4.	Steel Tape		Steel ribbon (1.6mm to 16mm), marked in millimeters	2m, 3m, 5m, 30m, 50m	Linear measurement

Table 2.1.1 Types of Tapes

2.1.8 Arrows

Arrows are made of steel wires of 4mm diameter. They vary from 400mm - 600mm length. They are pointed at one end for fixing in the ground. The other end is bent into a ring for easy handling. It is used to mark the ends of the chain during the process of chaining. Each chain is accompanied by 10 arrows.

Arrows should have a piece of white or red tape or cloth tied to the ring. Colour cloth/tape helps arrows to be easily visible at a distance.

When longer lines are measured, coloured ribbons are tied for easy visibility.

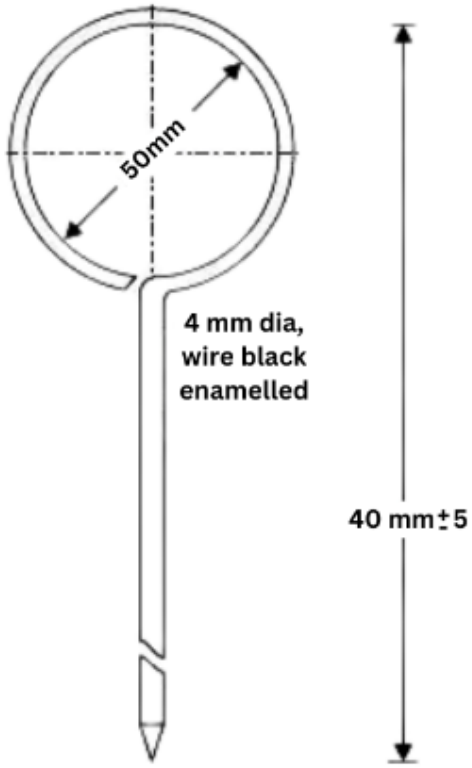


Fig 2.1.7 Arrows

2.1.9 Ranging Rod

Ranging Rod is a wooden / steel pipe of 2 or 3m length and 30mm diameter. It is painted with red and white or black and white at 200mm intervals.

1. The bottom of the rod is fixed with sharp metal shoe. It rigidly fixes the rod in the ground.
2. A flag is tied on the top for visibility when it is more than 200m in distance.
3. It is used for marking the position in chaining. It is used for fixing intermediate points in ranging. Colour flags are fixed in ranging rods to identify them easily while measuring long distances (more than 200m).

Fig 2.1.8 Ranging Rod

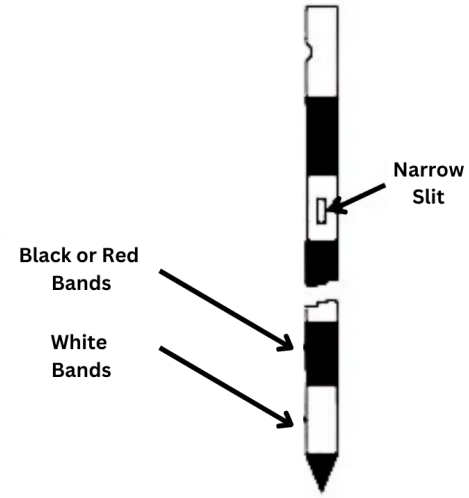


Fig 2.1.9 Offset Rod

Ranging Poles: Ranging Poles are similar to ranging rods, but are heavier. They vary in length from 4-6m or more. They are used to view length of the line.

Offset Rod: It is similar to a ranging rod with a hook at the top. It is used for pulling or pushing the chain through hedges and other obstructions. It is also used for aligning offset line and measuring short offsets.

2.1.10 Wooden Pegs

Wooden pegs serve as essential tools in surveying to mark station points. These pegs are firmly driven into the ground, providing precise location references for various layout tasks. With a pointed end for easy insertion into the soil, they typically measure between 450 to 600mm in length and have a section size of 50mm x 50mm. These pegs are crafted from either country wood or hardwood.

Fig 2.1.10 Wooden Pegs

Types of Pegs:

i. **Indicator Pegs:** Commonly used on development sites, these pegs have white-colored markings on top for easy identification.

ii. **Boundary Pegs:** These are often used to mark new boundaries created as part of sub-divisions. Boundary pegs include point, paint and chamfer.

iii. **Residential Pegs:** These are used to indicate the exact location for residential property. They are usually painted in white. They come in number of lengths.

Fig 2.1.11 Indicator Pegs

Fig 2.1.12 Boundary Pegs

Fig 2.1.13 Residential Pegs

Driving the Wooden Pegs

Wooden pegs should be driven into the ground using a sledgehammer exactly in a vertically upright position.

i. The pegs should project above the surface of the ground up to 300mm or 30 cm.

ii. Once the pegs are driven into the ground, concrete must be laid around the peg for consolidation.

iii. Once the pegs are firmly fixed on the ground, the points over the peg can be fixed.

iv. Nails can be fixed over the exact point for easy identification.

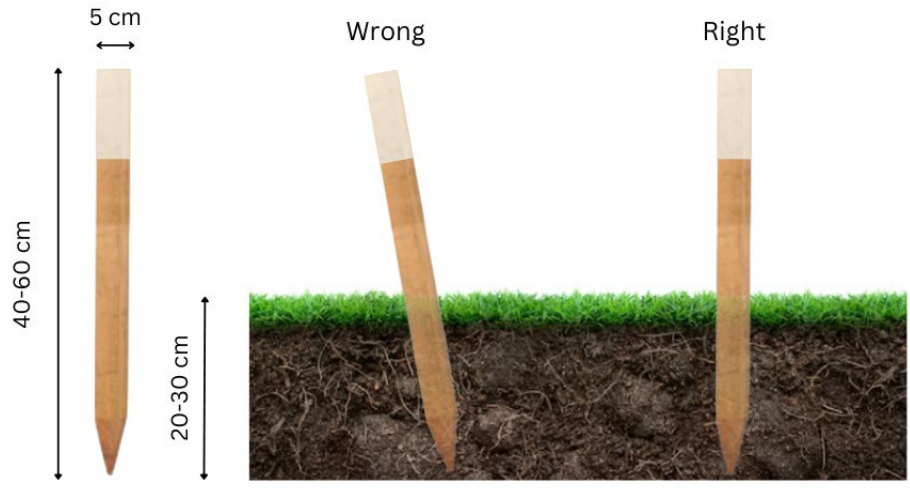


Fig 2.1.14 Driving the pegs in the ground

2.1.11 Offsets

The lateral distance measured from the chain line to the object is called as offset. Offsets are classified according to direction and length.

The process of measuring lateral distances from the chain line to the object which is to be plotted is called as offsetting.

Based on the direction of chain line, offsets can be divided into two types:

i. **Perpendicular Offsets:** These are distances measured at right angles to the chain line from objects. Perpendicular offsets are typically used to record measurements that are perpendicular to the main survey line, providing valuable data in surveying tasks.

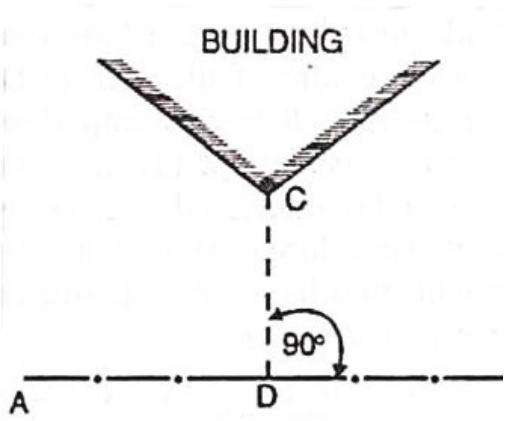


Fig 2.1.15 Perpendicular Offsets

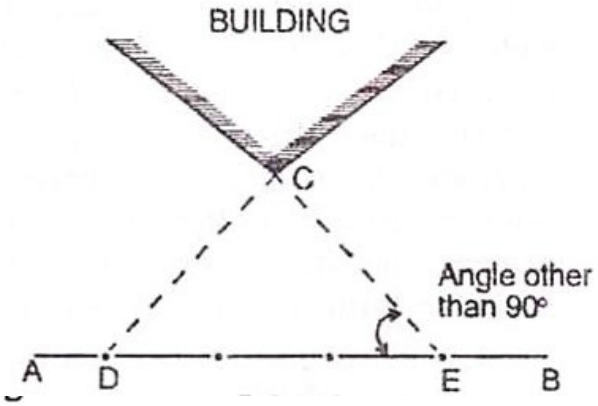


Fig 2.1.16 Oblique Offsets

ii. **Oblique Offsets:** Objects that are not aligned at right angles to the main survey line are referred to as oblique offsets or tie line offsets. These offsets are often employed when the object of interest is at a significant distance from the chain line or is of particular significance, such as a building's corner.

Based on length of chain line, offset can be:

i. Short offsets are less than 15mm in length.

ii. Long offsets are more than 15m in length

2.1.12 Cross Staff

A cross staff, also known as Jacob's staff or a surveyor's staff, is a historical measuring instrument used in land surveying and navigation. It consists of a long, straight staff with a transverse bar that can be adjusted along its length. The primary purpose of a cross staff is to measure angles, specifically the angular distance between two points.

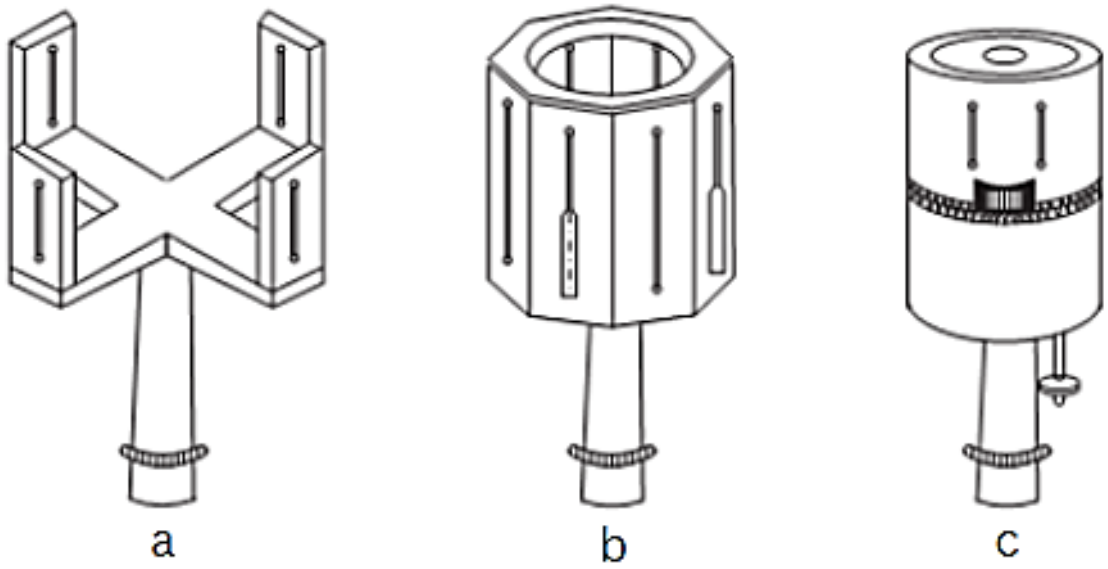


Fig 2.1.17 Types of Cross Staffs a. Open Cross Staff, b. French Cross Staff, c. Adjustable Cross Staff

Types of Cross Staffs Perpendicular Offsets:

- **Open Cross Staff:** This straightforward instrument aids in setting perpendicular offsets along the chain line without the need to alter angles. It offers simplicity and reliability for precise measurements.
- **French Cross Staff:** The French cross staff extends its utility by allowing the establishment of even 45° angles with precision, making it an ideal choice for a range of surveying applications.
- **Adjustable Cross Staff:** The adjustable cross staff offers unparalleled versatility by permitting the setup of angles at any degree. It features graduated markings, and the upper drum can be smoothly rotated over the lower drum, facilitating precise angle adjustment in various surveying tasks.

2.1.13 Compass Surveying

Compass is a small instrument which consists of a magnetic needle, a graduated circle and a line of sight.

Compass surveying is a method of land surveying that uses a compass and a chain or tape to measure horizontal angles and distances. It is primarily used for small-scale surveys and is suitable for relatively flat terrains.

Types of Compass

i. **Surveyor Compass:** The surveyor's compass is mainly used in mine surveying, and it's not commonly used for other types of surveys. Its key parts and construction are quite similar to a prismatic compass, with a few differences.

ii. **Prismatic Compass:** Prismatic compass is a navigation and surveying instrument which is extensively used to find out the bearing of the transferring and included angle between them.

Functions of Prismatic Compass:

- The magnetic field aligns with the magnetic meridian. (N-S Direction)
- The line of sight is the line joining the object vane and eye vane.
- The angle between N-S direction and the line of sight is observed in the compass.
- Nowadays, only the Prismatic Compass is used for surveying.

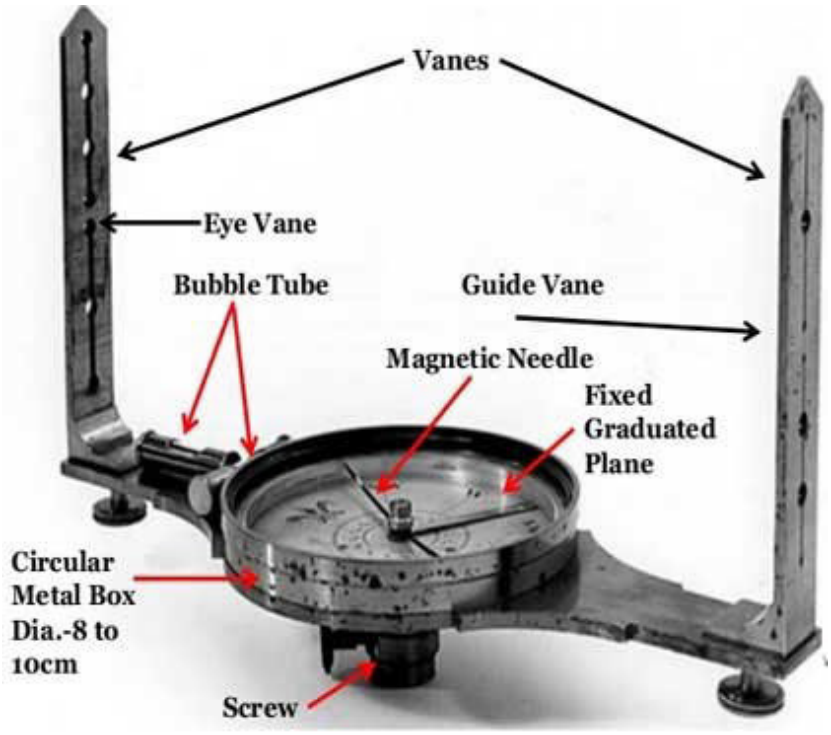


Fig 2.1.18 Prismatic Compass

Notes

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Instruments used in Chain Surveying

Unit 2.2: Levelling and Angle Measurement Instruments

Unit Objectives

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

1. List the various level and bearing measuring instruments such as dumpy level, auto level, tilting level, etc.
2. Explain the process and use of levelling accessories such as levelling staff, arrows and pegs.
3. List various level and angle measuring instruments like tachometer, theodolite, total station, etc.
4. Demonstrate handling of offsets, levelling equipment, angles, and angle measuring instruments and other tools and accessories used in surveying works.

2.2.1 Levelling Instruments

Levelling instruments are instruments that are widely used in surveying and construction to measure height differences and to transfer, measure, and set heights of known objects or marks. Levelling instruments are used to obtain a horizontal line of sight. Vertical distances of the points above or below the line are measured using tapes. At present, electronic auto levels are used in projects.

Levelling instruments are available in various types which are as follows:

- **Dumpy level:** Dumpy levels are the most common levelling tool. In this level, the telescope is fastened to its support and cannot move horizontally. Top of telescope has bubble tube. The levelling head can be rotated horizontally with the telescope. Internal focusing telescopes have four major pieces in a metal tube: Objective lens, Lens negative, Diaphragm and Eye-piece.

Fig 2.2.1 Dumpy level

- **Tilting level:** Tilting level telescopes may rotate horizontally and vertically by 4 degrees. This level makes bubble centering easy. Every arrangement requires a tilting screw to centre the bubble. Tilting levels are excellent for taking a few observations with one level configuration.

Fig 2.2.2 Tilting level

- **Auto level:** The automatic level resembles a dumpy level, with a fixed telescope. You can attach a circular spirit for rough leveling or a compensator inside for precise leveling. The compensator, also known as a stabilizer, has two fixed prisms that establish an optical path between the eyepiece and objective, aiding automatic leveling.

Fig 2.2.2 Tilting level

2.2.2 Levelling Staff

A leveling staff is a straight, rectangular rod marked in meters, starting at zero at its bottom end. It's crafted from seasoned wood or high-grade aluminum and serves to ascertain the height or depth relative to the line of sight. Various types of markings are present on the staff, with the staff's midpoint serving as the reference for readings.

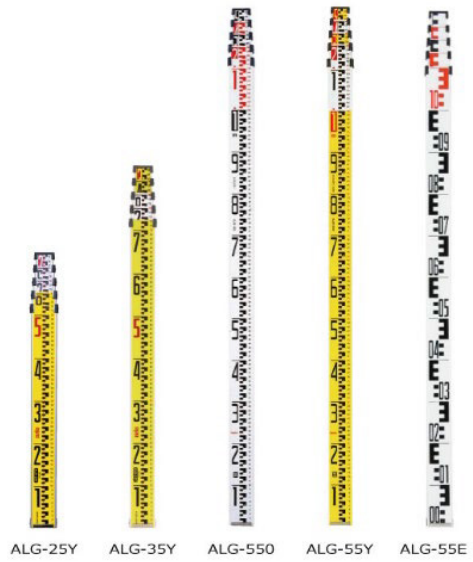

Fig 2.2.4 Levelling Staff

Fig 2.2.5 View of levelling instruments with staff

Marking Staff

i. **Locating the staff as per instruction:** Fig 2.2.4 shows the location of the point as instructed by the Surveyor. Placing the staff in the exact point as instructed: As instructed by the surveyor, the staff man holds the staff exactly at the point.

ii. **Holding the staff in the vertical position:** The levelling staff should be fixed in the exact location by holding the staff exactly vertical over the point.

iii. **Hand signals for Levelling staff:**

   a. Hold the staff vertically.

   b. Check verticality of the staff with the vertical hair and adjust it with the use of hand signals as shown in Fig 2.2.7.

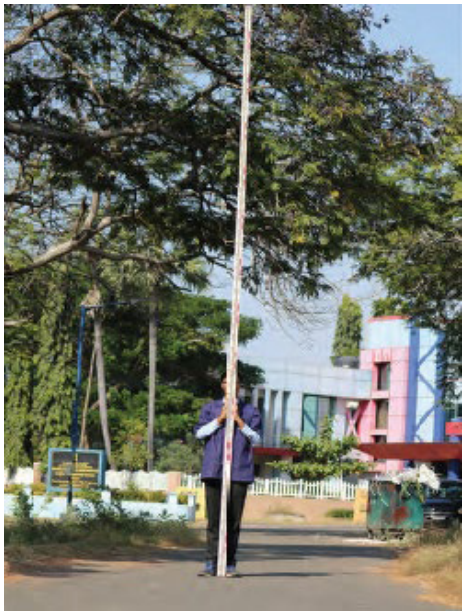

Fig 2.2.6 Locating the Staff

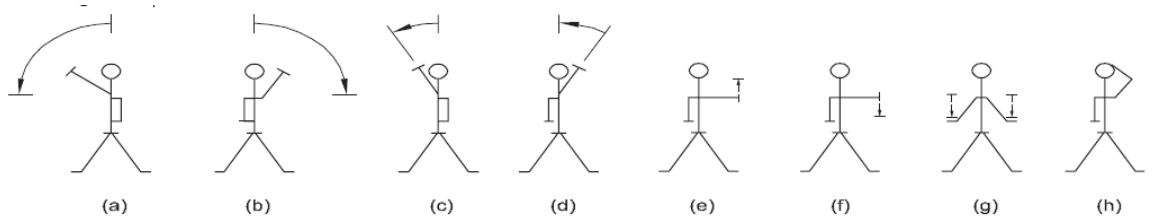

Fig 2.2.7 Hand Signals

S.No.	Signal	Message / Meaning
1.	Movement of the left arm over 90°	Move to the left
2.	Movement of the right arm over 90°	Move to the right
3.	Movement of the left arm over 30°	Move top of staff to the left
4.	Movement of the right arm over 30°	Move top of staff to the right
5.	Extension of one arm horizontally and moving the other hand upwards	Raise height of peg or staff
6.	Extension of one arm horizontally and moving the other hand downwards	Lower height of peg or staff
7.	Extension of both arms and slightly thrusting them downwards	Establish the position
8.	Extension of both arms and placement of one hand on top of the head	Return to the Surveyor

Table 2.2.1 Meaning of the Hand Signals

2.2.3 Tripod

The figure 2.2.6 shows a Surveyor's tripod which comes with a shoulder strap. The head of the tripod supports the instrument. The bottom of the legs spiked to anchor the tripod on the ground. Modern tripods are made of either aluminium or wood. The tripod is placed at the required location. Once the tripod is securely positioned, the survey instrument is placed on the head. Example, levelling instrument, total station etc.

The mounting screw is screwed tight once the instrument is placed in the correct position. The flat surface of the tripod head is called the foot plate. It is used to support the adjustable legs of the instrument.

Positioning the tripod and the instrument over the station point requires lot of practice.

Fig 2.2.6 Tripod

2.2.4 Angle Measuring Survey Instruments

Survey instruments used for measuring angles include theodolites, total stations, and compasses. These tools are essential for determining horizontal and vertical angles in surveying and mapping tasks. Different types of angle measuring survey instruments are:

i. Theodolites

ii. Tacheometer

iii. Total Station

2.2.5 Theodolite

The Theodolite is an instrument used by Surveyors for precise measurements. They are used to measure horizontal or vertical angles or both.

The main parts of a theodolite include the telescope, trunnion axis, vernier frame, vertical circle, plate levels, A-frame or standards, upper plate (vernier plate), upper clamp screw, lower clamp screw, tripod, lower plate (scale plate), leveling head, clip screw, altitude level tube, plumb bob, compass, shifting head, two spindles or axes, tangent screw, foot screw, tribrach, and spirit level, which collectively enable precise measurement of horizontal and vertical angles in surveying and engineering applications.

Fig 2.2.6 Theodolite

Types of Theodolites

A. Based On The Movement Of The Telescope On The Horizontal Axis In A Vertical Plane
   i. Transit Theodolite
   ii. Non-Transit Theodolite

B. Based On An Arrangement To Measure The Angles
   i. Vernier Theodolite
   ii. Micrometer Theodolite
   iii. Electronic digital Theodolite

2.2.6 Tacheometer

A tacheometer, also known as a tachymeter, is a versatile instrument employed for precisely measuring horizontal and vertical distances through angular observations. Its utility shines in rugged and challenging terrains, making it an indispensable tool for tasks such as locating contours in hydrographic surveys. Additionally, tacheometers play a pivotal role in infrastructure development, aiding in the precise alignment and grade calculations required for highway and railway route construction.

Fig 2.2.7 Tacheometer

2.2.7 Total Station

Total Station is an assembly of a short to medium-range EDM (Electronic Distance Measurement) instrument. It is installed in the framework of an electronic Theodolite. All components are under the control of a built-in microprocessor. This single instrument permits observing distances and directions from a single setup.

Total Stations are used for measuring distances and angles.

Total stations are used in setting out the Survey after establishing northing and easting coordinates at sites. Initially recording has been done by analogue method and it is been replaced by digital data collection in surveying.

Basic components of Total Station:

i. An Electronic Distance Measurement (EDM) instrument.

ii. An electronic angle measuring component.

iii. A computer or microprocessor

iv. Prism set - Prism, Prism holder, Centering rod.

Fig 2.2.8 Total Station

Fig 2.2.7 Prism with Holder

Fig 2.2.7 Total Station Set

Notes

QR Codes

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https://youtu.be/j8poe2vvD2Q

Introduction to Leveling

Unit 2.3: Miscellaneous Survey Tools and Instruments

Unit Objectives

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

1. Demonstrate handling of miscellaneous instruments such as those used in GPS, photogrammetry and transit surveys.
2. Demonstrate storing and stacking of surveying tools and instruments.
3. Demonstrate handling, stacking and storing different surveying materials such as lime, strings, hurdles, and paints etc. as per standard practices/instructions.

2.3.1 Global Positioning System (GPS)

For thousands of years, navigators have depended on the sky for direction. Today, celestial navigation has moved from natural objects to man-made technology. A satellite based navigation called GPS and hand held receivers help in very accurate navigation.

GPS is a satellite based navigation system. It is a network of 24 satellites placed into orbit by the U.S. Department of Defence. It continuously transmits coded information. It makes it possible to precisely identify locations on the earth. It helps in measuring the distance from the satellites.

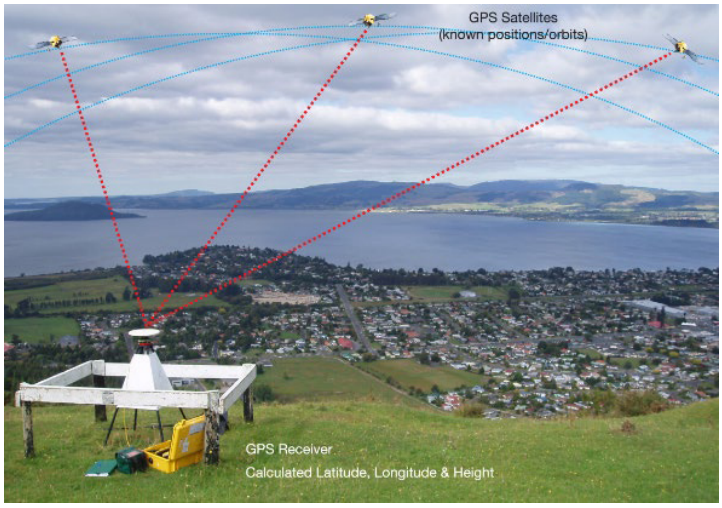

Fig. 2.3.1 Locating exact station by GPS

2.3.2 Photogrammetry

Photogrammetry is used in analysing aerial and terrestrial photographs. Gathering information about physical objects and the environment are possible in this method. It is used in fields such as topographic mapping, architecture, engineering, manufacturing, quality control, police investigation and geology.

There are many uses for non-aerial or close range photogrammetry. This includes:

i. Digital modeling for architectural restoration.

ii. Medical imaging for forensic sciences and reconstructive surgery.

iii. Data collection for structural stability studies of bridges.

iv. Data collection for structural stability studies of hydroelectric dams.

v. Documentation of traffic accidents.

vi. Documentation of crime scenes by the police department.

Fig: 2.3.2 shows aerial ground surveying. Fig: 2.3.3 shows the aerial photograph taken during heavy rain, to estimate the damage caused.

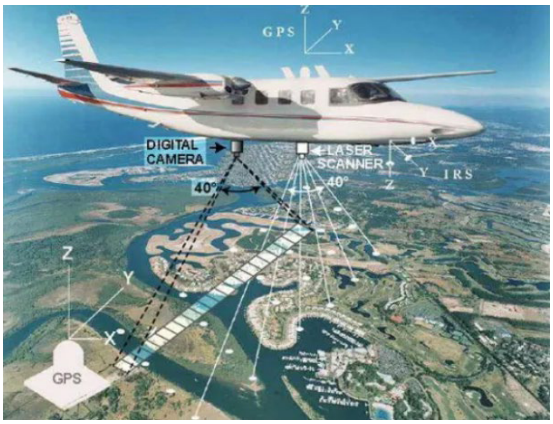

Fig. 2.3.2 Air Surveying

Fig. 2.3.3 Aerial view of water-logged area

2.3.3 Transit (Satellite)

The development of the transit system started in 1958. Transit 1A was launched in September 1959. It failed to reach the orbit. Transit 1B was launched on April 13, 1960. Surveyors used Transit to locate remote benchmarks.

The elevation of Mount Everest was corrected in the late 1980s by using a Transit receiver to re-survey. The Transit system has been replaced by the Global Positioning System (GPS) from 1996. Improvements in electronics allowed GPS receivers to effectively take several fixes.

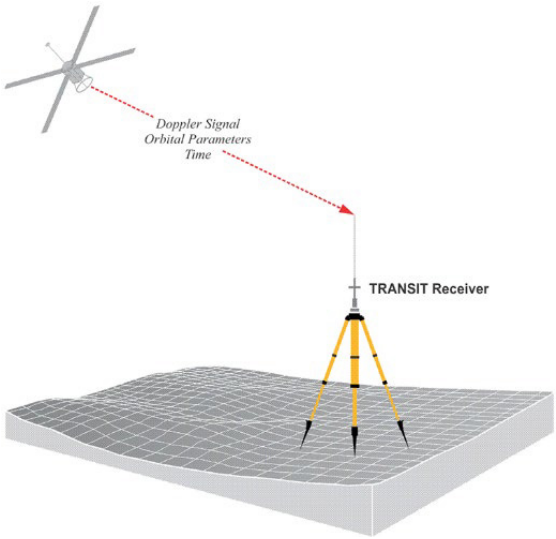

Fig. 2.3.4 Transit Surveying

2.3.4 Storing Survey Instruments

Surveying equipment are used under most stressful conditions. The equipment is exposed to extreme weather conditions. It is used in dusty construction areas and is subject to bumpy transportation. The methods in which the equipment is used, stored, transported, and adjusted contributes to the successful completion of the survey.

- Suitable storage racks and shelves should be provided to store the instrument in a safe manner.
- Storage racks and shelves should be non-combustible. They should not retain water.
- Separate storage room should be provided with proper racks and shelves to store the survey instruments and tripods.
- Proper tags should be provided to identify the instruments and tripod.
- Tripod should be properly tied with the belt provided in the stand. It should be kept in the vertical position racks.
- Lack of good maintenance leads to unjustified replacement costs. It also seriously affects the efficiency and accuracy of the entire survey.
- The maintenance of all surveying instruments, equipment, tools, and supplies should be taught.

Fig 2.3.5 Storing the instrument in racks

Fig 2.3.6 Storing surveying instrument in shelves

Fig 2.3.6 Storing surveying accessories

2.3.5 Storing different Surveying Tools and Materials

Suitable storage racks and a proper box with lock and key are to be provided to store smaller tools like tape, Spirit Level, and other tools. A tool box is to be provided to store small tools and tackles.

The details of storing different tools is as follows:

i. **Hammer:** Hammers are to be stored in shelves. The handle should be kept upright and vertical. It should be stored on the basis of its type and weight to identify and handle easily. Tags may be fixed in the racks for easy identification.

ii. **Pencils, Scales:** All tools should be kept in the relevant covers/boxes and stored in closed containers in the racks. Measuring Tapes: Store a tape in a dry place. Moisture will cause the steel components to rust. If a theape is wet, wipe it with a soft cloth.

iii. **Plumb Bob, Spirit Level:** Both the tools should be kept in respective toolboxes and stored in the related racks.

iv. **Wooden Peg:** Wooden pegs should be stored in a bundle. The bundle should be kept in the racks. Proper tags are to be provided according to the material and size.

v. **Enamel Paint:** Enamel paint should be kept separately in small containers. The containers should not be kept open as paint may dry and become hard.

vi. **Brushes:** Brushes are to be stored in separate covers according to the size of the brush.

vii. **Red oxide powder:** It is available in 500gm packets. It should be stored separately in an air-tight box.

viii. **Line dory / Thread:** It should be kept as a roll in a thin wooden piece for different works. It should be stored separately in a box.

ix. **Lime / Chalk Powder:** It should be stored in gunny bags separately. Lime should be handled carefully using hand gloves. If lime is used without wearing gloves, it may cause injury to the hands. Outdoor storage should be avoided.

Fig 2.3.5 Storage racks

Exercise

Answer the following questions:

A. Short Answer Questions

1. List the equipment and tools used in chain surveying?
2. What is the purpose of linear measurement instruments?
3. What is the primary function of a theodolite in surveying?
4. What are the different types of cross-staff?
5. What are the different types of tapes?

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

1. Cloth tapes are very strong.
2. Open cross staff helps to set even 45° angles.
3. Tapes and rulers are used to measure only vertical distances.
4. White or red tape or cloth tied to the ring helps the arrows to be easily seen from a distance.
5. Ranging rods are used for chaining and fixing intermediate points in ranging.
6. Offset rods help in pushing the chain through obstructions.

Notes

QR Codes

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https://youtu.be/78VQvIKjtmU

GPS Surveying

https://youtu.be/6WoT5C0nveQ

Photogrammetry For Mapping & Surveying

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

3. Provide Support in Various Surveying Works

Unit 3.1 - Preparatory Works Prior to Surveying
Unit 3.2 - Assist in Linear Measurement of Distances and Lengths
Unit 3.3 - Angular Measurement, Levelling and Setting out

CON/N0902

Key Learning Outcomes

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

1. Explain the standard procedures of levelling, linear and angular measurements.
2. Demonstrate placement and fixing of tripod.
3. Demonstrate initial setup and fixing of staff for angular measurement and levelling.
4. Demonstrate layout marking for setting out.

Unit 3.1 Preparatory Works Prior to Surveying

Unit Objectives

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

1. Explain selection of tripods based upon the instrument to be used.
2. Describe importance of placing the tripod at the exact location of marking.
3. Demonstrate selection and shifting of tools and materials to the instructed location.
4. Demonstrate placing and fixing of tripod on the marked location.
5. Demonstrate unfolding of the chain as per standard practices.

3.1.1 Lifting and Shifting Surveying Tools and Instruments

Lifting Tripod

i. Tripod is lifted manually using both the hands.

ii. While lifting the tripod, one leg of tripod should be behind the shoulder and the other two legs should be placed in the front side of the shoulder.

Fig. 3.1.1 Lifting Tripod

Shifting tripod

i. While shifting the tripod, it should rest on the right side shoulder to prevent it from falling.

ii. While shifting the tripod, one leg of the tripod should be in the front side of the shoulder. The other two legs should be at the back side of the shoulder.

Fig. 3.1.2 Shifting the Tripod

Shifting ranging rod and empty instrument box

i. While shifting the ranging rod, it should be in the slant position and the ranging rod's top should face the sky and the bottom should face the ground.

ii. While shifting the instrument box manually, the box should be in the closed position. The handle of the box should be held in one hand at a minimum height.

Shifting box with instruments

i. While shifting the box with the instruments manually, the handle of the box should hang on the right-hand shoulder.

Fig. 3.1.3 Shifting the Tripod

Fig. 3.1.4 Shifting box with instruments

Tripod fixed over the located point

The tripod is placed in the required location. The Surveyor will press down the legs on the platform to securely anchor the tripod legs in the soil. The Surveyor may force the legs to a lower position on an uneven marked placement. The legs are adjusted to bring the tripod head to a convenient height. It is fixed roughly in level.

Fig. 3.1.5 Tripod fixed over the located point

Fig. 3.1.6 Placing over the located point and adjusting the instrument.

Tripod with instruments fixed over the located point

Once the tripod is positioned and secured the Survey instrument is placed on the head. The mounting screw is pushed up under the instrument to attach the instrument. The base or screw is tight when the instrument is in the correct position.

Tripod with the instrument is placed on the located point and the instruments are adjusted by the Surveyor.

i. Check if the plate bubble of the instruments is in the center of the circle.

ii. If the bubble is not in the centre of the circle, adjust the foot screw at 180° and 270°. Finally, at 360°, see that the plate bubble is in the center of the circle from all directions.

iii. If the plate bubble is in the centre from all directions, then the instrument is ready for starting the surveying work.

3.1.2 Selection of Tripods

The selection of an appropriate tripod for surveying instruments demands careful consideration of the instrument type, aiming to optimize performance and ensure precision in surveying endeavors:

1. **Theodolites:**
    - Theodolites, which are central to angle measurement in surveying, necessitate a robust and stable tripod with adjustable telescopic legs.
    - Stability is paramount for the accuracy of angle measurements, which are foundational to the theodolite's function.

Fig. 3.1.6 Theodolite with Tripod

2. **Total Stations:**
    - For total stations, instruments that combine electronic distance measurement with angle measurement capabilities, the tripod selection should balance stability and portability.
    - An ideal tripod for total stations possesses adjustable legs, facilitating precise height adjustments, and features a flat head for expedited setup and alignment.

Fig. 3.1.7 Total Station with Tripod

3. Levels (Leveling Instruments):

- In the context of leveling instruments, including automatic and digital levels, tripod selection must prioritize the preservation of measurement accuracy during leveling activities.
- Tripods with adjustable legs and flat heads are the preferred choice, with sturdiness being a critical attribute to ensure the integrity of the leveling process.

Fig. 3.1.8¬ Dumpy Level with Tripod

4. GPS Receivers:

- GPS receivers, central to geospatial positioning, demand tripods that offer a harmonious blend of stability and lightweight construction.
- These tripods typically feature telescopic legs for enhanced portability and should be compatible with the mounting mechanisms of GPS receivers, aligning with the need for both stability and ease of use.

Notes

QR Codes

Scan the QR code to watch the video

https://youtu.be/YmRcexxCZnA

How to Setup a Surveying Tripod over a Point

https://youtu.be/gxtLTIktem4

Surveying Stake Out for Beginners

Unit 3.2 Assist in Linear Measurement of Distances and Lengths

Unit Objectives

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

1. Explain standard procedure for linear and angular measurements.
2. List different types of staffs to be used for different types of instruments.
3. Describe different method of holding the staff.
4. Demonstrate liner measurements of distances using chains, ranging rods and arrows, while properly interpreting the hand signals.
5. Demonstrate initial setting up of instruments and fixing of staff for capturing reading in angular measurement and levelling.

3.2.1 Staffs

Different types of staffs are used in surveying to match various types of surveying instruments and measurement methods. Here are some common types of staffs used for different instruments and applications:

i. **Leveling Staff:** Used with leveling instruments such as dumpy levels, automatic levels, and digital levels to measure height differences or elevations.

ii. **Total Station Prism Pole:** Paired with total stations for measuring distances and angles simultaneously, commonly used in land surveying and construction.

3.2.2 Holding the Staff

1. Two-Person Method:
   - This is a traditional and widely used method.
   - Requires two people: one to hold the staff and another to operate the surveying instrument (theodolite or level).
   - The person holding the staff positions it vertically at the designated point.
   - The instrument operator takes measurements through the telescope while ensuring the crosshairs align with the staff graduations.

Fig. 3.2.1 Two-Person Method

2. **One-Person Method:**

- Suitable for single-person surveying tasks where it's not possible to have an assistant.
- The surveyor uses a staff with an adjustable stand or tripod base.
- The staff is placed in a secure and stable position, and the surveyor operates the instrument and takes measurements independently.

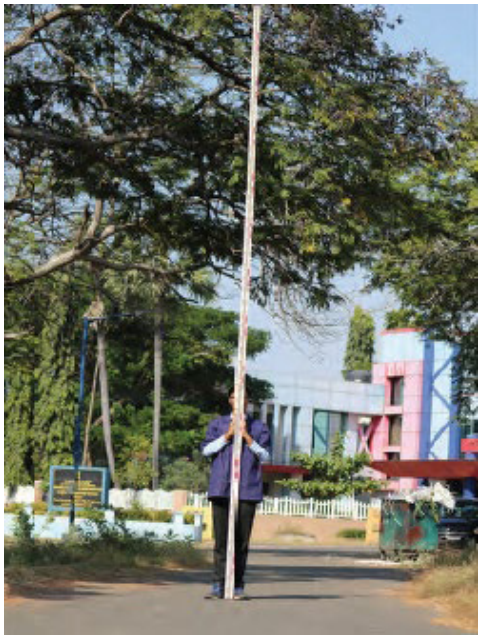

Fig. 3.2.2 One-Person Method

3. **Two-Person Autofocus Method:**
    - Used with modern instruments that feature autofocus capabilities.
    - One person holds the staff and positions it approximately in the target area.
    - The instrument operator activates the autofocus feature, allowing the instrument to automatically focus on the staff.
4. **Reflective Prism Method:**
    - Commonly used with total stations equipped with reflectorless capabilities.
    - The surveyor holds a prism target atop the staff.
    - The instrument sends a laser beam to the prism, and the reflected beam is used for distance and angle measurements.

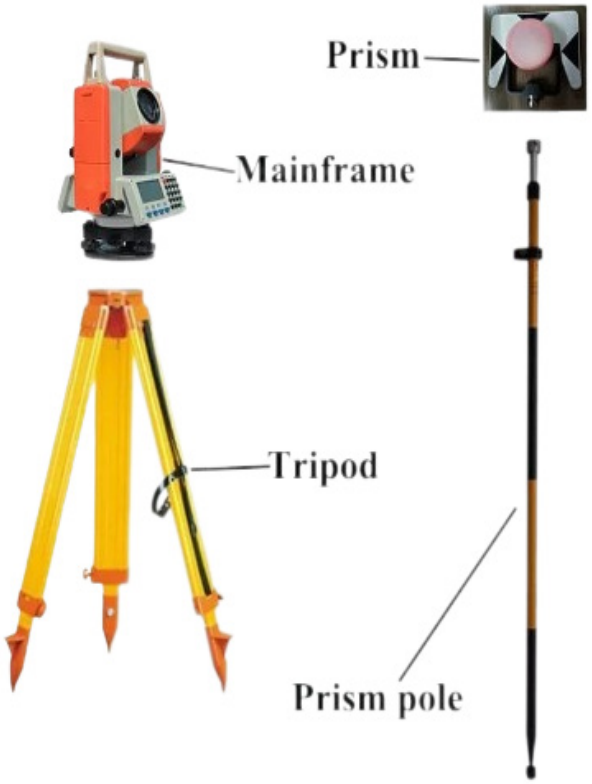

Fig. 3.2.3 Reflective Prism Method

5. **Pole Method:**
    - Used with GPS surveying equipment.
    - The surveyor attaches a GPS antenna or receiver to the top of a surveying pole.
    - The pole is positioned at the survey point, allowing the antenna to receive satellite signals.

3.2.3 Handling Chains for Reading

Making a chain: The chaining procedure necessitates the use of two chain men. The person at the front of the chain is referred to as the leader. The person on the other end is referred to as a follower.

Unfolding and Stretching:

i. Hold both chain handles with the left hand.

ii. Move backward, extending the chain.

iii. Toss the right-hand portion forward.

iv. Instruct the assistant to take one handle and move forward, stretching the chain.

v. Bring the handles together.

Reading the Chain (Measuring):

i. The follower keeps one end of the handle.

ii. The leader jerks and straightens the chain to its full length.

iii. Measure the required distance using the chain.

iv. Record the distance.

Folding the Chain:

i. After work, the assistant holds the chain's middle with the left hand.

ii. Use the right hand to take two pairs of links starting from the middle.

iii. Arrange them in a zigzag pattern until all pairs reach the left hand.

iv. Secure the chain handle with a leather strap.

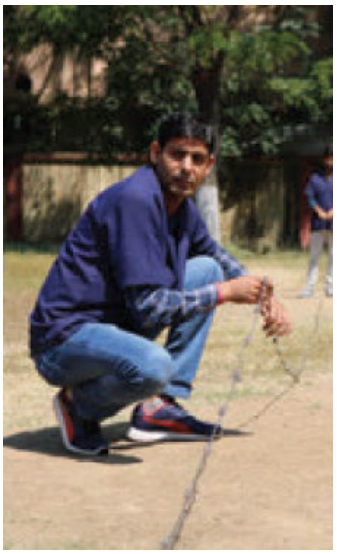

Fig. 3.2.4 Stretching the chain in line

Fig. 3.2.5 Folding the chain

Fig. 3.2.6 Folded chain

3.2.4 Hand Signals during Surveying

A good system of communication using hand signals between members of a surveying team is more efficient than word of mouth, code of signals should be mutually understood by the instrument man and rod man.

The Surveyor signals the Assistant when he finishes the observation during various survey works through hand signals. This helps them to move to the next point. The code of hand signals and their interpretation is given below in Fig 3.1.9.

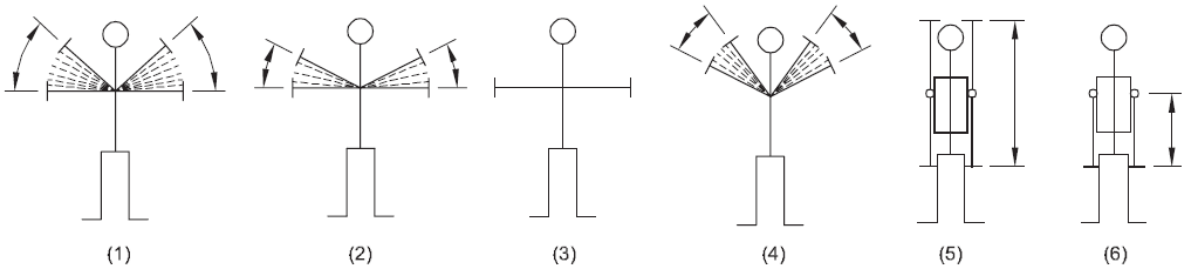

Fig 3.2.8 Hand Signal for Chain Surveying

S.No.	Signal	Action
1.	Rapid sweep with right or left hand towards the left	Move to the right or left.
2.	Slow sweep with right or left hand	Move slowly to the right or left
3.	Right or left arm extended	Move continuously to the right or left
4.	Right or left arm up and moved to the right or left	Plumb the rod to the right or left
5.	Both hands above the head and then brought down	The position of the rod is correct
6.	Both arms extended forward horizontally and then brought down	Fix the rod

Table 3.2.1 Hand Signals and Actions

3.2.5 Linear Measurement using Arrows

Marking Arrows

i. Complete the chain Survey.

ii. Tie flags on the ring in the arrow.

iii. At the end of each chain length, fix the arrows to mark station points.

iv. Count the number of arrows in the chain line to calculate the distance.

v. If any fractional distance is found in the chain line, measure it with steel tape.

Fig. 3.2.9 Marking the Point

Fixing Arrows

- Arrows are used to mark the ends of each chain during the process of chaining. Arrows indicate the station point or reference point.
- In this manner, we can determine linear measurement to any length during a contour/ topographic survey.
- Flags are tied to arrows for the follower to easily identify the leader during chaining.
- Measurement from the exact point is taken with help of the steel tape.

3.2.6 Linear Measurements using Ranging Rod

To measure the length of the survey line in a chain survey, the ranging /offset rod is used. There are two types of ranging.

i. Direct ranging - It may be done by eye judgement or by using the line ranger.

ii. Indirect ranging - when the ends of the line are not visible, indirect ranging is used

Practice for erecting of ranging rods using the materials given in the requirement

Fig. 3.2.10 Holding the Ranging Rod at Starting Point

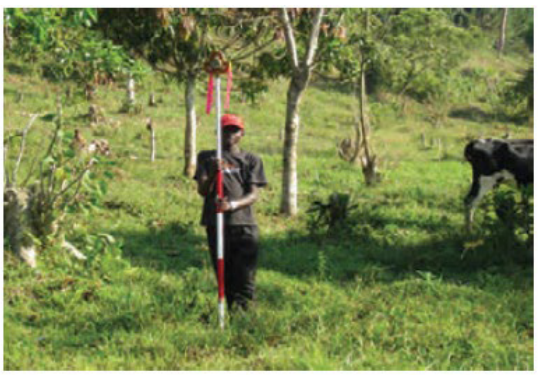

Fig. 3.2.11 Holding the Ranging Rod at Instructed Location

Fig. 3.2.10 Holding the Ranging Rod at Starting Point

i. The Assistant Surveyor erects ranging rods at the ends of the survey line in the vertical position.

ii. The Assistant is instructed to erect ranging rods at intermediate points.

iii. The Surveyor checks the line of the rods and the level.

iv. The Surveyor instructs the Assistant to measure the distance between the rods along the direction of the survey line.

Notes

QR Codes

Scan the QR code to watch the video

https://youtu.be/09nMd_O6Ilc

Chain Survey, Linear Measurement

https://youtu.be/VjX46ArKq54

Measurement of Horizontal Angle by Reiteration Method

Unit 3.3 Angular Measurement, Levelling and Setting out

Unit Objectives

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

1. Explain standard procedure for marking various points and symbols for layout, using paint.
2. Elucidate the procedure for setting out using hurdles/profiles for layout marking.
3. Explain procedures for installing hurdles and profiles for setting out.
4. Describe importance of correct setting out.
5. Elucidate the process of marking layout for excavation using lime.
6. Show the process of setting out - marking points of layout and installing hurdles, marking grids and connecting hurdles - as per layout/work plan.
7. Show how to mark the layout for excavation using lime.

3.3.1 Hurdles and Profiles

The most important thing to do before starting a new construction project is setting out a profile and getting accurate measurements.

This involves installing hurdles and profiles. Before marking the excavation points or marking foundation, plumbers and electricians can install the required pipes, meters, etc. The construction department will be able to form and construct footing systems using the hurdles that are set out.

Carpenters may also use these set out lines to begin frame work. One of the most important things in setting out is accuracy and the position in which the hurdles are placed. Always keep the hurdles back, at least 2 to 3m away from the construction outline, if possible. This will give access to machinery to dig footings. They do not disturb the set out lines.

Fig. 3.3.1 Installing hurdles around excavation area

Fig. 3.3.2 Installing hurdles for marking

Fig. 3.3.3 Laying plumbing lines before survey

3.3.2 Profile Levelling

The process of determining the elevations of a series of points at measured intervals along a line is profile levelling. For example, the center line of the proposed trench or road, the center line of natural features such as a sea bed. Normally, an elevation of 100.00 to the datum is assigned rather than using mean sea level.

Method:

i. Add staff reading Back Sight (BS) to turning point elevations where benchmark is known. This gives the elevation of the line of sight which is Height of collimation (HI).

ii. Subtract staff readings Intermediate sight (IS) and Fore Sight (FS) from the line of sight. This helps to establish elevations of unknown points.

iii. Take any number of Intermediate Sight readings at the point along the line. Establish a turning point to move the level. Repeat as required.

iv. The beginning station of profile levelling is termed 0+00.

v. In carrying out profile levelling, a level is placed at a convenient location (say I1).

vi. Position the instrument to first take FS on a benchmark or on a stable point.

vii. Take observations at regular intervals (say at 1, 2, 3, 4) along the central line and foresight to a designated turning point (say TP1).

viii. Reposition the instrument to some other convenient location (say I2). After properly adjusting the instrument, start observations from TP1 at regular intervals (say at 5,6 etc.) terminating at another turning point (say TP2) etc.

ix. Take staff readings at salient points where marked changes in slope occur.

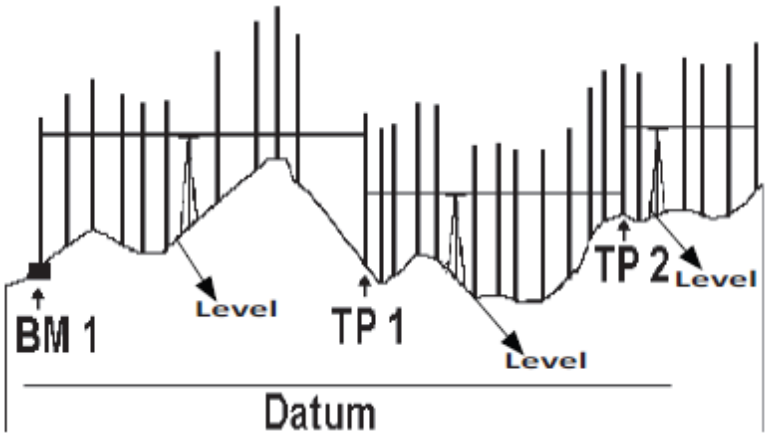

Fig. 3.3.3 Laying plumbing lines before survey

Uses: Plotting of profile levelling provides a graphical representation of the ground points on a longitudinal section along the alignment. It is used to determine the depth of cutting or filling on the proposed gradient (for highways, railways, canals, etc.). It also helps to study grade crossing problems, to locate depth of sewers, tunnels, etc.

3.3.3 Marking of Profiles

Profile Marking Tools

S.No.	Tool Description	Tool Image
1.	**Hammer:** Hammers are used in survey to drive the peg in the ground. It also drives the nails in the wooden pegs.	
2.	**Wooden Peg:** Wooden pegs are available in different sizes from 300mm to 450mm. They are used to fix the exact point / station once the peg is driven in the ground. The exact points are shown by driving the nails over the point in the peg.	
3.	**Wire Nails:** Wire nails are fixed in the wooden peg. They help to identify the exact point and to tie the line dory for marking.	
4.	**Tri Square:** It is either made of wood or steel. It is available in various sizes.	
5.	**Spirit level:** Spirit levels are used to check the levels of the survey pillars. They are used to check the horizontal and vertical levels and to draw the vertical / horizontal lines and Survey symbols.	
6.	**Plumb Bob:** Plumb Bob contains a solid metal bob connected to the end of a thread. It is used to check the vertical aspect of the structure. It is also used to transfer the survey station point above or below the ground level	

Table 3.3.1 Profile Tools

Profiles Marking Method

Connect the nails using thread / string on the profile for marking the points.

Fixing Wooden Peg

1. Drive the wooden peg in the exact station point.
2. Lay the concrete around the peg to strengthen it.
3. Mark the exact point over the peg according to the Surveyor's instructions.
4. Fix the nails in the exact point over the wooden peg.
5. Connect the nails using line dory / thread.
6. Fix the required points on the profile as per plan.
7. If the thread is above the ground level, transfer using the line Plum Bob or Sprit Level.
8. Connect the nails using thread to fix the appropriate point of the profile

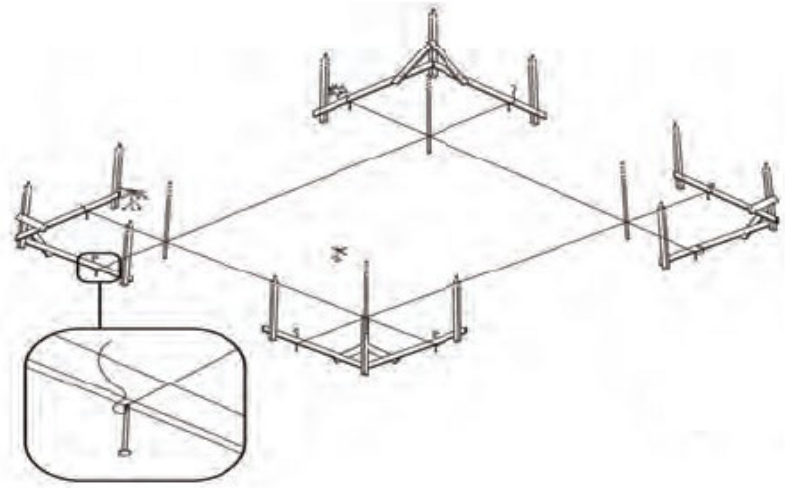

Fig. 3.3.5 Nails connected using thread for a profile

3.3.4 Setting Out

Measuring and marking out a full size plan of a building or element of a building on site is called as setting out. It is the process of developing physical position of the building by transferring dimensions from the layout plan to the ground.

The main function of setting out is to establish the position of trench and walls of the structure as well as the position of corners and rooms.

- In order to begin excavation of trenches / pits are required for building's foundation, the builder must know the position and level of the building lines shown on the layout drawings on the ground.

- The exact length, width, depth and position of the foundations must be marked on the ground.
- The setting out points will be denoted by driving the nails over the exact point in the wooden pegs.
- Position the first set of profiles A and B Parallel to the front boundary or as per plan. Mark points 'a' and 'b' as building width using 3-4-5 method. Position the line of C and D. Mark a point along C to D to fix the building length as 'c'.
- Measure the building size parallel to AB and CD and fix a point,'d'.
- Extend the building line 2 or 3m away from the corner points. Fix the wooden peg and drive the nails exactly over the point. Fix the intermediate points of the building. The building's setting out is ready for construction work.
- Connect the nails using a string. Draw the setting out as instructed.

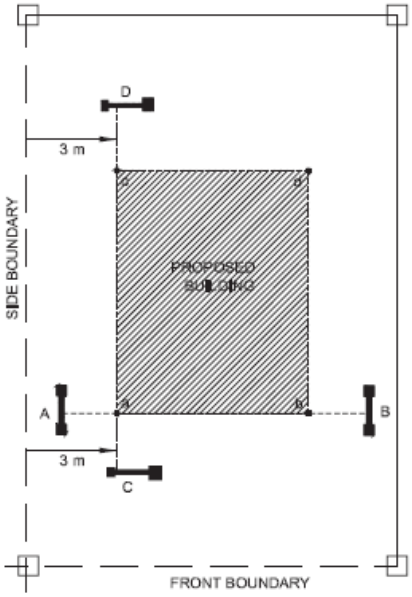

Fig. 3.3.6 Boundary Line Setting Out

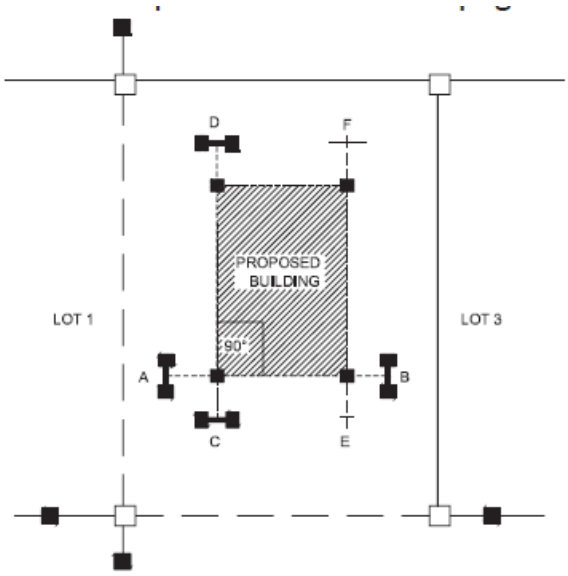

Fig. 3.3.7 Layout Setting Out

3-4-5 Method

If a triangle has sides measuring 3, 4 and 5 meter, it must be a right angled triangle. The angle between the smaller sides is 90°.

$AB^2 + BC^2 = AC^2$

As shown in Fig. 3.3.8, right angle for any rectangle or a square AB should be 4 units from AB and BC should be 3 units. Set AC should be 5 units.

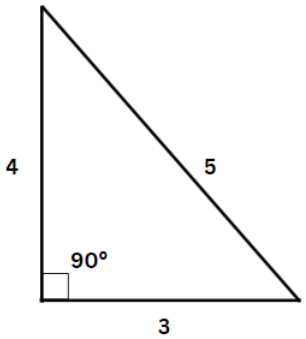

Fig. 3.3.8 Layout Setting Out

Setting out for a building plan

1. Study the building plan thoroughly before starting the setting out.
2. Check if the boundary is parallel to the road.
3. Fix the first profile at one corner of the layout as per instruction given by the Surveyor.
4. Fix the second profile B (wooden peg) parallel to the front boundary line.
5. From the line 'AB', using 3-4-5 method draw another line at right angle to 'AB'. Mark the third profile and fix the point as 'C'.
6. Draw parallel lines to 'AB' and 'AC'. The parallel lines are marked as 'CD' and 'BD'. The intersection point of the lines 'CD' and 'BD' is the location of the fourth profile 'D'.
7. Fix the nails over the profile 'A', 'B', 'C', and 'D' and connect them using thread.
8. Check the diagonal for setting out 'AD' and 'BC'. If the diagonal 'AD' and 'BC' are correct, then the layout is in right angle and the setting out is correct. If the diagonal is not correct, check all the measurements once again. If any deviation is found, change it to the correct length as per the building plan.

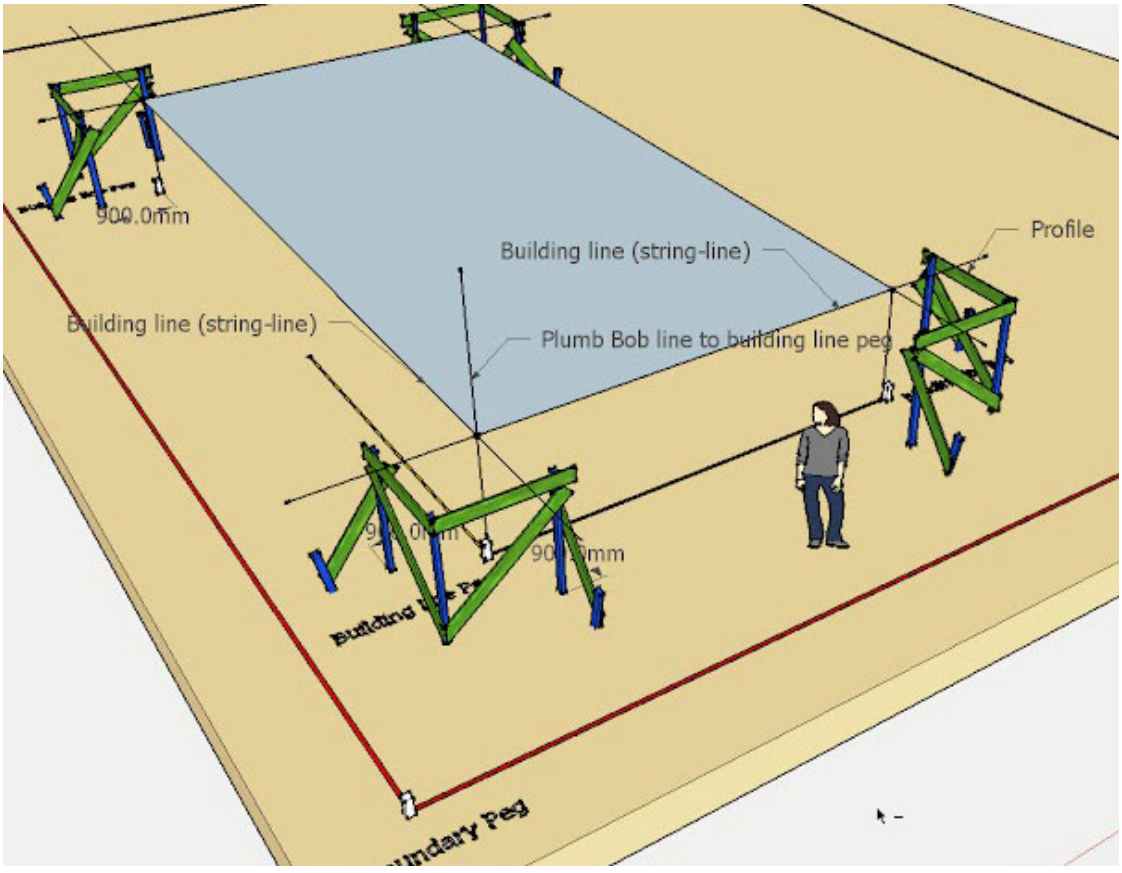

Fig. 3.3.8 Setting Out Building Layout

3.3.5 Lime Post Setting

Marking the excavation points:

1. Drive the nails over the exact point in the wooden peg. Connect the nails along the grid using line dory.

   A_1- A_2, B_1-B_2,

   A_1- B_1 and A_2-B_2

2. Connect all the lines using thread. Apply lime over the thread to mark the area to be excavated.
3. Remove the thread after marking.

Marking offset pit for excavation:

1. To avoid unnecessary excavation, the offset area can be marked for the excavation. As shown in the sketch, connect all the nail points using line dory. Apply lime for the area to be excavated.

   A_1 - A_3, A_1 - B_1

   B_1 - B^1_2, - - B^1_2 - C_3

2. Remove the thread after marking.

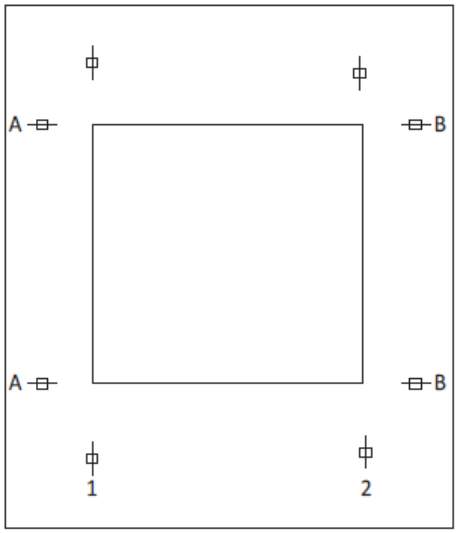

Fig. 3.3.6 Marking the Excavation

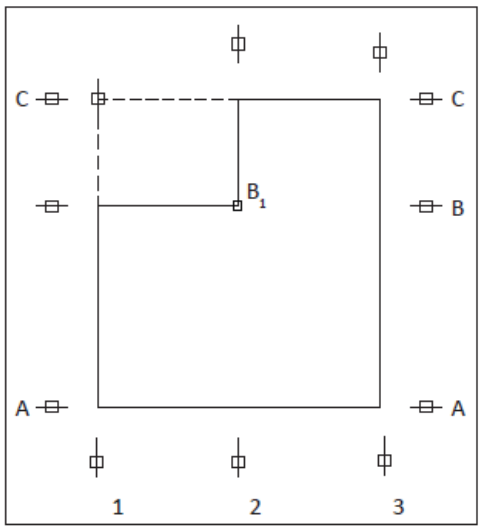

Fig. 3.3.7 Marking for Offset Excavation

Materials used for Application of Lime for Marking

1. **Line dory/thread:** Generally, green thread or nylon thread is used to connect the survey lines using nails.
2. **Lime:** Lime is applied over the survey line to identify the area to be excavated.
3. **Enamel paint:** Various colours of enamel paint are applied to denote different signs or symbols.
4. **Red oxide powder:** Red oxide powder is mixed with water. Line dory is wetted in the red oxide and marked in the PCC / concrete surfaces to mark the foundation / column starters / retaining wall, etc.

Procedure for application of lime

1. Connect the nails point by line dory of all Survey lines.
2. Transfer the point to the ground using Plumb Bob then fix the corner points.
3. Connect the survey points using the thread.
4. Apply lime over the thread.
5. Remove the thread. The area is ready for excavation.

Fig. 3.3.8 Lime Application over the String Line using Lime Applicator

Fig. 3.3.9 Lime Application over Thread/Line Dory

Fig. 3.3.10 Marked Excavation Area

Exercise

Answer the following questions:

A. Short Answer Questions

1. How do you choose a tripod for a specific surveying instrument?
2. Why are arrows used in surveying?
3. Describe the method of holding the levelling staff?
4. Describe the process of marking the layout for excavation using lime?

B. Match the following

Tool Description	Tool Image
Hammer	
Wooden Peg	
Wire Nails	
Tri Square	

Spirit level	
Plumb Bob	

Notes

QR Codes

Scan the QR code to watch the video

https://youtu.be/-HDMz4miUf4

Lay Out A House Foundation On Site With Excavation Plan

https://youtu.be/5sZB0glopR0

Site Set Out - Understanding Profiles

https://youtu.be/rBmTf8wp4xo

Setting Out a Building

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

Unit 4.1 - Effective Communication and Teamwork

Unit 4.2 - Working Effectively and Maintaining Discipline at Work

Unit 4.3 - Maintaining Social Diversity at Work

CON/N8001

Key Learning Outcomes

1. Elucidate own roles and responsibilities.
2. Explain the importance of effective communication.
3. Elucidate the consequence of poor teamwork on project outcomes, timelines, safety at the construction site, etc.
4. Demonstrate how to pass on work related information/ requirement clearly to the team members.
5. Explain different modes of communication used at workplace.
6. Explain the importance of creating healthy and cooperative work environment among the gangs of workers.
7. Show how to report any unresolved problem to the supervisor immediately.
8. Elucidate applicable techniques of work, properties of materials used, tools and tackles used, safety standards that co-workers might need as per the requirement.
9. Demonstrate ways to hand over the required material, tools, tackles, equipment and work fronts timely to interfacing teams.
10. 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.
11. Explain the importance and need of supporting co-workers facing problems for the smooth functioning of work.
12. Demonstrate ways to work together with co-workers in a synchronized manner.
13. Discuss the fundamental concept of gender equality.
14. Explain how to recognise and be sensitive to issues of disability, culture and gender.
15. Discuss legislation, policies, and procedures relating to gender sensitivity and cultural diversity including their impact on the area of operation.
16. Demonstrate effective implementation of gender neutral practices at workplace.
17. Demonstrate ways to address discriminatory and offensive behaviour in a professional manner as per organizational policy.

Unit 4.1: Effective Communication and Teamwork

Unit Objectives

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

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

4.1.1 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:

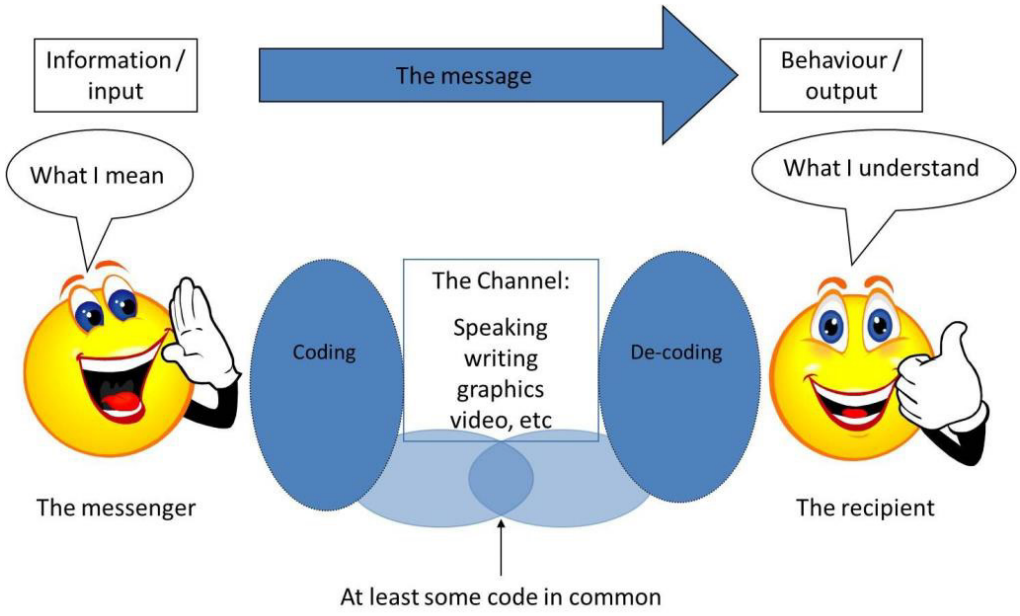

Fig. 4.1.1 Effective Communication – Two-way Process

- **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. 4.1.2 C's of Communication

4.1.2 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:

Fig. 4.1.3 Communication at Construction

- **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.
- **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. 4 .1.4 Coordination during Construction Work

7.1.3 Adverse Effects of Poor Communication

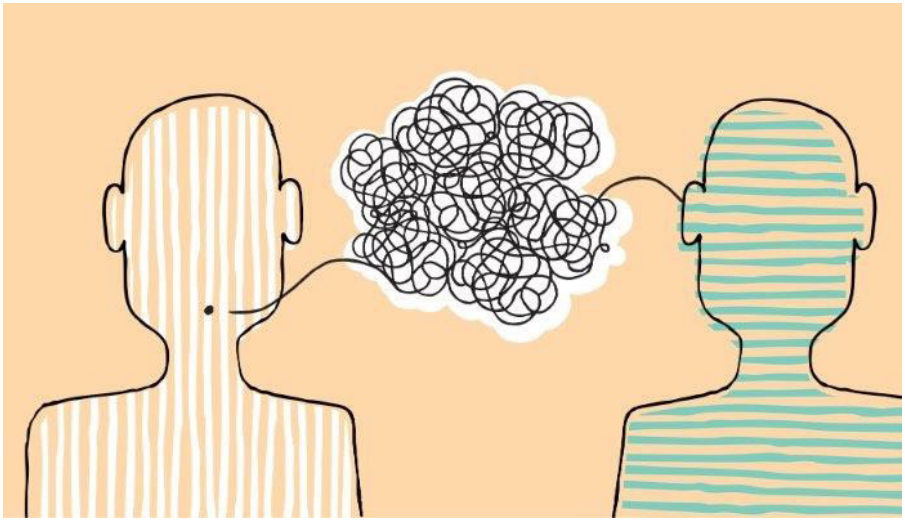

Fig. 4.1.5 Adverse Effects of Poor Communication

Hearing	Listening
Receiving any message through ears is known as hearing.	On the other hand explanation of the received message can be labeled as listening.
	
Function of hearing is just to receive the verbal message.	Listening involves decoding or interpretation of the message.

Understanding instructions correctly is crucial for project success. Active listening ensures that workers grasp the requirements, specifications, and safety measures provided by supervisors and project managers. It minimizes the risk of miscommunication and mistakes that could lead to delays, rework, or even accidents.

Safety is of paramount importance in the construction industry. Active listening helps workers' pay attention to safety briefings, hazard warnings, and emergency procedures. By actively engaging in safety protocols, workers can protect themselves and their colleagues from potential risks, accidents, and injuries.

Teamwork is vital on construction sites, where multiple professionals collaborate to achieve project objectives. Active listening fosters a culture of open communication, where workers feel comfortable sharing ideas, concerns, and feedback. It promotes mutual respect, trust, and inclusivity, leading to better collaboration and problem-solving.

Adaptability is essential in the dynamic construction environment. Active listening keeps workers informed about changes, updates, and unexpected challenges. Being receptive to new information enables them to adjust their approach and work efficiently, ensuring project progress remains on track.

Moreover, active listening enables construction professionals to build strong relationships with team members, clients, and stakeholders. By understanding and acknowledging others' perspectives, workers demonstrate empathy and enhance client satisfaction

Overall, active listening at a construction site enhances safety, teamwork, productivity, and client relations. It empowers workers to communicate effectively, respond to challenges proactively, and contribute to the successful completion of construction projects.

4.1.4 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. 4.1.6 Teamwork at Workplace

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.

4.1.5 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.

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.

Fig. 4.1.7 Effective and Successful Collaboration

1. **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.

2. **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.

3. **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.

4. **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.

4.1.7 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.
- **Reduced Productivity:** Poor teamwork

Fig. 4.1.8 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 4.2: Working Effectively and Maintaining Discipline at Work

Unit Objectives

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

1. Explain the importance of creating healthy and cooperative work environment among the gangs of workers.
2. Elucidate applicable techniques of work, properties of materials used, tools and tackles used, safety standards that co-workers might need as per the requirement.
3. 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.
4. Explain the importance and need of supporting co-workers facing problems for the smooth functioning of work.
5. Demonstrate ways to hand over the required material, tools, tackles, equipment and work fronts timely to interfacing teams.
6. Demonstrate ways to work together with co-workers in a synchronized manner.

4.2.1 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.

Fig. 4.2.1 Discipline at Work

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.
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.

4.2.2 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. 4.2.2 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.
13. **Seek Feedback:** Ask for feedback from supervisors or experienced colleagues on ways to improve your time management skills.
14. **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.

4.2.3 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. 4.2.3 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. 4.2.3 Interpersonal Conflicts

Notes

Unit 4.3: Maintaining Social Diversity at Work

Unit Objectives

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

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

7.3.1 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. 4.3.1 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. 4.3.2 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. 4.3.3 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.

7.3.2 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. 4.3.4 Disability-Friendly 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 - hand-shakes, 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. 4.3.4 Disability-Friendly Workplace

Exercise

Answer the following questions:

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?

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.

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

Construction Skill Development Council

Unit 5.1 - Hazards and Emergency Situations

Unit 5.2 - Safety Drills, PPEs and Fire Safety

Unit 5.3 - Hygiene and Safe Waste Disposal Practices

Unit 5.4 - Infectious Disease and Its Cure

CON/N9001

Key Learning Outcomes

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

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 5.1: Hazards and Emergency Situations

Unit Objectives

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

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

5.1.1 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.

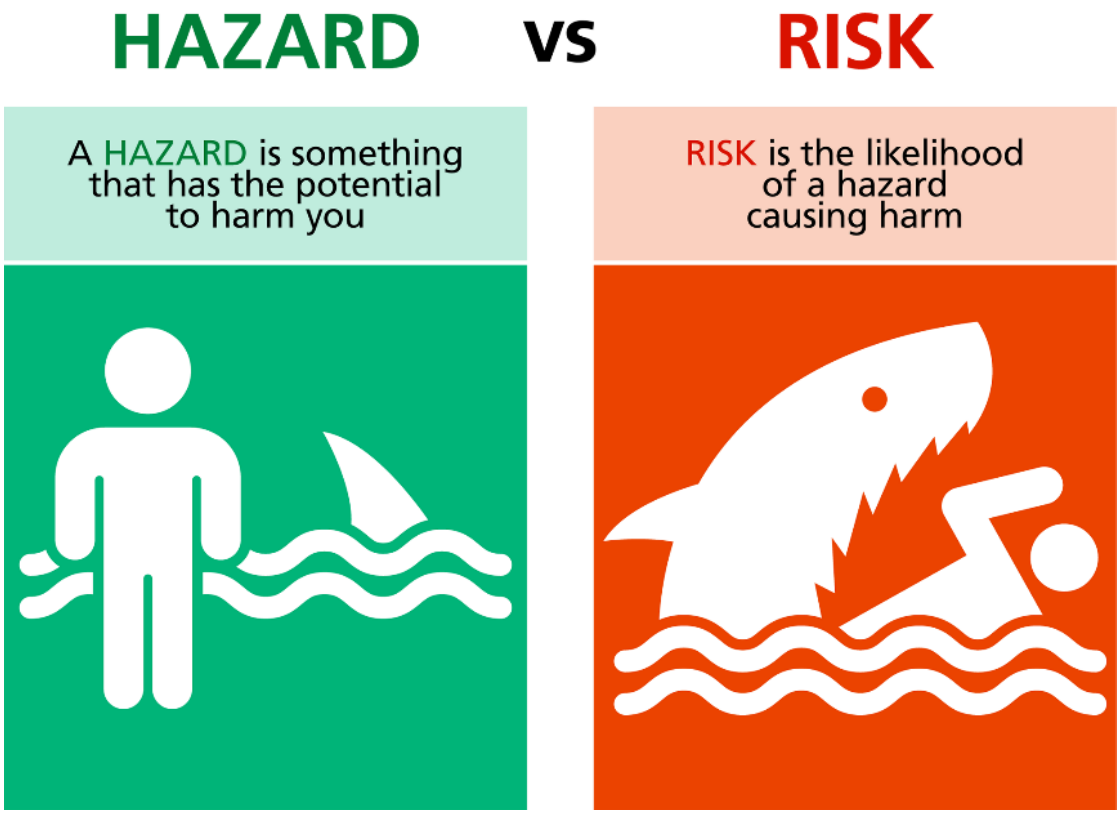

Fig. 5.1.1 Hazards versus Risk

Workplace Hazards Types: Workplace hazards can vary depending on the type of work and the industry.

Fig. 5.1.2 Workplace Hazards

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

- **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.

Fig. 5.1.3 Risk Associated with Hazards

5.1.2 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. 5.1.4 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.

Fig. 5.1.5 Risk Management Process

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.

Hazards Specific to Domain-Related Works in Construction:

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

- **Painting Hazards:** Painters may encounter risks from working at heights, using chemicals in paints, and exposure to fumes.
- **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.

5.1.3 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:

- Red
- Blue
- Yellow
- Green

Fig. 5.1.6 Workplace Warning Signs

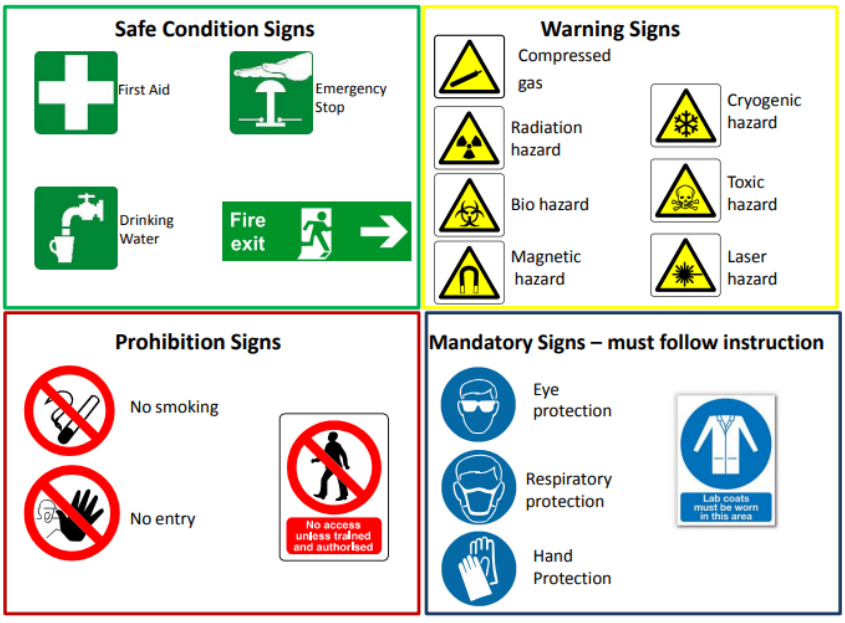

Fig. 5.1.7 Four Types of Safety Signs and their Colour

5.1.4 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 5.1.8 Emergency Response Plan (ERP)

5.1.5 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. 5.1.10 Reporting 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.
9. **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.
10. **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.

Notes

Unit 5.2: Safety Drills, PPEs and Fire Safety

Unit Objectives

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

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

5.2.1 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.

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

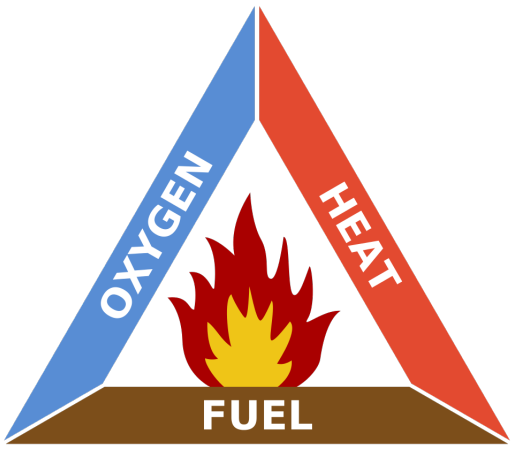

Fig. 5.2.1 Fire Triangle

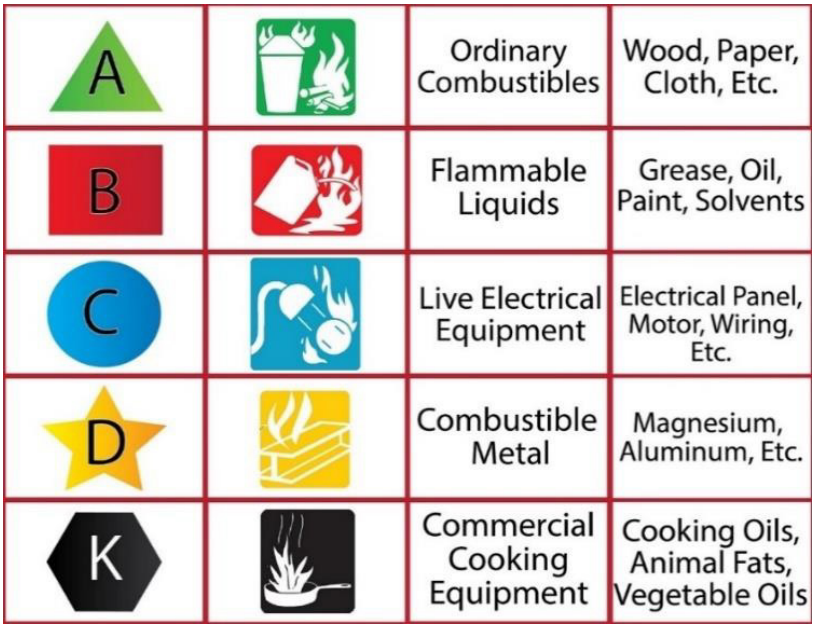

Fig. 5.2.1 Fire Triangle

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.

5.2.2 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. 5.2.3 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.

5.2.3 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.

1. **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).
2. **Wet Chemical Fire Extinguisher (Class K):**
    - Specifically designed for Class K fires involving cooking oils and fats.

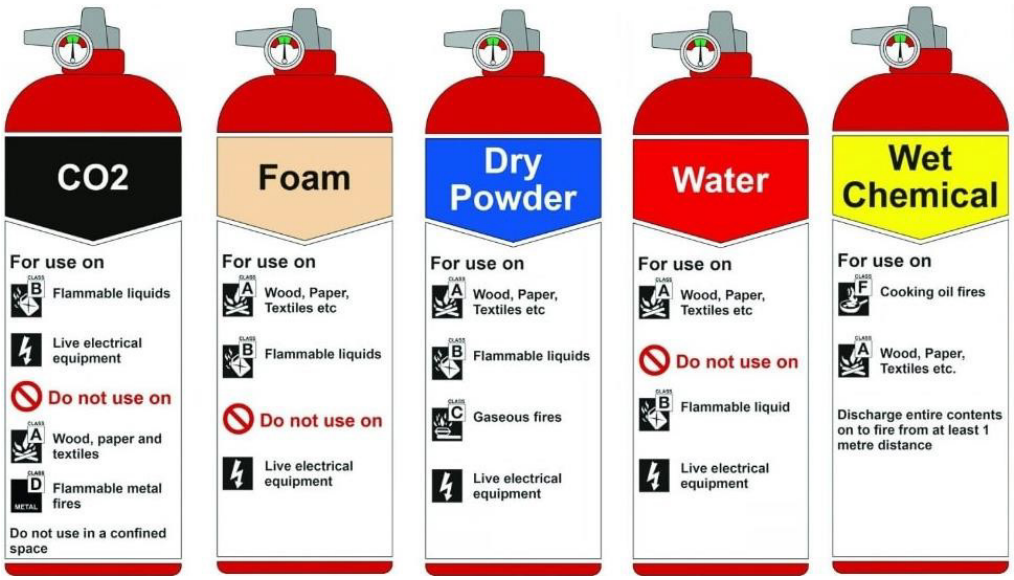

Fig. 5.2.4 Types of Fire Extinguishers

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.

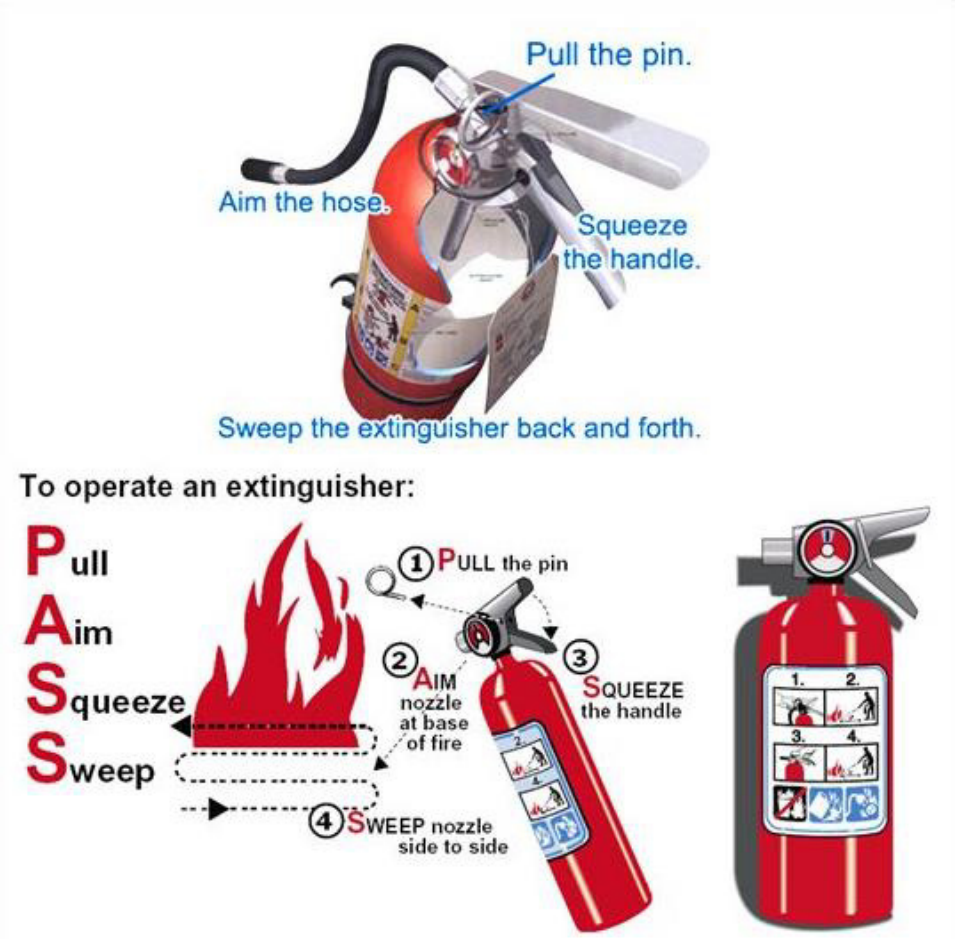

Fig. 5.2.5 Using a Fire Extinguisher

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.

5.2.4 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. 5.2.6 Components related to Safety Drill

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

- **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.
- **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.
- **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.
- **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.
- **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.
- **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.
- **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.

- **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.
- **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.
- **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. 5.2.7 Emergency Evacuation

5.2.5 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 1947, 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 1949. The certificate of fitness is only valid for one year from the date it was issued.

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.

Fig. 5.2.8 Medical Examination for Construction Workers

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

5.2.6 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.

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

Fig. 5.2.9 Vertigo Test for Construction Workers

5.2.7 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.

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:

Fig. 5.2.10 Basic Ergonomic Principles

- 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.

5.2.7 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:

Fig. 5.2.11 First Aid to Injured Person

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.

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.

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.

Fig. 5.2.12 First Aid Kit

5.2.9 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. 5.2.12 First Aid Kit

- 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. 5.2.14 Electrical Safety

5.2.10 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. 5.2.15 PPEs in Construction Industry

Importance of PPE in Construction Industry:

- **Hazard Protection:** PPE serves as a barrier between workers and potential workplace hazards, preventing injuries and illnesses.
- **Legal Compliance:** Regulatory authorities require the use of appropriate PPE in construction to meet safety standards and comply with regulations.
- **Injury Prevention:** PPE can significantly reduce the risk of injuries and accidents, protecting workers' health and well-being.
- **Risk Reduction:** PPE mitigates the risk of exposure to harmful substances, noise, dust, and other occupational hazards.
- **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 can lead to permanent hearing loss, physical strain & 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.	

Table 5.2.1 PPEs for Construction Worker

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.

Fig. 5.2.14 Electrical Safety

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

5.2.11 Ladder Safety in Construction

Ladder safety is crucial in the construction sector to prevent accidents and injuries. Here are some important guidelines and practices that workers should follow when using ladders:

- Choose the right ladder for the task, considering height and weight capacity.
- Inspect the ladder for defects, cracks, and damage before use.
- Place the ladder on a stable and level surface to prevent tipping.
- Maintain three points of contact while climbing (two hands, one foot, or two feet, one hand).
- Never overreach while on the ladder; reposition it if necessary.
- Keep the ladder area clear of obstacles and debris.
- Ensure there are no overhead hazards like power lines or obstacles.
- Secure the ladder at the top to prevent sliding or shifting.
- Use non-conductive ladders when working near electrical sources.
- Provide training to workers on proper ladder usage and safety measures.

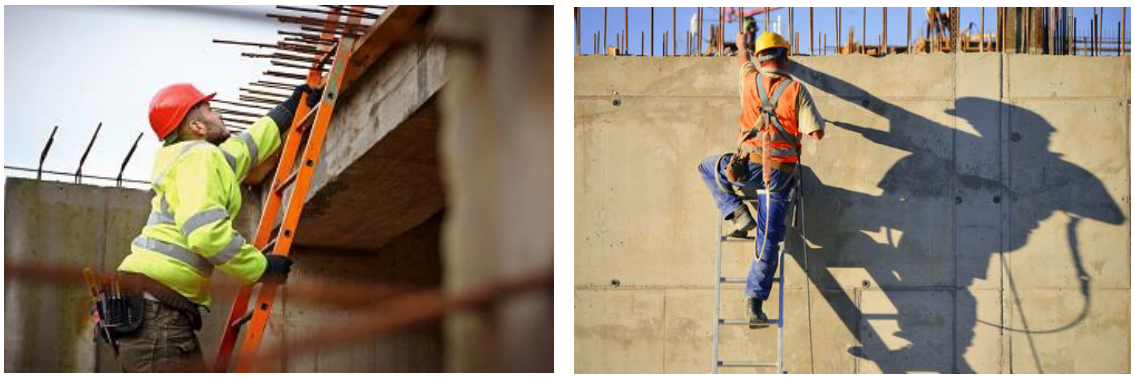

Fig. 5.2.17 Ladder safety

Notes

Unit 5.3: Hygiene and Safe Waste Disposal Practices

Unit Objectives

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

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

5.3.1 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. 5.3.1 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 food-borne 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. 5.3.2 Infectious Disease

5.3.2 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. 5.3.3 Workplace Cleanliness

Here are some important aspects of workplace cleanliness and sanitization:

- **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.
- **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.
- **Hand Sanitizing Stations:** Place hand sanitizing stations at convenient locations throughout the workplace to encourage employees and visitors to maintain hand hygiene.
- **Restroom Hygiene:** Maintain clean and well-stocked restrooms with proper sanitation supplies. Regularly clean and disinfect restroom surfaces to prevent the spread of germs.
- **Waste Management:** Provide clearly marked waste disposal bins and ensure proper waste segregation. Regularly empty trash bins and dispose of waste appropriately.
- **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.
- **Ventilation and Air Quality:** Ensure proper ventilation to improve indoor air quality. Clean air filters regularly to remove dust and allergens from the air.
- **Personal Protective Equipment (PPE):** Provide appropriate PPE, such as masks and gloves, for employees when needed, especially during pandemics or when handling hazardous materials.
- **Educate Employees:** Educate employees about the importance of workplace cleanliness and hygiene practices. Encourage them to follow hygiene guidelines and protocols.
- **Workplace Signage:** Display hygiene-related signage, such as handwashing instructions, cough etiquette, and reminders about cleaning protocols, to reinforce good practices.
- **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.
- **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.

5.3.3 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:** 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.

Fig. 5.3.4 Designated Areas

2. **Regular Cleanup**: 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.

Fig. 5.3.5 Clean-up Debris and Waste

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. 5.3.6 Disposing of Waste

1. **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. 5.3.7 Clear Walkways

2. **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. 5.3.8 Store Flammable Safely

3. **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. 5.3.9 Prevent Hazards

1. **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. 5.3.10 Wetting Down Dust

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

Fig. 5.3.11 Material Handling with Safety

3. **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. 5.3.12 Securing Tools & Equipment

4. **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. 5.3.13 Inspect and Maintain Equipment

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.

Fig. 5.3.14 Good Housekeeping and Safety relevance

5.3.4 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. 5.3.15 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. 5.3.16 Wash Hands Properly

5.3.5 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.

Fig. 5.3.17 Avoid Bad Habits

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.
- 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.

5.3.6 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. 5.3.18 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.

5.3.7 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.

Fig. 5.3.18 Construction Wastes

The importance of waste management is:

- 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.

5.3.8 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. 5.3.20 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.

5.3.9 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.

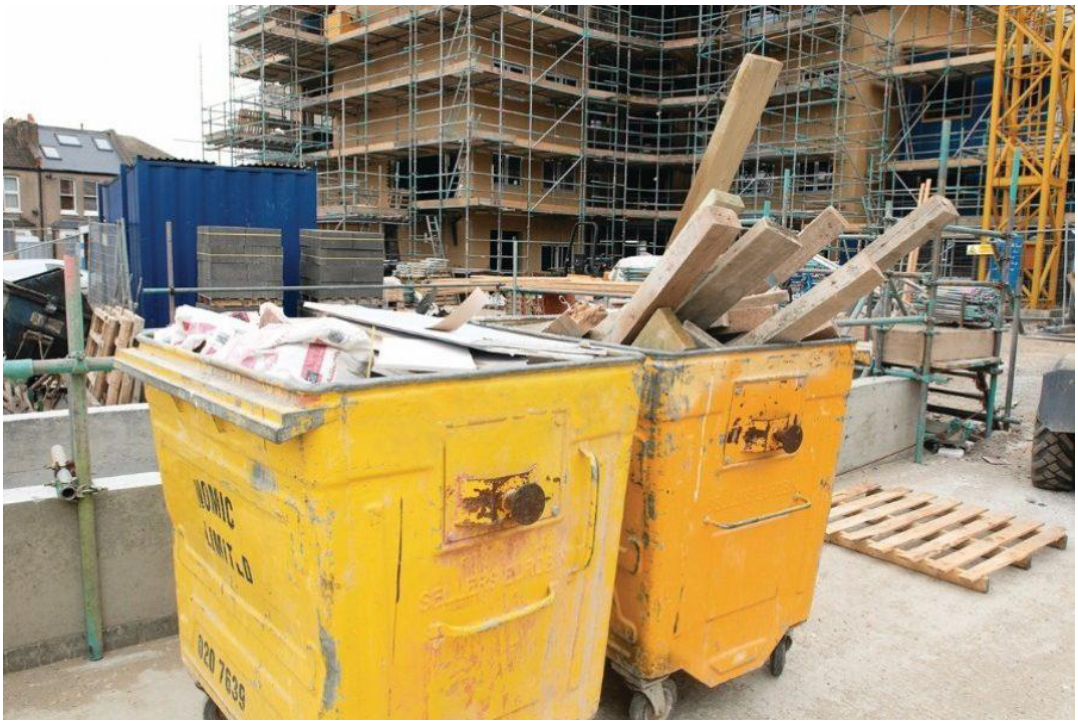

Fig. 5.3.21 Waste Management on a Construction Site

Notes

Unit 5.4: Infectious Disease and Its Cure

Unit Objectives

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

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

5.4.1 Infectious Diseases

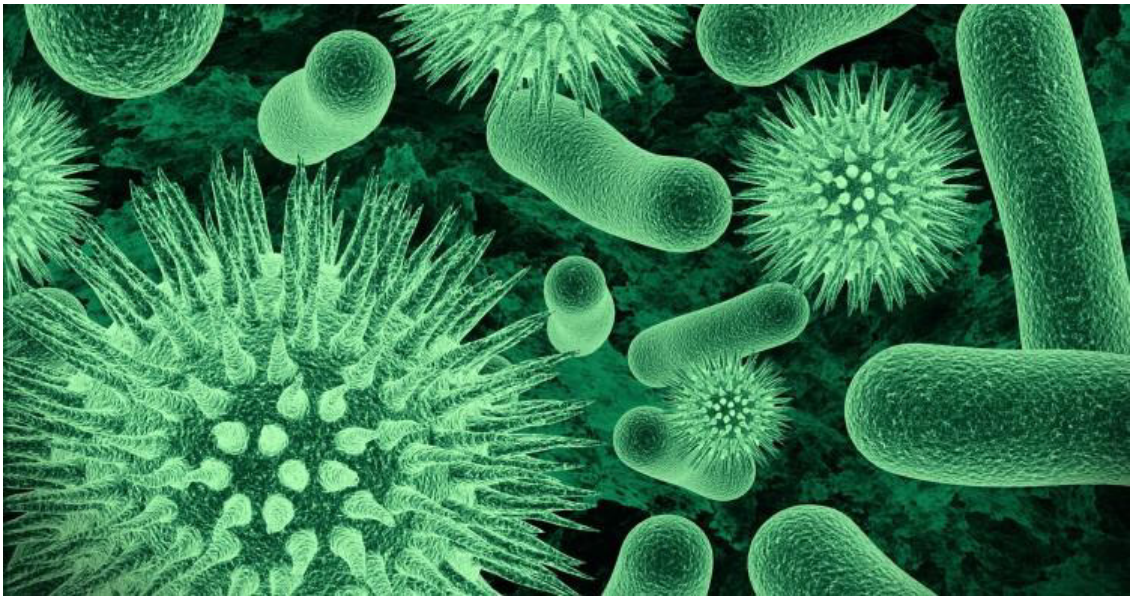

Fig. 5.3.21 Waste Management on a Construction Site

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.

5.4.2 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.

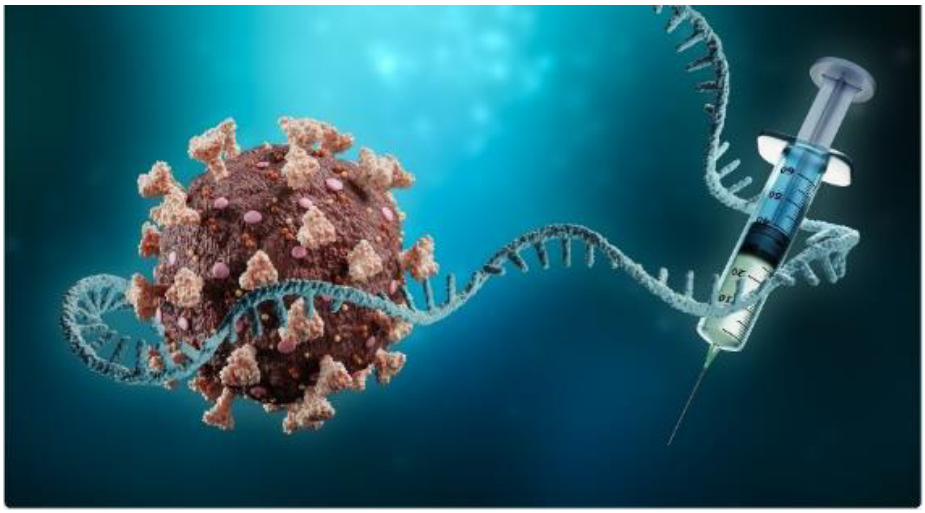

Fig. 5.4.2 Vaccines for Infectious Diseases

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.

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. 5.4.2 Vaccines for Infectious Diseases

5.4.3 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. 5.4.4 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.

5.4.4 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:

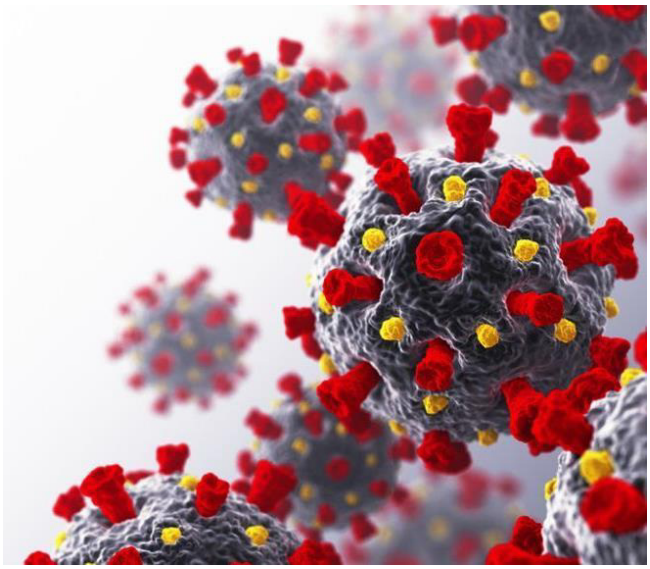

Fig. 5.4.2 Vaccines for Infectious Diseases

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

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:

A. Short Questions:

1. What are the reporting procedures for breaches or hazards at the construction site as per guidelines?
2. Can you identify different types of safety hazards commonly found at construction sites?
3. How would you demonstrate following emergency and evacuation procedures in the case of an accident or fire?
4. What are basic ergonomic principles and how are they applicable to construction work?
5. What steps should you take in responding to accidents and other emergencies at the construction site?

B. Fill-in-the-Blanks Questions:

1. Proper handling of tools, equipment, and materials is essential as per ..... (project schedule / applicable norms).
2. Different types of fire extinguishers correspond to various types of ..... (weather conditions / fires).
3. Using hazardous materials safely involves following ..... (project deadlines / standard guidelines).
4. Proper ..... (cleaning / disposal) methods are important to manage construction waste.
5. Personal Protective Equipment (PPE) includes items like head protection, ear protection, and ..... (sunglasses / fall protection).

C. True/False Questions:

1. Accidents and hazards don't need to be reported if they result in minor injuries. (True/False)
2. Ergonomic principles focus on optimizing workspaces and equipment for worker comfort and safety. (True/False)
3. All types of fire extinguishers can be used interchangeably on different types of fires. (True/False)
4. Using Personal Protective Equipment (PPE) is not necessary if you're experienced in construction work. (True/False)
5. Proper cleaning and disinfection of materials, tools, and supplies is not important in construction work. (True/False)

Notes

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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

6.Employability Skills (60 Hours)

It is recommended that all trainings include the appropriate Employability skills Module. Content for the same can be accessed https://www.skillindiadigital.gov.in/content/list

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Construction Skill Development Council

7. Annexure

Annexure I - QR Codes - Video Links

Annexure-I

Annexure of QR Codes for Assistant Surveyor

Chapter Name	Unit Name	Topic Name	URL	Page no.	QR Code	Video Duration
Chapter 1: Introduction to the Job Role of an Assistant Surveyor	UNIT 1.1: Introduction to Construction Industry	Overview of Construction Sector in India	https://youtu.be/yhjDhav4Pfw	6	Overview of Construction Sector in India	0:13:24
	UNIT 1.2: Role and Responsibilities of an Assistant Surveyor	Assistant Surveyor Job and their responsibility	https://youtu.be/T0fjjRmZ1DE	11	Assistant Surveyor Job and their responsibility	0:04:27
		Career In Land Surveying	https://youtu.be/UipJHJrBf9A		*Career In Land Surveying*	0:21:40
Chapter 2: Handle and Store Surveying Tools and Instruments (CON/N0901)	Unit 2.1: Linear Measurement Instruments	Instruments used in Chain Surveying	https://youtu.be/mcyRThsdi-Q	28	Instruments used in Chain Surveying	0:23:01
	Unit 2.2: Levelling and Angle Measurement Instruments	Introduction to Leveling	https://youtu.be/j8poe2vvD2Q	36	Introduction to Leveling	0:14:02

	Unit 2.3: Miscellaneous Survey Tools and Instruments	GPS Surveying	https://youtu.be/78VQvIKjtmU	42	GPS Surveying	0:09:52
		Photogrammetry For Mapping & Surveying	https://youtu.be/6WoT5C0nveQ		Photogrammetry For Mapping & Surveying	0:03:06
Chapter 3: Provide Support in Various Surveying Works (CON/N0902)	Unit 3.1: Preparatory Works Prior to Surveying	How to Setup a Surveying Tripod over a Point	https://youtu.be/YmRcexxCZnA	51	How to Setup a Surveying Tripod over a Point	0:06:10
		Surveying Stake Out for Beginners	https://youtu.be/gxtLTIktem4		Surveying Stake Out for Beginners	0:15:59
	Unit 3.2: Assist in Linear Measurement of Distances and Lengths	Chain Survey, Linear Measurement	https://youtu.be/09nMd_O6Ilc	59	Chain Survey, Linear Measurement	0:09:37
		Measurement of Horizontal Angle by Reiteration Method	https://youtu.be/VjX46ArKq54		Measurement of Horizontal Angle by Reiteration Method	0:01:56

	Unit 3.3: Angular Measurement, Levelling and Setting out	Lay Out A House Foundation On Site With Excavation Plan	https://youtu.be/-HDMz4miUf4	70	Tools used for Installation of Gypsum Ceiling	0:12:50
		Site Set Out - Understanding Profiles	https://youtu.be/5sZB0glopR0		How to Install a Suspended Ceiling	0:04:45
		Setting Out a Building	https://youtu.be/rBmTf8wp4xo		How to Install an MF Plasterboard Ceiling	0:21:21

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