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सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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Construction Skill Development Council of India

Facilitator Guide


Sector
Construction

Sub-Sector
Real Estate and Infrastructure Construction

Occupation
Construction Electrical Works

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NSQF Level 3.5

Construction Electrician – LV

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Disclaimer

"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

Acknowledgement

We are thankful to all organizations and individuals who have helped us in the preparation of this Facilitator Guide. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving the quality, coherence and content presentation of chapters. This Facilitator Guide will lead to the successful rollout of the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert for the content and for helping us in the preparation of this Facilitator Guide.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery. We welcome suggestions from users, industry experts and other stakeholders for any improvement in future.

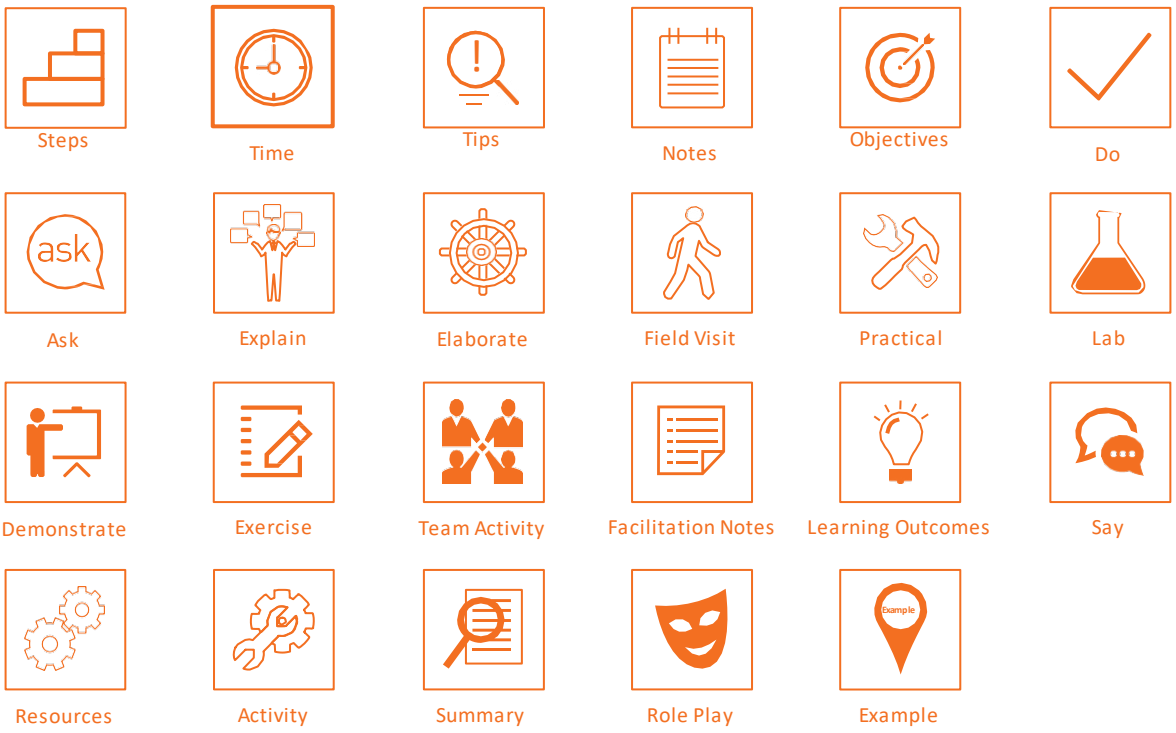
About this book

The objective of the guide is to provide an approach map for interacting with the trainees undergoing training in this job role. The course aims to provide both theoretical and practical knowledge to the trainees and also to guide them about Construction Electrician - LV. The guide is neither a substitute nor a complete road map, but an aid to help to pass on the knowledge on all the aspects to the trainees in a systematic manner. It is expected that the trainer is fully conversant with all the contents of the guide. The guide is just to indicate how to proceed in covering a topic and includes some additional information that may be necessary for the trainer to develop better comprehension of the following aspects:

- **Knowledge and Understanding: Satisfactory operational learning and comprehension to play out the required chore.**
- **Performance Criteria: Pick up the required aptitudes through hands-on preparation and play out the required operations inside the predetermined measures.**
- **Professional Skills: Capacity to settle on operational choices relating to the zone of work.**

The job will also include judging comprehension and also help them learn more through hands-on training. But it has to be ensured that these are following the knowledge imparted and time spent on each unit. It is expected that irrespective of the region, knowledge of all aspects will be imparted to trainees

Symbols Used



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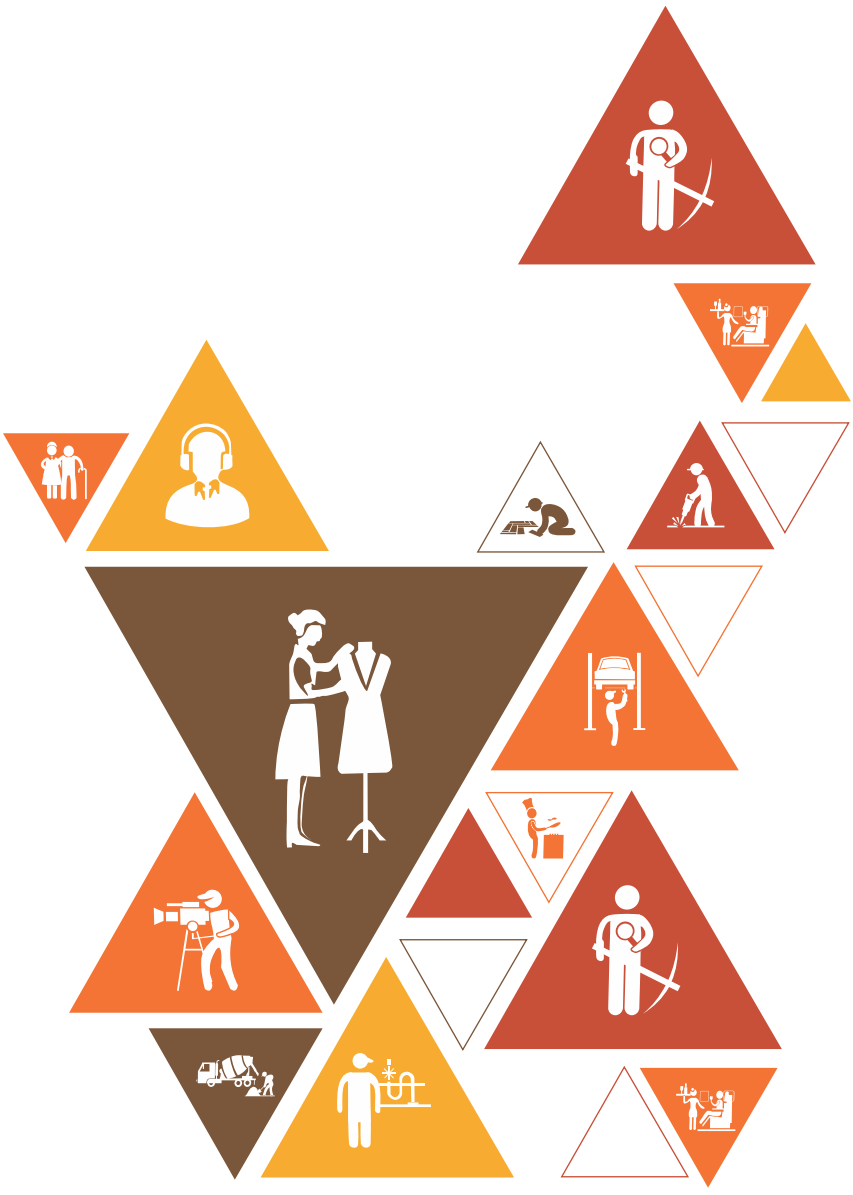
https://www.skillindiadigital.gov.in/content/list



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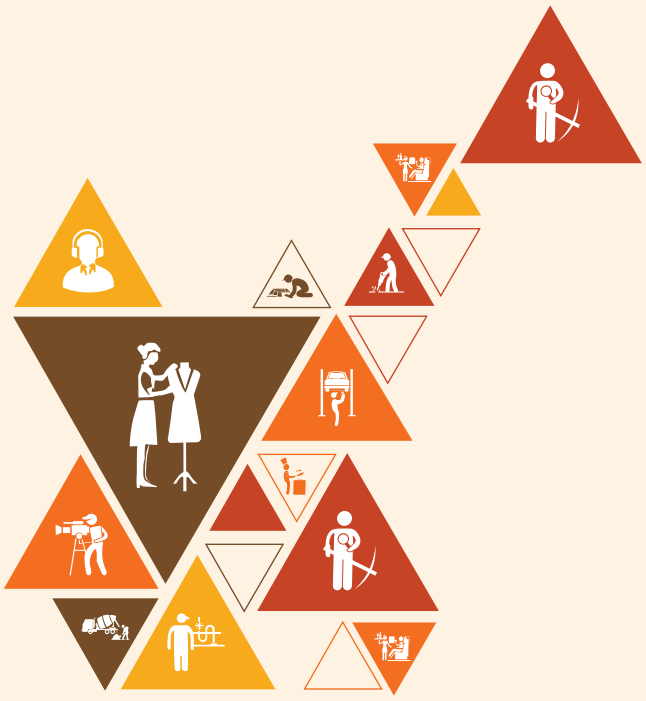
1. Introduction to the Role of a Mason Tiling

Unit 1.1 – Overview of construction industry in India

Unit 1.2 – Major occupation in construction sector

Unit 1.3 – Mason tiling - job role and responsibility

Unit 1.4 – Training for mason tiling



Bridge Module

Key Learning Outcomes

At the end of this module, trainer will ensure that participant will be able to:

1. Describe the size and scope of the Construction industry and its sub-sectors.
2. Discuss the role and responsibilities of a Construction Electrician - LV.
3. Identify various employment opportunities for a Construction Electrician - LV.

Unit 1.1 – Construction Industry in India

Unit Objectives:

At the end of this unit, trainer will ensure that participant will be able to:

- Describe the size and scope of the construction industry and its sub-sectors
- Compare urban and rural construction
- Observe and outline modernization of construction
- Know about major occupations in the construction sector

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.

Say

- Let's begin with an ice-breaking session, introduce yourself and ask participants to introduce themselves.

Team Activity

- **Purpose:** This activity aims to familiarise the participants in the group with one another.
- **Tentative Duration:** 15 Mins
- **Procedure:**
  - Ask the participants to pronounce their name with an adjective beginning with the initial letter of their name.
  - Request that they additionally provide a brief introduction of themselves.
- **Expected Outcome:** The outcome of this activity is that the participants will become familiar with each other.

Explain

Introduction to Major Occupations in Construction Sector:

- Explain about construction sector in India
- Compare urban and rural construction types
- Observe and outline modernization of construction
- Know about major occupations in the construction sector

Notes for Facilitation

- Use the 'Construction Electrician – LV' PHB and refer unit 1.1 to explain Construction Industry in India.
- The construction industry in India is a critical driver of economic growth, encompassing various sectors such as real estate, infrastructure, and rural construction. Let's take a closer look at each of these segments:
  - Real Estate Sector: The real estate sector in India includes the development of residential, commercial, and industrial properties. It has a substantial impact on urbanization and provides essential spaces for living, working, and recreation. Key Points are:
    - Residential Properties: The demand for housing, especially in urban areas, remains high due to rapid urbanization and population growth.
    - Commercial Properties: The growth of industries and businesses fuels demand for office spaces, retail outlets, and commercial complexes.
    - Industrial Properties: As manufacturing and industrial sectors expand, there's a need for well-designed industrial facilities and warehouses.

- Infrastructure Development: India's focus on infrastructure development is crucial for economic progress and improving the quality of life for its citizens. Key Points are:
  - Transportation: Roadways, highways, railways, airports, and ports are being developed to improve connectivity.
  - Energy: Investment in power plants and renewable energy projects is essential for meeting the energy needs of a growing economy.
  - Urban Development: The "Smart Cities Mission" aims to create sustainable and efficient urban centers.
- Rural construction focuses on developing infrastructure and facilities in rural areas to bridge the urban-rural divide and improve the living standards of rural communities. Key Points are:
  - Housing: Initiatives like "Pradhan Mantri Awas Yojana - Rural" aim to provide affordable housing to rural populations.
  - Rural Infrastructure: Building roads, schools, healthcare facilities, and water supply systems enhances rural living conditions.

- The construction sector encompasses a wide range of job opportunities across various occupations. Here are some major occupations in the construction industry along with a few job roles under each occupation:
  - Civil Engineers: Civil engineers play a key role in designing, planning, and overseeing construction projects. They ensure projects are completed safely, efficiently, and according to specifications.
    - Structural Engineer: Designs and analyzes the structural components of buildings and infrastructure projects.
    - Geotechnical Engineer: Evaluates soil conditions and provides recommendations for foundation design.
    - Transportation Engineer: Designs roads, highways, and transportation systems to ensure smooth mobility.
  - Architects: Architects are responsible for designing the overall layout, aesthetics, and functionality of buildings and structures.
    - Residential Architect: Designs homes and residential buildings, focusing on functionality and aesthetics.
    - Commercial Architect: Specializes in designing commercial spaces, offices, and retail complexes.
    - Landscape Architect: Plans outdoor spaces, parks, and landscapes within construction projects.
  - Construction Managers: Construction managers oversee the entire construction process, including budgeting, scheduling, and coordinating various teams.
    - Project Manager: Manages all aspects of a construction project, from planning to completion.
    - Site Manager: Supervises on-site activities, ensuring safety and efficient progress.
    - Estimator: Calculates project costs and prepares budgets for construction projects.
  - Electricians: Electricians are responsible for installing and maintaining electrical systems in buildings and structures.
    - Residential Electrician: Installs electrical systems in homes and residential complexes.
    - Commercial Electrician: Works on electrical installations in commercial buildings and offices.
    - Industrial Electrician: Focuses on electrical systems in factories and industrial facilities.
  - Plumbers: Plumbers install, repair, and maintain water supply and drainage systems in buildings.
    - Residential Plumber: Handles plumbing systems in homes and residential buildings.
    - Commercial Plumber: Works on plumbing installations in commercial spaces and offices.
    - Pipefitter: Installs and maintains pipes in industrial settings.
  - Welders and Fabricators: Welders and fabricators join and shape metal parts to create structures and components.
    - Structural Welder: Welds and assembles metal parts for construction projects.
    - Pipe Welder: Specializes in welding pipes for plumbing and industrial systems.
    - Sheet Metal Fabricator: Crafts metal components used in construction projects.
  - Surveyors: Surveyors measure and map out the land, providing crucial data for construction projects.
    - Land Surveyor: Measures and defines property boundaries and topography.

        - Quantity Surveyor: Estimates materials and costs for construction projects.
        - Geodetic Surveyor: Uses advanced techniques to map larger areas and create accurate models.
    - Construction Laborers: Construction laborers perform various physical tasks on construction sites to support other professionals.
        - Concrete Worker: Pours, levels, and finishes concrete for foundations and structures.
        - Carpenter: Constructs and installs wooden components in buildings.
        - Mason: Lays bricks, stones, and other masonry materials to build structures.
- Each of these major occupations within the construction sector offers a wide range of job opportunities and career paths. From engineering and design to hands-on labor, the construction industry provides diverse roles that contribute to building the world around us.

Say

Let us now perform an activity based on various market segments of the construction industry.

Team Activity

- **Purpose:** The objective of this activity is to introduce participants to the different market segments within the construction industry.
- **Resources Required:** Presentation materials (slides or handouts) explaining market segments in the construction industry, internet access or library resources for research, whiteboard or flip chart with markers, printed construction industry reports or data (optional but helpful), worksheets for students to complete during the activity.
- **Tentative Duration:** 60-90 minutes
- **Methods/Procedure:**
    - Step 1: Introduction- Begin the activity by discussing the importance of understanding market segments in the construction industry. Explain that market segmentation helps professionals identify specialized opportunities and areas of expertise within the broader field of construction.
    - Step 2: Presentation- Deliver a presentation on the different market segments within the construction industry. Include information on residential construction, commercial construction, industrial construction, infrastructure development, and specializations like green building, renovation, and restoration. Use visual aids to make the information more engaging and accessible.
    - Step 3: Group Research- Divide the students into small groups and assign each group a specific market segment to focus on. Provide the groups with access to the internet or library resources to conduct research on their assigned market segment. They should explore the scope, current trends, major players, challenges, and potential career opportunities within their segment.
    - Step 4: Group Presentation- Each group presents their findings to the rest of the class. Encourage them to use visuals, statistics, and examples to support their presentation. Allow for a short Q&A session after each presentation to clarify doubts and exchange insights.
    - Step 5: Reflection and Discussion- Lead a class discussion to debrief the activity. Encourage students to share their thoughts on which market segments they find most appealing and why. Discuss the skills and qualifications required for different market segments and how students can prepare to excel in their chosen area.
- **Expected Outcome:** By the end of this classroom activity, students are expected to:
    - Understand the concept of market segmentation in the construction industry.
    - Identify the various market segments within the construction field, including residential, commercial, industrial, infrastructure, and specialized sectors.
    - Analyse the characteristics, opportunities, and challenges associated with each market segment.
    - Gain insights into potential career paths and specialization options within the construction industry.
    - Reflect on their interests and skills to make informed decisions about their vocational course and future career goals in construction.

Notes

Unit 1.2 – Roles & Responsibilities of Construction Electrician - LV

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

- Explain role description/ functions of the job role- Construction Electrician - LV.
- Define the personal attributes required for Construction Electrician - LV occupation.
- Recall the basic terms used in Construction Electrician - LV.
- Explain future possible progression for role of Construction Electrician - LV.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.

Explain

- Explain the role description/ functions of the job role- Construction Electrician - LV.
- Reiterate the personal attributes required for Construction Electrician – LV job role.
- Explain the future possible progression for role of Construction Electrician - LV.

Career Progression Path

- Show and explain the various stages of career progression path.
- List down the important mile stones in the progression path.
- Discuss the advantages of the career progression path.

Elaborate

- About the necessity of defining roles and responsibilities.
- List the roles and responsibilities of a Construction Electrician - LV in detail.
- Correlate the roles and responsibilities of a Construction Electrician - LV.
- About the necessity of personal attributes.
- List the personal attributes of a Construction Electrician - LV in detail.
- Correlate the roles, responsibilities and personal attributes of Construction Electrician - LV.
- Show and explain the various stages of career progression path.
- Discuss the advantages of the career progression path.

Notes for Facilitation

- Use the 'Construction Electrician – LV' PHB and refer unit 1.2 to explain about Roles & Responsibilities of Construction Electrician – LV Occupation.
- Roles and Responsibilities of a Fabricator:
  - Install electrical systems.
  - Manage low-voltage cables.
  - Test and troubleshoot systems.
  - Ensure safety compliance.
  - Collaborate with other trades.
  - Maintain quality standards.
  - Procure materials.
  - Manage documentation.
  - Adhere to electrical codes.

- Communicate with clients.
- Implement energy-efficient solutions.
- Handle emergency repairs.
- Train apprentices.
- Perform upkeep and maintenance.
- Maintain records.

- Stay updated on industry trends.

- Personal Attributes of a Construction Electrician - LV:
  - Attention to detail
  - Problem-solving skills
  - Physical stamina
  - Safety-conscious
  - Team player
  - Communication skills
  - Adaptability
  - Time management
  - Customer service orientation
  - Technical aptitude
  - Analytical thinking
  - Dependability
  - Patience
  - Organizational skills
  - Continuous learner
- Career Progression Path Stages:
  - Apprenticeship:
    - Start as an apprentice to learn the fundamentals of low-voltage electrical systems.
    - Receive on-the-job training and classroom instruction.
  - Journeyman Electrician - LV:
    - After completing the apprenticeship program and passing licensing exams, become a licensed journeyman electrician specializing in low-voltage systems.
    - Gain experience working on various low-voltage projects.
  - Specialization:
    - Choose a specific area of low-voltage systems, such as security, data, telecommunications, or audiovisual systems.
    - Obtain specialized training and certifications in your chosen field.
  - Senior Technician or Lead Installer:
    - Progress to a senior technician or lead installer role, taking on more responsibilities and leadership in projects.
    - Oversee the installation and maintenance of complex low-voltage systems.
  - Supervisory Roles:
    - Advance to supervisory positions, such as low-voltage foreman or project supervisor.
    - Manage teams of low-voltage technicians and coordinate project tasks.

Say

Let us now perform an activity based on various career opportunities available for a Construction Electrician - LV.

Activity:

Exploring Career Opportunities for Construction Electrician - LV

- **Purpose:** This activity aims to introduce participants to various career prospects within the Construction Electrician - LV field. It will emphasize the roles, responsibilities, and potential career progression for Construction Electricians - LV.
- **Resources Required:** Presentation materials, handouts or printouts of job descriptions.

- **Tentative Duration:** Approximately 60 minutes.
- **Procedure:**
  i. Introduction: Begin by stressing the importance of Construction Electricians - LV in the construction industry and how their work is integral to building safe and functional structures.
  ii. Objective: Explain that the activity's purpose is to explore the diverse employment opportunities available to Construction Electricians - LV and inspire participants to consider different career paths within this field.
  iii. Initial Thoughts: Encourage participants to share their initial thoughts on the roles and respon
  iv. sibilities they associate with Construction Electricians - LV.
  v. Job Opportunities Handouts: Distribute handouts or printouts containing information about various employment opportunities within the Construction Electrician - LV profession, categorized by different career levels and specializations.
  vi. Discussion: Go through each opportunity, elaborating on roles, responsibilities, and the skills
  vii. required. Discuss how each career path aligns with different aspects of Construction Electrician - LV work.
  viii. Group Activity: Divide participants into small groups.
  ix. Assignment: Assign each group a specific employment opportunity from the handouts. Instruct them to discuss key aspects, including qualifications, skills, and potential career progression for that role.
  x. Group Presentation: Each group presents a brief researched explanation of the assigned employment opportunity to the entire group.
  xi. Summary: Summarize the key points presented by each group, highlighting the wide range of career paths available to Construction Electricians - LV. Emphasize their vital role in the construction industry.

Expected outcome: Participants will gain insights into the diverse career opportunities within the Construction Electrician - LV field, understand specific roles and responsibilities of Construction Electricians - LV, and be motivated to explore potential career trajectories within this dynamic industry.

Exercise:

Key Solutions to PHB Exercise:

A. Short Answers:

1) Primary responsibilities of a Construction Electrician - LV in a construction project: Installing, managing, testing, and troubleshooting low-voltage electrical systems.
2) Areas of specialization for a Construction Electrician - LV: Security systems, data networks, telecommunications, audiovisual systems, and more.
3) Essential personal attribute for LV electricians: Safety-consciousness.
4) Definition of "Voltage" in electrical systems: Electrical force or pressure that drives current through a circuit.
5) Specialization opportunities for LV electricians: Security systems, audiovisual technology, home automation, data networking, and telecommunications.

B. Fill-in-the-Blanks Questions:

1) A Construction Electrician - LV reads and interprets Electrical codes to plan and execute electrical installations accurately.
2) LV electricians need to demonstrate a commitment to Safety to protect themselves and others.
3) Physical fitness is not a significant factor in the success of a Construction Electrician - LV. - False
4) The purpose of a GFCI (Ground Fault Circuit Interrupter) in an electrical system is to detect ground faults.
5) Ohm's Law relates to Voltage, current, and resistance in electrical circuits.

C. True/False Questions:

i. A Construction Electrician - LV is responsible for maintaining and repairing high-voltage electrical systems. False
ii. LV electricians primarily work with high-voltage systems. False
iii. Physical fitness is not a significant factor in the success of a Construction Electrician - LV. False
iv. Entrepreneurial LV electricians can never start their own electrical contracting businesses. False
v. A Construction Electrician - LV can progress to become a master electrician. True

Notes

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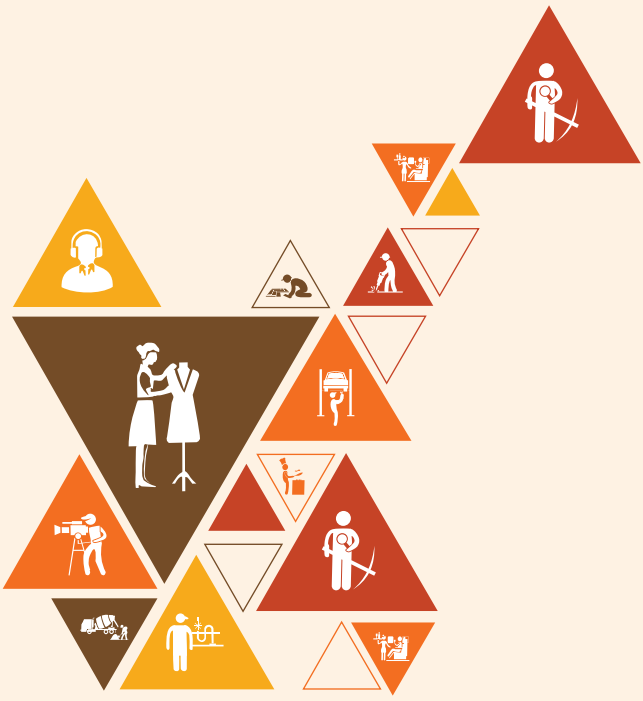
2. Generic Mathematical Skills

UNIT 2.1: Unit Conversion and Measurement

UNIT 2.2: Basic Geometrical Shapes and its Properties



Bridge Module

Key Learning Outcomes

At the end of this module, trainer will ensure that participant will be able to:

1. Explain brief on metric system of measurement;
2. Explain briefly inch system of measurement;
3. Perform basic arithmetic calculations;
4. Know about basic geometrical shapes;
5. Calculate area, volume and perimeter of different shapes;

UNIT 2.1: Unit Conversion and Measurement

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

- Explain brief on metric system of measurement; and
- Understanding inch system of measurement.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Calculator, conversion charts, measurement tapes

Do

- Perform basic mathematical calculation
- Identify the different types of shapes

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 2.1 to explain Unit Conversion and Measurement.

- For Construction Electricians - LV, understanding both the metric system and the inch system of measurement is essential, as they work with various components and materials that use these measurement systems. Here's a brief explanation of both systems:

- Metric System of Measurement:
  The metric system is the international system of measurement used in most countries worldwide, including in many aspects of the construction industry. Key features of the metric system include:
  - Base Units: The metric system is based on a set of fundamental units, such as the meter for length, the gram for mass, and the second for time.
  - Decimal System: It employs a decimal system of prefixes to indicate multiples or fractions of the base units. For example, a millimeter (mm) is one-thousandth of a meter.
  - Consistency: The metric system is consistent and logical, making it easy to convert between units and measure various quantities.
  - Common Metric Units in Construction:
    - Length: Meters (m), centimeters (cm), millimeters (mm)
    - Mass: Grams (g), kilograms (kg)
    - Volume: Liters (L)
    - Area: Square meters (m^2)
    - Temperature: Degrees Celsius (°C)

  Construction Electricians - LV often encounter metric measurements, especially when working with electrical components and equipment manufactured in countries that use the metric system. Familiarity with metric measurements is crucial for accurate installations and compatibility with international standards.

- Understanding Inch System of Measurement:
  The inch system of measurement, also known as the imperial system, is commonly used in the United States and a few other countries. It is important for Construction Electricians - LV to understand this system, especially when working on projects in regions where it is the standard. Key features of the inch system include:
  - Units: The inch system uses inches (in) as the primary unit for length and feet (ft) for measuring

- longer distances. It also includes other units like yards and miles for larger measurements.
- Fractional Notation: Inches are often expressed in fractional form, such as 1/2 inch or 3/4 inch.
- Common Inch System Units in Construction:
  - Length: Inches (in), feet (ft)
  - Conduit size: Inches (e.g., 1/2-inch conduit)
  - Box dimensions: Inches (e.g., 4x4 inch electrical box)
  - Wire gauge: American Wire Gauge (AWG)

Construction Electricians - LV working in regions that use the inch system need to be proficient in converting between metric and inch measurements to ensure precise installations and adherence to local standards and building codes.

- In summary, Construction Electricians - LV must be versatile in their ability to work with both the metric and inch systems of measurement to accommodate the various components and materials they encounter in the construction and electrical industries.

Activity 2.1.1

Name: "Understanding Metric and Inch Measurements in Construction Electrician - LV"

Purpose: This activity is designed to familiarize Construction Electricians - LV with both the metric and inch systems of measurement commonly used in the construction and electrical industry. The goal is to ensure that participants can confidently work with and convert between these two measurement systems.

Resources Required:

- Presentation materials explaining the metric and inch systems.
- Measuring tools (rulers, tape measures) in both metric and inch units.
- Sample electrical components and materials with measurements in both systems.
- Conversion tables and charts.

Tentative Duration: Approximately 60 minutes

Procedure:

1. Introduction (10 minutes):
   - Explain the importance of understanding both metric and inch systems in the construction and electrical industry.
   - Highlight scenarios where each system is commonly used.
2. Metric System Overview (15 minutes):
   - Present an overview of the metric system, including base units and common metric units used in construction.
   - Provide examples of metric measurements on sample components and materials.
3. Inch System Overview (15 minutes):
   - Present an overview of the inch system, including common units and fractional notations.
   - Show examples of inch measurements on sample components and materials.
4. Measurement Tools (10 minutes):
   - Distribute measuring tools (rulers or tape measures) that display both metric and inch units.
   - Instruct participants to practice measuring various items using both systems.
5. Conversion Practice (10 minutes):
   - Provide conversion tables and charts for participants.
   - Conduct exercises where participants convert measurements from metric to inches and vice versa.
6. Discussion (5 minutes):
   - Facilitate a group discussion to share insights and challenges faced during the measurement exercises.
   - Address any questions or concerns about the two measurement systems.
7. Real-World Application (5 minutes):

- Discuss the significance of applying these measurement skills in real-world construction and electrical projects.

8. Wrap-up (5 minutes):
   - Summarize the key points covered in the activity.
   - Encourage participants to continue practicing measurement conversions and to seek guidance when working with unfamiliar units.

Expected Outcome:

- Participants will gain a better understanding of both the metric and inch systems of measurement, be able to use measuring tools proficiently in both systems, and feel more confident in converting between these systems, which is crucial for success in the Construction Electrician - LV field.

Notes

UNIT 2.2: Basic Geometrical Shapes and its Properties

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

- Perform basic arithmetic calculations;
- Know about basic geometrical shapes; and
- Calculate area, volume and perimeter of different shapes.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Calculator, conversion charts, measurement tapes

Do

- Explain basic arithmetic calculations;
- Demonstrate basic geometrical shapes; and explain them
- Calculate area, volume and perimeter of different shapes.

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 2.2 to explain Basic Geometrical Shapes and its Properties.
- Understanding basic arithmetic calculations, basic geometrical shapes, and the ability to calculate areas, volumes, and perimeters of different shapes are fundamental skills that Construction Electricians - LV need in their work. Here's an explanation of these concepts:
  i. Basic Arithmetic Calculations:
     - Addition and Subtraction: Electricians often need to add or subtract measurements, such as wire lengths, conduit sizes, or voltage values. For example, when calculating the total length of wires needed for a project.
     - Multiplication and Division: These operations are crucial for determining things like voltage drop over a distance, current loads, and the number of fixtures required in a space.

  ii. Basic Geometrical Shapes:
     - Rectangles: Rectangles are common in construction, representing components like electrical panels and junction boxes. A rectangle has four right angles and opposite sides of equal length.
     - Circles: Circles come into play when working with objects like electrical conduit or the cross-sections of wires. A circle is defined by its radius (distance from the center to the edge) or diameter (twice the radius).
     - Triangles: Triangles are used when calculating angles and dimensions for mounting fixtures or when installing lighting in angled ceilings. They have three sides and three angles.
     - Squares: Squares are encountered when dealing with square junction boxes or electrical panels. They have four equal sides and four right angles.

  iii. Calculating Area, Volume, and Perimeter:
     - Area: Calculating the area is essential for determining the amount of material or space required. For rectangles, multiply length and width. For circles, use πr^2 (pi times the radius squared), and for triangles, use 0.5 * base * height.
     - Volume: Volume calculations are necessary when working with conduits or enclosures. For rectangular prisms, use length * width * height. For cylindrical conduits, use $\pi r^2 h$ (pi times the radius squared times the height).
     - Perimeter: The perimeter, or the distance around a shape, is important for estimating the amount of wiring, conduit, or trim needed. For rectangles, use 2 * (length + width). For circles, use 2 * πr (2 times pi times the radius), and for triangles, add the lengths of the three sides.

- Understanding these concepts enables Construction Electricians - LV to accurately plan and execute their work, ensuring the right amount of materials and efficient installations. They are crucial for creating electrical systems that meet safety standards and function properly in various construction projects.

Activity - 1

Mathematical skills - Practice

Conduct a group activity.

- Ask the participants to assemble at a designated place.
- Distribute the 'Practical Activity Format' which includes task, duration allowed, specific instructions, method statements, etc.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Maximum duration mentioned in the below table is for extensive practice and corresponding guidance until the skill is acquired by the participants.
- Explain the roles to each of them.
- Rotate the roles after completing one cycle.

Sub activity	Skill Practice	Time	Resources
1	Measure the size of the room in metric system by using a tape measure	2 Hours	Tape measure, stationary items (pen, marker, scale and notebook)
2	Measure the size of the room in imperial system by using a tape measure	2 Hours	
3	Convert the following: • 100000 mm into ..... mts, and • 1000mts into ..... mm. • 100 inches into ..... ft. • 10000 sft into ..... m^2 • $1m^3$ into ..... mm^3	1 Hour	
4	Solve the below: 300-200+100x50-30/5 = ... 100-20/3+15-150 = ... 1.5-0.2/4+2.8-1500+15000 = ...	1 Hour	

Table 2.2.1 – Mathematical skills

Specific Instructions:

- Make sure all the participants are wearing proper PPEs.
- Explain the overall procedure and key points of measuring the room with a tape measure before commencing the exercise.
- Use the unit conversion table for the activity.
- Give hints on the method of converting the units easily.
- Assist them wherever, it is necessary during the activity.
- At end of the process ask each one of them to mention the experience they had in activity.
- Clarify doubts, if any.
- Check and observe that all the steps followed by the participants.
- Complete the activity in scheduled time, at the end of activity, to assess the skill and knowledge acquired, call a person randomly from the group and ask him to explain the steps involved for mathematical conversion of units, calculation of area/volume and squaring of corners.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

1) The base unit for measuring length in the metric system is the meter (m).
2) The metric unit commonly used for measuring mass is the gram (g).
3) In the metric system, the unit used for measuring volume is the liter (L).
4) In the inch system, the equivalent of 1 foot in inches is 12 inches.
5) To calculate the volume of a rectangular prism, you multiply the length, width, and height.

Fill-in-the-Blanks Questions:

1) In the inch system, it's Fahrenheit.
2) The metric system uses the prefix "kilo" to represent 1,000.
3) The inch system uses the unit "pound" for measuring mass.
4) In the inch system, there are 36 inches in a yard.
5) 0 is considered an even number. This statement is true.

True/False Questions:

1) True/False: The metric system is widely used in most countries around the world. True.
2) True/False: The inch system is based on the decimal system. False.
3) True/False: A triangle has four sides. False.
4) True/False: The perimeter of a square is four times the length of one of its sides. True.
5) True/False: The inch system is commonly used in the United States. True.

Notes

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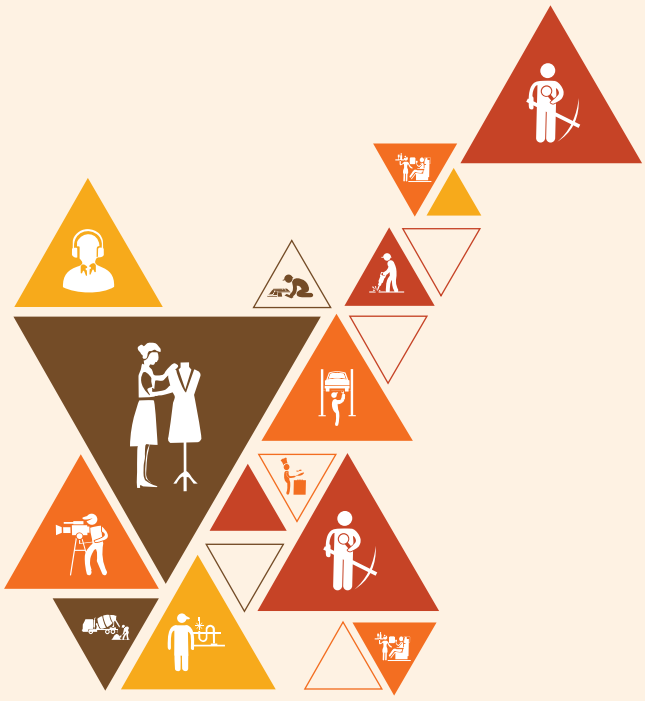
Corporation
Transforming the skill la

3. Lay (single/ three phases) Cable and Provide Electrification for Equipment at Construction Sites

UNIT 3.1: Preparatory Steps and Material Familiarization

UNIT 3.2: Cable Laying and Installation

UNIT 3.3: Electrical Safety, Compliance, Quality Assurance, and Component Installation



(CON/N0608)

Key Learning Outcomes

At the end of this module, trainer will ensure that participant will be able to:

- Explain the standard practices for establishing temporary LV power connection arrangements at the construction site.
- Explain the method, material specification, and time requirement of cable laying.
- Discuss the importance of inspecting the work area for embedded service lines, the presence of a water table, and the vicinity of flammable items before cable laying.
- Explain permits and checklists required before and after cable laying activity.
- Explain the safety parameters required to be checked for poles or trenches used for laying the cable.
- Explain the type of cables (single/ 3 phase) used as per electrical load requirement.
- Explain the standard practice of safeguarding installed electrical equipment from external damaging effects.
- Describe the termination of cables as per specification or standard practice.
- Explain tagging of embedded, exposed electrical lines, their accessories and other equipment.
- Explain the safety rules and regulations for handling and storing relevant tools, equipment, and materials for electrical works.
- Discuss the guidelines provided in the Indian Standard Code of Practice applicable to electrical works.
- Show how to assist in the planning of cable laying activity at construction sites.
- Demonstrate how to read and interpret electrical drawings, specifications, and manufacturer's guidelines.
- Show how to check cables, lights and accessories to be used according to instructions/ drawings/ manufacturers' specifications.
- Demonstrate the process of isolation of the power source at the construction site as per electrical safety norms.
- Demonstrate how to conduct cable laying as per plan ensuring all quality and safety aspects.
- Demonstrate the preparatory activities such as digging of trenches, laying of conduits, erection of poles etc.
- Show how to lay cables according to standard practice through trenches, conduits or using poles at the construction sites.
- Demonstrate checking for rigidity of poles, condition of exposed cables and fittings, depth and backfilling of trenches, and proper barricading as per safety norms.
- Demonstrate installation of components like circuit breakers, starters, relays, etc. as per the requirements.
- Demonstrate the methods to connect the cables to power sources and electrical equipment/ machinery as per the manufacturer's guidelines and standard practices.
- Demonstrate methods to provide earthing for the various equipment.
- Demonstrate electrical testing methods during inspection and trial run of the installed equipment.
- Show the to carry out the proper housekeeping of the work area.

UNIT 3.1: Preparatory Steps and Material Familiarization

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Discuss the importance of inspecting the work area for embedded service lines, the presence of a water table, and the vicinity of flammable items before cable laying.
- Explain the safety rules and regulations for handling and storing relevant tools, equipment, and materials for electrical works.
- Explain permits and checklists required before and after cable laying activity.
- Show how to assist in the planning of cable laying activity at construction sites.
- Demonstrate the preparatory activities such as digging of trenches, laying of conduits, erection of poles, etc.
- Explain the standard practices for establishing temporary LV power connection arrangements at the construction site.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Pliers, Screw Drivers Set, Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets, Pliers, Hammers, Hacksaws, Chisels, Spanners (Set), Wrenches, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Multi-Meter, Voltage Tester, Drilling Machine, Hand Cutting Machine, Cables, Wires, Sockets, Switches, Lights, Conduits (Flexible And Rigid), Raceways, Vibrators, Bar Cutting Machine, Bar Bending Machine, Water Pumps.

Do

- Clearly define the learning objectives and outcomes for each topic to ensure that learners understand what is expected of them.
- Use real-world examples and case studies to illustrate the importance of inspecting the work area, safety rules, permits, and planning activities.
- Prioritize safety throughout the training, emphasizing the potential risks and hazards associated with electrical work and the importance of adhering to safety regulations.
- Incorporate visual aids, such as diagrams, images, and videos, to enhance understanding and retention of the material.
- Encourage active participation through discussions, Q&A sessions, and group activities that engage learners in applying the knowledge.
- For practical topics like cable laying and trench digging, provide hands-on demonstrations or simulations to allow learners to experience these activities.
- Explain the specific permits and checklists relevant to cable laying activities and ensure learners understand the procedures for obtaining and completing them.
- Challenge learners to think critically about potential challenges and solutions in planning cable laying activities.
- Offer additional resources, such as reference materials, manuals, and websites, to help learners further explore the topics.
- Implement assessments or quizzes to evaluate learners' comprehension of the materials and provide constructive feedback.
- When explaining safety rules and regulations, physically demonstrate the correct procedures for handling tools and equipment safely.

- Facilitate group activities or discussions to promote collaboration and problem-solving related to preparatory activities like trench digging and pole erection.
- Use role-playing scenarios to simulate real-life situations involving temporary LV power connections, ensuring learners can apply the standard practices effectively.
- Collect feedback from learners at the end of each session to gauge their understanding and address any areas of confusion or concern.
- Offer ongoing support, such as a question-and-answer forum or follow-up sessions, to address any questions or issues that may arise after the training.
- Keep up with the latest industry standards, regulations, and best practices to ensure the training content remains relevant and accurate.
- Create an open and supportive learning environment where learners feel comfortable asking questions and seeking clarification.
- Stress the importance of personal responsibility and accountability in adhering to safety rules and best practices in electrical work.

Notes for Facilitation

- Use the 'Construction Electrician - LV' PHB and refer unit 3.1 to explain Preparatory Steps and Material Familiarization.
- Importance of Inspecting the Work Area Before Cable Laying:
  As a Construction Electrician - Low Voltage, it's crucial to inspect the work area before cable laying to ensure safety and efficiency. Here's why:
  - Safety: Embedded service lines, like gas or water pipes, can pose significant dangers if accidentally damaged during cable installation. Identifying their locations helps prevent accidents and potential disasters.
  - Water Table Awareness: The presence of a high-water table can lead to water infiltration in underground cable systems, causing electrical hazards and system failures. By knowing the water table's depth, you can take necessary precautions to waterproof cables and installations.
  - Fire Hazard Mitigation: Proximity to flammable items can create a fire hazard, especially when working with electrical systems. Identifying these items allows you to take appropriate measures to reduce the risk of fire, such as proper cable insulation and fireproofing.
- Safety Rules and Regulations for Handling Tools and Materials:
  - Tool Safety: It's essential to follow safety rules when handling tools. Ensure tools are in good working condition, use proper personal protective equipment (PPE), and follow safe operating practices to prevent accidents.
  - Material Handling: Proper storage and handling of electrical materials and equipment are critical. Understand the weight and size limitations for lifting and moving equipment. Follow OSHA regulations and manufacturer guidelines for handling heavy equipment and materials.
- Permits and Checklists Before and After Cable Laying:
  - Permits: Depending on the jurisdiction, various permits may be required for cable laying, including excavation permits and electrical permits. Compliance with permit requirements ensures that the work is conducted legally and meets safety standards.
  - Checklists: Before commencing work and after completing cable laying, using checklists is beneficial. Pre-work checklists can ensure that all necessary safety measures and materials are in place. Post-work checklists help verify that the installation meets specifications and safety standards.
- Assisting in Planning Cable Laying Activity:
  - Site Assessment: Collaborate with project managers and engineers to assess the construction site. Evaluate cable routes, power requirements, and potential challenges. This assessment helps in planning the most efficient and safe cable installation.
  - Routing and Pathway Selection: Assist in selecting the best routes and pathways for cable installation. Consider factors like minimizing cable length, avoiding interference with other services, and optimizing cable support systems.
- Demonstrating Preparatory Activities:
  - Trench Digging: Show proper techniques for digging trenches, considering depth, width, and soil conditions. Ensure trenches are free of debris and obstructions that could damage cables.
  - Conduit Installation: Demonstrate how to lay conduits, ensuring they are correctly sized and securely anchored. Proper conduit installation protects cables and makes future maintenance easier.

- Pole Erection: If applicable, demonstrate safe pole erection practices, including site preparation, leveling, and secure anchoring. Emphasize the importance of proper bracing and grounding.

- Standard Practices for Temporary LV Power Connections:
  - Distribution Panels: Explain the setup of temporary low-voltage (LV) power distribution panels. Ensure proper grounding, cable sizing, and overcurrent protection to meet safety and load requirements.
  - Cable Connection: Detail the connection of temporary cables, emphasizing secure termination and strain relief. Highlight the importance of safety measures, like cable protection and insulation.
- By understanding and adhering to these practices, Construction Electricians - LV can contribute to safer and more efficient cable installations and temporary LV power connections at construction sites, ultimately ensuring the reliability of electrical systems.

Activity 3.1.1

Name: "Inspecting the Work Area Before Cable Laying"

Purpose: This activity is designed for trainees in a Construction Electrician - LV course to understand the importance of inspecting the work area before cable laying to ensure safety and efficiency in electrical installations.

Resources Required:

- Site layout plan or diagram
- Safety equipment (e.g., hard hats, safety vests)
- Marking tools (e.g., flags, paint)
- Mock cables or markers to represent utilities
- Fire extinguisher (simulated)

Tentative Duration: Approximately 90 minutes

Procedure:

1) Introduction (15 minutes):
   - Provide an overview of the importance of inspecting the work area before cable laying, emphasizing safety and avoiding potential hazards.
2) Site Inspection Overview (15 minutes):
   - Explain the key elements of the inspection, including checking for embedded service lines, assessing the water table, and identifying flammable items in the vicinity.
3) Safety Briefing (10 minutes):
   - Conduct a safety briefing, ensuring that all trainees are equipped with necessary safety gear.
4) Embedded Service Line Simulation (20 minutes):
   - Set up a mock work area with hidden markers representing gas or water lines.
   - In small groups, instruct trainees to inspect the area, marking the locations of the simulated service lines.
5) Water Table Assessment (15 minutes):
   - Discuss the significance of the water table's presence.
   - Demonstrate how to measure the water table's depth using appropriate tools.
6) Flammable Items Assessment (10 minutes):
   - Identify potential flammable items in the vicinity.
   - Discuss strategies for minimizing fire hazards during cable laying.
7) Interactive Discussion (10 minutes):
   - Gather trainees to share their findings from the site inspection simulations.
   - Discuss any challenges or concerns encountered during the process.
8) Fire Safety Demonstration (5 minutes):
   - Briefly demonstrate how to use a fire extinguisher.
   - Explain the importance of having fire safety equipment on-site.
9) Review and Recap (10 minutes):
   - Summarize the key points of the activity, highlighting the importance of pre-inspection for safety

in cable laying.

10) Q&A and Discussion (10 minutes):
    - Invite trainees to ask questions and share their thoughts or experiences related to site inspections.

Expected Outcome:

- By actively participating in this activity, trainees will gain practical experience in inspecting work areas for potential hazards before cable laying, which is essential for the safety and success of electrical installations in construction projects.

Notes

UNIT 3.2: Cable Laying and Installation

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Show how to lay cables according to standard practice through trenches, conduits, or using poles at the construction sites.
- Demonstrate checking for rigidity of poles, condition of exposed cables and fittings, depth, and backfilling of trenches, and proper barricading as per safety norms.
- Demonstrate how to read and interpret electrical drawings, specifications, and manufacturer's guidelines.
- Explain the type of cables (single/3 phase) used as per electrical load requirement.
- Explain the method, material specification, and time requirement of cable laying.
- Demonstrate how to conduct cable laying as per plan, ensuring all quality and safety aspects.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Pliers, Screw Drivers Set, Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets, Pliers, Hammers, Hacksaws, Chisels, Spanners (Set), Wrenches, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Multi-Meter, Voltage Tester, Drilling Machine, Hand Cutting Machine, Cables, Wires, Sockets, Switches, Lights, Conduits (Flexible And Rigid), Raceways, Vibrators, Bar Cutting Machine, Bar Bending Machine, Water Pumps.

Do

- Start by outlining clear and specific learning objectives for each topic to guide the training session.
- Provide hands-on demonstrations of cable laying techniques, including trenching, conduit installation, and pole usage. Allow trainees to observe and practice under supervision.
- Encourage trainees to actively participate in the demonstrations. Ask questions, promote discussions, and invite them to share their thoughts and experiences.
- Prioritize safety throughout the training. Emphasize the importance of checking rigidity, cable condition, depth, backfilling, and proper barricading as per safety norms.
- Use visual aids such as diagrams, charts, and real-world examples to enhance understanding and retention of the material.
- Provide examples of electrical drawings, specifications, and manufacturer's guidelines for trainees to read and interpret. Encourage them to apply this knowledge.
- Explain the types of cables (single/3 phase) used based on electrical load requirements. Use real-world scenarios to illustrate the selection process.
- Clarify the method and material specifications for cable laying. Include details on the time required for various cable laying tasks.
- Highlight the significance of adhering to quality and safety aspects in cable laying as per the plan. Stress the potential consequences of deviating from these standards.
- Incorporate practical exercises where trainees can practice cable laying as per the plan. Ensure they follow safety and quality guidelines.
- Periodically review the trainees' progress and provide constructive feedback. Address any questions or concerns promptly.

- Present real-world cable laying challenges and encourage trainees to brainstorm solutions. This fosters critical thinking and problem-solving skills.
- Utilize role-playing scenarios to simulate cable laying situations, enabling trainees to apply what they've

- learned in practical settings.
- Share relevant case studies or examples of successful cable laying projects. Analyze the best practices used and the lessons learned.
- Implement assessments or quizzes to evaluate trainees' comprehension of the materials. Use these assessments to identify areas where additional support may be needed.
- Offer ongoing support, such as follow-up sessions or resources for further learning, after the training is complete.
- Foster a safe learning environment where trainees feel comfortable asking questions and making mistakes while learning.

Notes for Facilitation

- Use the Construction Electrician – LV PHB and refer unit 3.2 to explain Cable Laying and Installation.
- As a Construction Electrician (Low Voltage), it is essential to be proficient in various aspects of cable laying and electrical installations. Here's a description of the topics you've mentioned:
    - Laying Cables According to Standard Practice:
        - In the construction industry, laying cables is a fundamental task. This includes installing electrical cables through trenches, conduits, or using poles. Each method has its own set of guidelines and best practices.
        - Trenches are often used to bury cables underground. Electricians need to know how to dig trenches to the appropriate depth, lay cables, secure them, and then properly backfill the trench to ensure cables are protected and won't be damaged.
        - Conduits are protective pipes or tubes used to house cables. Installing conduits involves proper sizing, positioning, and secure fastening to ensure cables are safe from environmental factors and physical damage.
        - Poles are used for overhead cable installations. This involves mounting cables on poles securely, taking into account load distribution and safety.
    - Checking for Rigidity of Poles and Safety Measures:
        - Before attaching cables to poles, electricians need to check the rigidity and structural integrity of the poles. This ensures the safety of the entire installation.
        - It is vital to inspect the condition of exposed cables and fittings to confirm that they are in good shape, properly insulated, and free from damage.
        - When digging trenches, the depth needs to be accurate, avoiding interference with other utilities like water or gas lines.
        - Proper backfilling of trenches using the right materials is essential to protect cables and maintain their integrity.
        - Erecting barricades and safety signage around the cable installation area is necessary to keep workers and the public safe during and after installation.
    - Reading and Interpreting Electrical Drawings, Specifications, and Manufacturer's Guidelines:
        - Understanding electrical drawings, blueprints, and schematics is crucial to knowing where and how cables should be installed.
        - Electrical specifications detail the materials and methods that should be used for cable installations. Following these specifications is essential for compliance and safety.
        - Manufacturer's guidelines provide specific instructions for installing their equipment and components. Deviating from these guidelines can lead to system failures or safety hazards.
    - Type of Cables (Single/3 Phase) Based on Electrical Load Requirement:
        - Electricians need to select the appropriate type of cables (single-phase or three-phase) based on the electrical load requirements of a given project.
        - Single-phase systems are used for smaller loads and residential applications, while three-phase systems are typically used in industrial and commercial settings with higher power requirements.
    - Method, Material Specification, and Time Requirement of Cable Laying:
        - Cable laying methods may involve trenching, conduit installation, or pole mounting.

Each method has specific techniques and considerations.
    - Material specifications cover the types of cables, conduits, support structures, and protective measures required for safe and reliable installations.
    - Estimating the time required for cable laying depends on various factors, including the length of cables, complexity of the installation, and the size of the installation team.

- Conducting Cable Laying According to Plan with Focus on Quality and Safety:
    - Following a well-defined plan is essential for organized and efficient cable laying. Plans outline the sequence of tasks and safety measures to be followed.
    - Quality and safety aspects should be at the forefront of every cable laying project. Electricians need to ensure that cables are installed securely, are properly insulated, and adhere to safety standards and regulations.

- Being proficient in these aspects is critical for a Construction Electrician (Low Voltage) to successfully and safely perform cable laying tasks on construction sites. It ensures the reliability and safety of electrical systems in various projects.

Activity 3.2.1

Name: "Cable Laying Practical Simulation"

Purpose: This activity is designed for trainees in a Construction Electrician (Low Voltage) course to gain hands-on experience in cable laying techniques, while emphasizing safety, quality, and compliance with standards.

Resources Required:

- Mock construction site with designated areas for trenching, conduit installation, and pole mounting.
- Cables and conduit materials (simulated).
- Poles (real or simulated).
- Safety equipment (hard hats, vests, gloves).
- Measuring tools (tape measures, levels).
- Safety barricades and signage.
- Electrical drawings, specifications, and manufacturer's guidelines (simulated).

Tentative Duration: Approximately 2 hours

Procedure:

1. Introduction (15 minutes):
    - Explain the importance of cable laying in electrical installations and the significance of adhering to safety, quality, and standards.
    - Briefly discuss the key aspects of the activity.
2. Group Division (10 minutes):
    - Divide trainees into smaller groups. Each group will rotate through different cable laying scenarios.
3. Scenario 1: Trenching (20 minutes):
    - In this area, trainees will practice cable laying through trenches.
    - Demonstrate how to dig trenches to the correct depth and width.
    - Trainees must lay simulated cables, secure them properly, and backfill the trench.
    - Emphasize safety measures throughout, including proper trench shoring.
4. Scenario 2: Conduit Installation (20 minutes):
    - Trainees move to the conduit installation area.
    - Instruct them on proper conduit sizing, positioning, and secure fastening.
    - Trainees must install simulated conduits correctly.
    - Emphasize the importance of cable protection and secure fastening.
5. Scenario 3: Pole Mounting (20 minutes):
    - In the pole mounting area, trainees learn how to safely attach cables to poles.
    - Highlight load distribution and the importance of securely fastening cables.
    - Demonstrate the proper way to secure cables to poles.
6. Safety Inspection (15 minutes):

- After completing each scenario, conduct a safety inspection. Trainees must check the rigidity of poles, the condition of exposed cables and fittings, and ensure proper barricading and safety signage.

7. Reading and Interpretation (10 minutes):
   - Provide trainees with simulated electrical drawings, specifications, and manufacturer's guidelines.
   - Ask them to interpret the information and apply it to the cable laying scenarios they just practiced.
8. Discussion and Q&A (15 minutes):
   - Gather all trainees for a group discussion. Encourage them to share their experiences, ask questions, and discuss the challenges they encountered during the practical scenarios.
9. Review and Conclusion (10 minutes):
   - Summarize the key takeaways, highlighting the importance of safety, quality, and standards in cable laying.
   - Provide additional resources for trainees to explore after the activity.

Expected Outcome:

- By engaging in this practical simulation, trainees will gain a deeper understanding of cable laying techniques and the critical importance of adhering to safety and quality standards in real construction projects.

Notes

UNIT 3.3: Electrical Safety, Compliance, Quality Assurance, and Component Installation

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Demonstrate the process of isolation of the power source at the construction site as per electrical safety norms.
- Demonstrate the methods to connect the cables to power sources and electrical equipment/machinery as per the manufacturer's guidelines and standard practices.
- Demonstrate methods to provide earthing for various equipment.
- Explain the standard practice of safeguarding installed electrical equipment from external damaging effects.
- Describe the termination of cables as per specification or standard practice.
- Explain tagging of embedded, exposed electrical lines, their accessories, and other equipment.
- Explain the safety parameters required to be checked for poles or trenches used for laying the cable.
- Demonstrate electrical testing methods during inspection and trial run of the installed equipment.
- Show how to carry out the proper housekeeping of the work area.
- Discuss the guidelines provided in the Indian Standard Code of Practice applicable to electrical works.
- Demonstrate installation of components like circuit breakers, starters, relays, etc., as per the requirements.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Pliers, Screw Drivers Set, Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets, Pliers, Hammers, Hacksaws, Chisels, Spanners (Set), Wrenches, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Multi-Meter, Voltage Tester, Drilling Machine, Hand Cutting Machine, Cables, Wires, Sockets, Switches, Lights, Conduits (Flexible And Rigid), Raceways, Vibrators, Bar Cutting Machine, Bar Bending Machine, Water Pumps.

Do

- Start by outlining clear and specific learning objectives for each topic to guide the training session.
- Provide practical demonstrations for each of the learning outcomes, ensuring trainees can observe and, where possible, participate in the processes.
- Encourage trainees to actively participate in the demonstrations, ask questions, and engage in discussions related to the topics.
- Prioritize safety throughout the training. Highlight the importance of electrical safety norms and guidelines.
- Stress the significance of following manufacturer's guidelines for connecting cables to power sources and electrical equipment/machinery.
- Explain and demonstrate methods of providing earthing for various equipment, emphasizing safety and best practices.
- Explain and demonstrate how to safeguard installed electrical equipment from external damaging effects, such as environmental factors and unauthorized access.
- Describe the termination of cables as per specifications or standard practices, focusing on the importance of secure and proper connections.
- Explain the process of tagging embedded, exposed electrical lines, accessories, and equipment for clear

identification and maintenance purposes.

- Discuss and demonstrate the safety parameters that need to be checked for poles and trenches used for cable laying, highlighting the prevention of hazards.
- Show trainees how to conduct electrical testing methods during the inspection and trial run of installed equipment, including the use of testing equipment and the interpretation of results.
- Emphasize the importance of proper housekeeping at the work area to maintain a safe and organized environment.
- Discuss and elaborate on the guidelines provided in the Indian Standard Code of Practice applicable to electrical works. Encourage trainees to understand and apply these standards.
- Demonstrate the installation of various electrical components like circuit breakers, starters, relays, etc., in accordance with specific requirements and safety measures.
- Offer ongoing support, such as follow-up sessions or resources for further learning, after the training is complete.
- Incorporate real-world scenarios and case studies to illustrate practical applications and challenges in electrical works.

Notes for Facilitation

- Use the Construction Electrician (LV) PHB and refer unit 3.3 to explain Electrical Safety, Compliance, Quality Assurance, and Component Installation.

- Isolation of Power Source as per Electrical Safety Norms:
  Demonstrating the process of isolating power sources is essential for ensuring safety during electrical work. Electricians learn how to properly disconnect power sources, use lockout/tagout procedures, and follow safety norms to prevent electrical accidents.

  Tip:
  - Always follow electrical safety norms, including lockout/tagout procedures, to prevent accidents.
  - Electricians must disconnect power sources safely and securely.
  - This involves identifying the correct circuits, switches, and breakers to isolate.
  - Following safety norms is essential to protect against electric shock or equipment damage.
  - Electricians should use lockout/tagout devices to physically lock switches and indicate isolation.
  - Proper labeling and documentation are crucial to inform others about the isolated circuits.
  - A thorough understanding of safety norms and equipment is required to isolate power sources effectively.

- Connecting Cables to Power Sources and Equipment:
  Electricians must be adept at connecting cables to power sources and electrical equipment/machinery while adhering to manufacturer's guidelines and standard practices. This includes selecting the right connectors, ensuring proper insulation, and conducting secure terminations.

  Tip:
  - Always adhere to manufacturer's guidelines and industry best practices for cable connections.
  - Electricians must select appropriate cables, connectors, and terminations for the task.
  - Ensuring proper insulation and secure connections are key to preventing electrical faults.
  - Adequate stress relief should be employed to prevent cable damage over time.
  - Regular inspection and maintenance of connections are necessary for safety and reliability.
  - Electricians should be familiar with different cable types and their specific uses.
  - Proper cable management and routing are essential for organization and safety.
  - Training in cable connection is crucial to avoid electrical failures or hazards.

- Earthing for Various Equipment:
  Proper earthing is crucial for electrical safety. Electricians learn how to provide earthing for various equipment to prevent electrical faults and reduce the risk of electric shock. Techniques include grounding, bonding, and earth electrodes.

  Tip:
  - Ensure that all equipment is properly grounded, and conduct regular inspections.

- Electricians learn various earthing techniques, including grounding, bonding, and electrode placement.
- Grounding ensures electrical equipment is connected to the earth to prevent voltage build-up.
- Bonding connects conductive materials to eliminate potential differences, enhancing safety.
- Earth electrodes are used to provide a path for fault currents to protect against electrical shocks.
- Regular testing and maintenance of earthing systems are essential to verify their effectiveness.
- Electricians should understand the specific requirements for earthing different types of equipment.
- Comprehensive knowledge of earthing principles is necessary for safe and reliable installations.

- Safeguarding Installed Electrical Equipment:
  Safeguarding electrical equipment from external damaging effects is vital. Electricians understand and implement practices such as enclosure, weatherproofing, surge protection, and tamper-resistant features to protect electrical components from environmental factors and unauthorized access.

  Tip:
  - Use appropriate enclosures and protective measures for the environment and location.
  - Electricians learn to safeguard electrical equipment from factors like weather, dust, and physical damage.
  - Weatherproof enclosures and insulation protect equipment from moisture and environmental elements.
  - Surge protection devices safeguard against voltage spikes and electrical surges.
  - Tamper-resistant features deter unauthorized access or interference with equipment.
  - Regular inspection and maintenance ensure protective measures are effective.
  - Safeguarding is essential for equipment longevity and reduced downtime.
  - Electricians should consider the specific environmental challenges and security requirements of each installation.
  - Proper training in safeguarding practices is critical for reliable electrical systems.

- **Termination of Cables:**
  The termination of cables involves correctly connecting and securing cables to various components. Electricians must follow specifications or standard practices, which include ensuring tight connections, proper insulation, and stress relief.

  Tip:
  - Always follow specifications and standard practices to ensure effective cable terminations.
  - Electricians learn how to terminate cables securely according to specified requirements.
  - Terminations must include proper insulation to prevent electrical faults.
  - Stress relief is crucial to protect cables and connections from wear and tear.
  - Electricians should be proficient in various termination methods, such as crimping and soldering.
  - Accurate cable sizing and connection techniques are essential for electrical reliability.
  - Following manufacturer's guidelines is critical to ensure safe and compliant terminations.
  - Regular inspection and testing of terminations are necessary to verify their integrity.
  - Proper training in cable termination practices is fundamental for reliable electrical systems.

- **Tagging of Electrical Lines and Equipment:**
  Proper tagging and labeling are essential for identifying electrical lines, accessories, and equipment. Electricians learn how to label wires, switches, outlets, and other components, making it easier for troubleshooting, maintenance, and safety.

  Tip:
  - Ensure clear and standardized labeling for easy identification and maintenance.
  - Electricians learn to tag and label embedded and exposed electrical lines, accessories, and equipment.
  - Clear labeling provides critical information for system maintenance and troubleshooting.
  - Standardized labeling conventions simplify identification and streamline maintenance efforts.
  - Labeling should include information about voltage, function, and any specific hazards.
  - Regular inspection of labels ensures they remain legible and accurate.
  - Electricians should be familiar with labeling standards and practices in their region.

- Proper tagging and labeling contribute to safe and efficient electrical systems.
- Training in labeling and tagging practices is essential for organized and safe installations.

- **Safety Parameters for Poles and Trenches:**
  When laying cables, it's essential to check safety parameters for poles and trenches. Electricians understand how to inspect poles for structural integrity, depth for trenching to avoid utility conflicts, and proper barricading to protect work areas.

  Tip:
  - Prioritize safety by conducting thorough inspections and following industry guidelines.
  - Electricians learn to inspect poles for structural integrity, including signs of wear, damage, or rot.
  - Trenches must be inspected for proper depth, width, and shoring to avoid utility conflicts or collapse.
  - Adequate barricading and safety signage should be used to protect the work area.
  - Understanding regional and industry safety guidelines is crucial for pole and trench safety.
  - Regular inspection and maintenance of poles and trenches are necessary to prevent hazards.
  - Electricians should be trained in safety procedures and hazard identification for poles and trenches.
  - Proper safety checks contribute to a secure work environment and accident prevention.

- **Electrical Testing Methods:**
  Electricians are trained in various electrical testing methods for inspection and trial runs of installed equipment. This includes using instruments like multimeters, insulation resistance testers, and circuit analyzers to ensure proper function and safety.

  Tip:
  - Regularly perform electrical testing to identify and address issues promptly.
  - Electricians learn various testing methods, such as using multimeters, insulation resistance testers, and circuit analyzers.
  - Testing should be conducted during inspection and trial runs to ensure proper equipment functionality.
  - Interpreting test results and understanding industry standards is critical for safety and reliability.
  - Regular equipment testing and maintenance are essential for preventing failures.
  - Electricians should be well-versed in using testing equipment and analyzing test data.
  - Comprehensive training in electrical testing contributes to safe and reliable electrical installations.

- **Proper Housekeeping:**
  Maintaining a clean and organized work area is crucial for safety and efficiency. Electricians are taught the importance of proper housekeeping, including storing tools, materials, and waste disposal in a safe and organized manner.

  Tip:
  - Prioritize regular cleaning and organization to prevent accidents and promote a productive work environment.
  - Electricians should learn to keep tools, materials, and the work area organized and free of clutter.
  - Proper waste disposal procedures should be followed to maintain cleanliness and safety.
  - Maintaining clear pathways and accessible emergency exits is crucial for safety.
  - Adequate storage and labeling of tools and materials simplify work and prevent hazards.
  - Regular housekeeping helps prevent accidents, lost time, and damage to equipment.
  - Electricians should be familiar with safety guidelines and industry best practices for housekeeping.
  - Effective housekeeping practices contribute to a safe, organized, and efficient work environment

- **Indian Standard Code of Practice:**
  Indian Standard Code of Practice provides guidelines for electrical works. Electricians discuss and understand these guidelines to ensure compliance with national standards in electrical installations.

Tip:

- Familiarize yourself with these guidelines and ensure compliance with national standards.
- Electricians should discuss and understand the guidelines in the Indian Standard Code of Practice applicable to electrical works.
- Compliance with these standards is crucial for ensuring the safety and reliability of electrical installations.
- Understanding and implementing the guidelines contribute to consistency and quality in electrical work.
- Regular updates and revisions of the code should be considered to stay current with industry practices.
- Electricians should be knowledgeable about the specific requirements and standards relevant to their region.
- Adherence to national standards is essential for ensuring safe and compliant electrical installations.

- **Installation of Electrical Components:**
  Electricians demonstrate the installation of various electrical components such as circuit breakers, starters, relays, and more. They follow specific requirements and safety measures for each component, ensuring proper connections and functionality.

  Tip:

  - Follow specific requirements and safety measures for each component to ensure proper and safe installation.
  - Electricians demonstrate the installation of various electrical components as per project requirements.
  - Proper connections, secure fastening, and adherence to manufacturer's guidelines are essential for safe and reliable installations.
  - Electricians should understand the specific requirements and standards for each type of component.
  - Training in component installation practices ensures proper functionality and safety.
  - Regular inspection and testing of installed components are necessary to verify their performance.
  - Proper installation contributes to the overall reliability and efficiency of electrical systems.

Activity 3.3.1

Name: "Safe Cable Connection Demonstration"

Purpose: To demonstrate safe cable connection methods, emphasizing adherence to manufacturer's guidelines and standard practices.

Resources Required:

- Electrical cables and connectors
- Electrical equipment or machinery
- Tools (screwdrivers, pliers, cable strippers, etc.)
- Manufacturer's guidelines
- Safety equipment (gloves, safety glasses, etc.)
- Presentation materials (slides or handouts)

Tentative Duration: Approx. 2 Hours

Procedure:

1) Introduction (10 minutes):
   - Begin the session with a brief introduction to the importance of safe cable connections in electrical work.
   - Explain the learning objectives, emphasizing adherence to manufacturer's guidelines and industry standards.

2) Safety Briefing (5 minutes):
    - Highlight the importance of safety in electrical work.
    - Discuss the use of personal protective equipment (PPE) such as gloves and safety glasses.
3) Equipment Setup (10 minutes):
    - Set up a work area with electrical cables, connectors, and electrical equipment or machinery.
    - Ensure all necessary tools and safety equipment are readily available.
4) Manufacturer's Guidelines (15 minutes):
    - Review the importance of following manufacturer's guidelines for cable connections.
    - Discuss the contents of the manufacturer's guidelines, including specifications for connectors, termination methods, and safety precautions.
5) Demonstration (30 minutes):
   Conduct a step-by-step demonstration of safe cable connection methods, following these key points:
    - Proper cable stripping and preparation.
    - Correct connector selection and installation.
    - Secure cable termination and fastening.
    - Adherence to torque and tightening specifications.
    - Ensuring proper insulation and stress relief.
6) Q&A Session (10 minutes):
    - Encourage trainees to ask questions and seek clarification on the demonstrated methods.
7) Practice (20 minutes):
    - Allow trainees to practice safe cable connections under supervision.
    - Provide feedback and guidance during their practice.
8) Discussion and Recap (15 minutes):
    - Lead a discussion on the challenges and best practices observed during the practice session.
    - Recap the key points of the demonstration, emphasizing adherence to manufacturer's guidelines.
9) Safety Review (10 minutes):
    - Reiterate the importance of safety in cable connections.
    - Discuss safety procedures for working with live electrical equipment and the use of safety locks and tags.
10) Conclusion (5 minutes):
    - Summarize the main takeaways from the activity.
    - Provide additional resources or references for further learning.

Key Tips:

- Emphasize the importance of meticulous cable preparation, including stripping and insulation.
- Stress the significance of proper torque and tightening for secure connections.
- Encourage trainees to read and understand manufacturer's guidelines before any cable connection task.
- Highlight the need for regular inspection and testing of cable connections for reliability and safety.
- Ensure that trainees are well-versed in safety procedures when working with live electrical equipment.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

i. Key safety considerations when establishing temporary LV power connections at a construction site include proper grounding, secure connections, insulation, and protection against weather and physical damage.
ii. The purpose of inspecting the work area for embedded service lines and the presence of a water table before cable laying is to prevent accidental damage to existing utilities, avoid water-related hazards, and plan the cable route effectively.
iii. Checking the rigidity of poles and the condition of exposed cables is important when laying cables in construction to ensure the structural integrity of supporting structures and to identify potential damage or wear on the cables, preventing electrical faults.
iv. The primary role of circuit breakers in electrical control panels is to protect electrical circuits from overcurrent and short circuits by interrupting the flow of electricity. Starters, on the other hand, control the starting and stopping of electric motors.
v. It is necessary to read and interpret electrical drawings and manufacturer's guidelines during installation to ensure the proper connection of components, compliance with specifications, and adherence to safety measures.

Fill-in-the-Blanks:

i. When laying cables, the choice of single or three-phase cables depends on the electrical load requirement.
ii. The Indian Standard Code of Practice provides guidelines for various aspects of electrical works, ensuring compliance with regulatory codes.
iii. Before and after cable laying activity, it is essential to complete the necessary permits and checklists for safety and compliance.
iv. The process of isolating the power source at a construction site is carried out in accordance with electrical safety norms.
v. To ensure electrical safety, it is vital to provide grounding for various equipment, preventing electrical hazards.

True/False Questions:

i. True: Rigidity of poles and proper backfilling of trenches are essential safety considerations during cable laying.
ii. True: The choice between single and three-phase cables depends on the electrical load requirement.
iii. True: The Indian Standard Code of Practice is a set of guidelines for electrical works in India.
iv. True: Housekeeping of the work area is essential to prevent electrical hazards and maintain a safe workspace.
v. False: Circuit breakers and starters are components that primarily control the electrical supply voltage.

Notes

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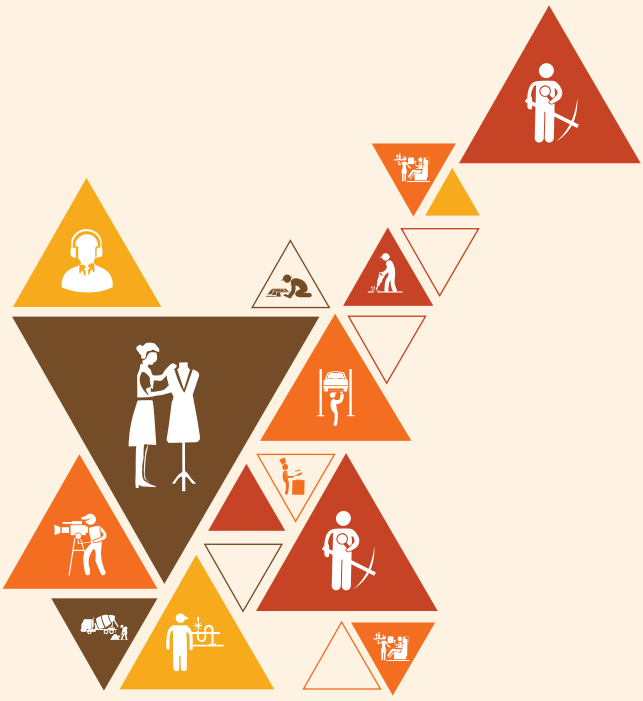
4. Inspect Electrical Maintenance of Construction Equipment as per Requirement

UNIT 4.1: Electrical Principles and Systems in Construction Equipment

UNIT 4.2: Electrical Equipment Maintenance and Fault Diagnosis



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Key Learning Outcomes

At the end of this module, trainer will ensure that participant will be able to:

- Explain the working principle and power rating of electrical circuits, MCB, RCCB, ELCB, components and fixtures used in construction equipment.
- Explain the type of connections and tests to be carried out in capacitive, inductive AC and DC circuits.
- Explain different types of motors, their uses and working principles.
- Explain the star, and delta connection and their uses in electrical circuits.
- Discuss the working principle of various types of starters used in DC motors such as 3point, 4 point etc. as well as that used 3 phase squirrel cage induction motors such as DOL, Star-Delta etc.
- Explain the working principle of different types of 3-phase transformers, connections (star-star, delta-delta, delta-star) and their components.
- Explain the application of transformers and relevant terminologies like magnetic flux, winding, current and voltage ratio, core and shell construction, etc.
- Describe different methods of earthing including measurement of earth resistance by earth tester, testing of earth Leakage by ELCB and relay, etc.
- Demonstrate appropriate tests to diagnose electrical faults of equipment.
- Demonstrate how to repair or replace faulty parts of circuits according to the power rating and manufacturer's guidelines.
- Show how to use appropriate starters according to the specification and power rating of motors during maintenance.
- Demonstrate how to carry out winding in the armatures of the motor as per the specification of the motor.
- Show how to inspect and rectify faults detected in earthing of construction equipment referring to manufacturer's guidelines.
- Show how to inspect leakage, and faults in LV single/ three phase power distribution wirings as per directions and standard practices.
- Demonstrate how to operate and inspect transformers to detect faults under close supervision.
- Demonstrate how to join damaged armoured cables (bearing heavy electricity loads) using straight-through joints efficiently.
- Demonstrate documentation of readings, and conclusions of tests performed.

UNIT 4.1: Electrical Principles and Systems in Construction Equipment

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Explain the working principle and power rating of electrical circuits, MCB, RCCB, ELCB, components, and fixtures used in construction equipment.
- Explain the type of connections and tests to be carried out in capacitive, inductive AC and DC circuits.
- Explain different types of motors, their uses, and working principles.
- Explain the star and delta connection and their uses in electrical circuits.
- Discuss the working principle of various types of starters used in DC motors such as 3-point, 4-point, etc., as well as that used in 3-phase squirrel cage induction motors such as DOL, Star-Delta, etc.
- Explain the working principle of different types of 3-phase transformers, connections (star-star, delta-delta, delta-star), and their components.
- Explain the application of transformers and relevant terminologies like magnetic flux, winding, current and voltage ratio, core and shell construction, etc.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Screw Driver Set, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Cutting Machine, Drilling Machine, Pliers, Screw Drivers (Set), Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Rigid Conduits, Flexible Conduit, Clamps For Conduits, Screws, Helmet, Safety Shoes, Safety Belt, Cotton Hand Gloves, Goggles, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets.

Do

- Provide clear and concise explanations for the working principles and power ratings of electrical circuits, MCBs, RCCBs, ELCBs, components, and fixtures. Use real-world examples to make the concepts relatable.
- Encourage interactive learning by involving trainees in discussions and asking questions to assess their understanding. Use practical demonstrations or visual aids when possible.
- Conduct hands-on exercises and practical demonstrations to help trainees gain practical experience in working with electrical components and fixtures.
- Create test simulations or scenarios for trainees to practice different types of tests in capacitive, inductive AC, and DC circuits. Allow them to troubleshoot and identify solutions.
- Explain different types of motors, their uses, and working principles, and relate this knowledge to the construction equipment they may encounter.
- Use diagrams, charts, and visual aids to illustrate the working principles of star and delta connections in electrical circuits. Show how these connections are used in practical applications.
- Describe the working principles of various types of starters used in DC motors (e.g., 3-point, 4-point) and 3-phase squirrel cage induction motors (e.g., DOL, Star-Delta). Emphasize the importance of proper motor starting methods.
- Explain the working principles of different types of 3-phase transformers and their connections (star-star, delta-delta, delta-star). Use diagrams to help trainees visualize transformer configurations.
- Discuss practical applications of transformers and use relevant terminologies such as magnetic flux, winding, current and voltage ratio, core and shell construction. Provide real-world examples to illustrate these concepts.
- Emphasize safety throughout the training, especially when working with electrical circuits and equip

ment. Highlight safety measures and precautions at every stage.

- Encourage trainees to work on problem-solving exercises related to the topics covered. This will help them apply their knowledge to real-world situations.
- Regularly assess trainees' understanding through quizzes, tests, or practical assignments. Provide constructive feedback to help them improve.
- Create an open and welcoming environment where trainees feel comfortable asking questions and seeking clarification on complex topics.
- Keep up-to-date with the latest developments in electrical technology and construction equipment to provide the most current and relevant information.
- Incorporate real-life examples and case studies from the construction industry to demonstrate the practical relevance of the topics being discussed.
- Encourage trainees to explore and research beyond the training materials, fostering a sense of curiosity and continuous learning.
- Organize group discussions or group activities where trainees can share their insights and learn from each other's experiences.
- Collect feedback from trainees to understand their learning experiences and identify areas for improvement in the training program.
- Offer certification or recognition for successful completion of the training, motivating trainees to excel in the subject matter.
- Ensure that training materials, resources, and support are readily accessible to all trainees, and accommodate different learning styles and abilities.

Notes for Facilitation

- Use the Construction Electrician (LV) PHB and refer unit 4.1 to explain Electrical Principles and Systems in Construction Equipment.
- Working Principle and Power Rating of Electrical Circuits, MCB, RCCB, ELCB, Components, and Fixtures:
  Explanation: Electrical circuits involve the flow of electricity in a closed path. Understanding the power rating is crucial to prevent overloading. Miniature Circuit Breakers (MCB), Residual Current Circuit Breakers (RCCB), and Earth Leakage Circuit Breakers (ELCB) provide protection in case of faults.

  Tips:
  - Choose components and fixtures compatible with the circuit's power rating.
  - Familiarize yourself with symbols used in circuit diagrams.
  - Regularly inspect MCB, RCCB, and ELCB for proper operation.

- **Type of Connections and Tests in Capacitive, Inductive AC, and DC Circuits:**
  Explanation: AC and DC circuits can include capacitive and inductive elements. Proper connections, like series and parallel, are crucial. Tests for continuity, voltage, and insulation ensure circuit integrity.

  Tips:
  - Use phasor diagrams to analyze AC circuit behavior.
  - Safety is paramount during testing; always follow safety procedures.
  - Test circuits before connecting to prevent accidents.

- **Different Types of Motors, Their Uses, and Working Principles:**
  Explanation: Motors are prevalent in construction equipment. DC motors, synchronous motors, and induction motors have various applications. Understanding their principles is essential for efficient operation.

  Tips:
  - Match the motor type to the specific needs of construction equipment.
  - Learn how to control motor speed and direction.
  - Regular maintenance ensures longer motor life.

- **Star and Delta Connection in Electrical Circuits:**
  Explanation: Star (wye) and delta (triangle) connections affect voltage and current distribution. Star is used for high voltage, while delta is for high current applications.

Tips:
- Memorize the wiring configurations for star and delta connections.
- Be aware of different voltages in star and delta connections.
- Choose the appropriate connection for your equipment's needs.

- **Working Principle of Starters in DC Motors and 3-Phase Squirrel Cage Induction Motors:**
  Explanation: Starters are used to control motor operations. Different types, such as 3-point and 4-point starters for DC motors, and DOL and Star-Delta starters for 3-phase motors, serve specific purposes.

  Tips:
  - Understand the sequence of operations for various starters.
  - Ensure proper overload and short-circuit protection.
  - Follow manufacturer guidelines for starter installation and maintenance.

- **Working Principle of Different Types of 3-Phase Transformers, Connections, and Components:**
  Explanation: 3-phase transformers play a key role in voltage transformation. They include various connections (star-star, delta-delta, delta-star) and components like windings and cores.

  Tips:
  - Calculate turns ratio for voltage transformation.
  - Recognize the purpose of transformers in voltage conversion and isolation.
  - Interpret transformer diagrams and symbols accurately.

- **Application of Transformers and Relevant Terminologies:**
  Explanation: Transformers are used to step up or step down voltage for different equipment. Understanding terminology like magnetic flux, winding design, current and voltage ratios, and core and shell construction is crucial.

  Tips:
  - Ensure the right transformer selection for voltage adaptation.
  - Pay attention to transformer maintenance for optimal performance.
  - Follow safety practices when working with transformers to prevent electrical hazards.

Activity 4.1.1

Name: "Exploring the Practical Applications of Electrical Concepts in Construction"

Purpose: To apply theoretical knowledge of electrical concepts to practical scenarios encountered in construction settings.

Resources Required:

- Construction equipment schematic diagrams
- Miniature Circuit Breakers (MCB), Residual Current Circuit Breakers (RCCB), Earth Leakage Circuit Breakers (ELCB)
- Various electrical components and fixtures
- Multimeter
- Safety equipment (gloves, safety glasses)

Tentative Duration: 70 minutes

Procedure:

1. Introduction (10 minutes):
   - Begin with a brief explanation of the importance of understanding electrical circuits and protection devices in construction.
   - Mention the objectives of the activity.
2. Theory Review (10 minutes):
   - Recap the working principles of electrical circuits, MCB, RCCB, and ELCB.
   - Discuss the power rating concept and its significance in construction.

3. Practical Demonstration (20 minutes):
    - Provide trainees with construction equipment schematic diagrams and actual MCB, RCCB, ELCB, components, and fixtures.
    - Demonstrate how to identify and calculate the power rating for specific components.
    - Show how to connect and install MCB, RCCB, and ELCB in a simulated electrical circuit.
4. Hands-On Activity (15 minutes):
    - Divide trainees into small groups.
    - Each group is given a construction equipment schematic diagram and a set of electrical components.
    - Instruct them to calculate the power rating and install the protection devices in the circuit.
5. Testing and Discussion (5 minutes):
    - Use a multimeter to check the completed circuits for power rating accuracy and proper functioning of protection devices.
    - Discuss the outcomes and address any questions or concerns.
6. Conclusion (10 minutes):
    - Summarize the key takeaways from the activity.
    - Emphasize the practical application of understanding electrical concepts in construction for safety and efficiency.

Tips:

- Encourage active participation and questions during the activity.
- Emphasize the importance of safety measures when working with electrical components.
- Relate the activity to real construction scenarios to reinforce its practical relevance.
- Provide opportunities for trainees to discuss challenges and solutions encountered during the activity.

Notes

UNIT 4.2: Electrical Equipment Maintenance and Fault Diagnosis

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Describe different methods of earthing, including measurement of earth resistance by earth tester, testing of earth leakage by ELCB and relay, etc.
- Demonstrate how to join damaged armoured cables (bearing heavy electricity loads) using straight-through joints efficiently.
- Demonstrate how to inspect and rectify faults detected in earthing of construction equipment referring to manufacturer's guidelines.
- Show how to inspect leakage and faults in LV single/three-phase power distribution wirings as per directions and standard practices.
- Demonstrate how to operate and inspect transformers to detect faults under close supervision.
- Demonstrate how to carry out winding in the armatures of the motor as per the specification of the motor.
- Show how to use appropriate starters according to the specification and power rating of motors during maintenance.
- Demonstrate appropriate tests to diagnose electrical faults of equipment.
- Demonstrate how to repair or replace faulty parts of circuits according to the power rating and manufacturer's guidelines.
- Show how to document readings and conclusions of tests performed.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Screw Driver Set, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Cutting Machine, Drilling Machine, Pliers, Screw Drivers (Set), Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Rigid Conduits, Flexible Conduit, Clamps For Conduits, Screws, Helmet, Safety Shoes, Safety Belt, Cotton Hand Gloves, Goggles, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets.

Do

- Ensure that you thoroughly understand the content and can effectively demonstrate each learning outcome. This includes all aspects, from earthing methods to fault diagnosis.
- Emphasize safety procedures throughout training sessions, especially when dealing with electrical equipment and tests. Trainees should understand the importance of safety protocols.
- Incorporate real-life examples and scenarios to illustrate the practical application of each learning outcome, making it relatable to construction electricians.
- Provide trainees with opportunities to practice and apply what they've learned. Hands-on experience is invaluable for building practical skills.
- During practical demonstrations, closely supervise trainees, correct their techniques as necessary, and ensure they follow manufacturer guidelines.
- Encourage trainees to identify and troubleshoot electrical faults independently. This will develop their problem-solving skills, a crucial aspect of the job.
- Teach trainees the importance of documenting their findings and conclusions from tests and inspections, emphasizing its role in maintaining records and ensuring accountability.
- Regularly assess trainee performance and provide constructive feedback to help them improve their skills and knowledge.
- Encourage trainees to think critically when diagnosing and repairing electrical faults, as well as when choosing the right components and methods.

- Keep up-to-date with industry standards, technological advancements, and safety regulations to ensure that your training reflects the latest practices and guidelines.
- Encourage collaboration among trainees, fostering a supportive learning environment where they can share experiences and insights.
- Utilize visual aids such as diagrams, charts, and videos to enhance the understanding of complex concepts and procedures.
- Recognize that trainees may face challenges along the way. Be patient, offer support, and create an environment where questions are welcomed.
- Adapt your teaching methods to accommodate different learning styles, ensuring that every trainee has the opportunity to excel.
- Stay enthusiastic and passionate about the subject matter. Your excitement can inspire trainees and make the learning process more engaging.

Notes for Facilitation

- Use the 'Construction Electrician (LV)' PHB and refer unit 4.2 to explain Electrical Equipment Maintenance and Fault Diagnosis.

- **Methods of Earthing:**
  Earthing is a vital safety measure in electrical systems. There are several methods, including plate, pipe, and rod earthing. Plate earthing involves burying a large metal plate in the ground, while pipe earthing uses a metal pipe. Rod earthing relies on metal rods driven into the earth. These methods provide a low-resistance path for fault currents to ensure safety. The effectiveness of earthing is measured by earth resistance using specialized tools like earth testers. Additionally, earth leakage can be detected and protected against using devices like Earth Leakage Circuit Breakers (ELCBs) and relays.

  Tips:
  - Regularly inspect and maintain the earthing system to ensure its effectiveness.
  - Choose the appropriate earthing method based on soil conditions and site requirements.
  - Comply with safety standards when working with earthing systems.

- **Joining Damaged Armoured Cables:**
  Armoured cables play a crucial role in electrical installations, and they can sometimes get damaged. When joining damaged armoured cables, it's essential to do it efficiently to maintain electrical integrity. Straight-through joints are used for this purpose, and proper insulation and sealing are crucial to prevent faults and ensure safety.

  Tips:
  - Ensure secure connections to prevent power loss and hazards.
  - Use suitable insulation materials and techniques for effective sealing.
  - Thoroughly check the joints for any potential issues.

- **Fault Rectification in Earthing:**
  Faults in the earthing system can compromise electrical safety. These faults can include poor connections, corrosion, or damage to grounding components. To rectify these issues, it's essential to follow the manufacturer's guidelines while inspecting and repairing the earthing system.

  Tips:
  - Strictly adhere to the manufacturer's recommendations for repairs.
  - Inspect the earthing system thoroughly and conduct tests as necessary.
  - Promptly replace any corroded or damaged components to maintain system integrity.

- **Inspection of LV Power Distribution Wirings:**
  Low-voltage (LV) power distribution wiring systems are prevalent in construction. Regular inspection is crucial to identify leakages and faults. Visual inspections and electrical tests are carried out to ensure the system's safety and functionality.

  Tips:
  - Perform systematic and regular inspections to detect issues promptly.
  - Use appropriate safety equipment when inspecting electrical systems.

- Adhere to testing procedures accurately for reliable results.

- Transformer Operation and Inspection:
  Transformers are integral to electrical systems. Understanding their operation and how to inspect them for faults is essential. This includes visual inspections, oil analysis, and testing procedures to ensure the transformer's reliability and safety.

  Tips:
  - Prioritize safety precautions when working with transformers.
  - Pay attention to grounding and protective measures to avoid accidents.
  - Regularly monitor oil quality and insulation for signs of trouble.

- **Armature Winding:**
  In motor maintenance, armature winding is a critical skill. It involves rewinding the armatures of motors according to motor specifications. This process ensures that the motor functions optimally.

  Tips:
  - Precisely follow motor specifications for winding to maintain performance.
  - Utilize high-quality winding materials for better durability.
  - Verify the wire gauge and insulation to prevent electrical issues.

- **Starter Selection for Motors:**
  Properly selecting and using starters for motors based on their specifications and power ratings is crucial. Different types of starters are available, each designed for specific applications.

  Tips:
  - Choose the appropriate starter that matches the motor's power rating and application.
  - Ensure correct wiring and connections to avoid electrical problems.
  - Follow the manufacturer's guidelines when selecting and installing starters.

- **Diagnosing Electrical Faults:**
  Diagnosing electrical faults in equipment involves a series of tests. This includes insulation resistance testing, continuity testing, and other diagnostics. Accurate diagnosis is key to effective troubleshooting.

  Tips:
  - Start with visual inspections before conducting more in-depth tests.
  - Record test readings meticulously for reference.
  - Use safety equipment and follow safety protocols while performing diagnostics.

- **Repairing or Replacing Faulty Circuit Parts:**
  Repairing or replacing faulty components within circuits is a common maintenance task. This process should adhere to the power rating and the manufacturer's guidelines to ensure safety and proper functioning.

  Tips:
  - Follow the manufacturer's recommendations for repairs and replacements.
  - Swiftly replace any malfunctioning components to prevent further issues.
  - Test the circuits after repairs to confirm proper functionality.

- **Documentation of Test Readings:**
  Properly documenting test readings and conclusions is essential for record-keeping and reference. Detailed records and reports ensure that all maintenance and testing activities are accurately recorded.

  Tips:
  - Maintain organized records for compliance and future reference.
  - Include all relevant details in reports, such as test date, equipment details, and test results.
  - Share findings with relevant personnel for further action and decision-making.

Activity 4.2.1

Name: " Testing Earthing Methods and Earth Leakage"

Purpose: To familiarize trainees with various earthing methods, earth resistance measurement using an earth tester, and the testing of earth leakage using an ELCB and relay.

Resources Required:

- Earth tester
- ELCB (Earth Leakage Circuit Breaker)
- Relay
- Various earthing materials (e.g., metal plate, metal rod)
- Safety equipment (gloves, safety goggles)

Tentative Duration: 2 Hours

Procedure:

1) Introduction (15 minutes)
    - The trainer provides an overview of the importance of proper earthing for electrical safety.
    - The trainer explains the different methods of earthing, including plate, pipe, and rod earthing.
    - Trainees are briefed on the purpose of using an earth tester, ELCB, and relay in electrical systems.
2) Method Demonstration (30 minutes)
    - Trainees are divided into groups.
    - Each group is assigned a specific earthing method (e.g., plate earthing).
    - Using the provided materials, each group demonstrates how to set up their chosen earthing method.
    - Trainees are encouraged to discuss the advantages and disadvantages of their chosen method.
3) Earth Resistance Measurement (15 minutes)
    - The trainer explains the process of measuring earth resistance using an earth tester.
    - Trainees take turns using the earth tester to measure the resistance of the earth in different scenarios, such as wet and dry soil.
    - Tips for accurate measurement are provided, emphasizing the importance of proper grounding.
4) Testing Earth Leakage (15 minutes)
    - The trainer demonstrates how an ELCB and relay can be used to detect earth leakage in an electrical circuit.
    - Trainees observe the process and learn to interpret the relay's response to earth leakage.
5) Discussion and Q&A (15 minutes)
    - Trainees regroup, and the trainer leads a discussion on the advantages and disadvantages of the different earthing methods.
    - Trainees share their experiences and observations regarding earth resistance measurements and earth leakage testing.
    - The trainer answers any questions and clarifies doubts.
6) Conclusion and Recap (10 minutes)
    - The trainer summarizes the key takeaways from the activity.
    - Trainees are reminded of the significance of proper earthing methods and the role of earth testers, ELCBs, and relays in maintaining electrical safety.

Tips for Trainees:

- When measuring earth resistance, ensure that the earth tester's probes are securely connected to the ground.
- Maintain safety precautions while working with electrical components and earthing materials.
- Use appropriate personal protective equipment, such as safety goggles and gloves.
- Understand the purpose of ELCBs and relays in detecting earth leakage and how they contribute to electrical safety.

Activity 4.2.2

Name: "Efficient Armoured Cable Repair"

Purpose: To teach trainees how to join damaged armoured cables effectively, ensuring electrical safety and reliability.

Resources Required:

- Damaged armoured cables (cut into sections)
- Cable jointing kits (straight-through joints)
- Cable stripping and crimping tools
- Insulation tape
- Safety equipment (gloves, safety goggles)
- Multimeter for testing

Tentative Duration: 1.5 hours

Procedure:

1. Introduction (15 minutes)
    - The trainer explains the importance of effectively repairing damaged armoured cables to maintain electrical safety.
    - An overview of the activity and its objectives is provided to the trainees.
2. Safety Precautions (10 minutes)
    - Trainees are briefed on safety precautions, emphasizing the use of safety equipment such as gloves and safety goggles.
3. Cable Repair Demonstration (30 minutes)
    - The trainer demonstrates how to join damaged armoured cables using straight-through joints.
    - Trainees observe the proper procedure for cable preparation, stripping, and crimping.
    - Tips for efficient and reliable cable repair are explained during the demonstration.
4. Hands-On Practice (30 minutes)
    - Trainees are provided with sections of damaged armoured cables and cable jointing kits.
    - They practice joining the cables using the techniques demonstrated by the trainer.
    - The trainer provides guidance and feedback to ensure correct procedures are followed.
5. Testing and Evaluation (10 minutes)
    - Trainees use a multimeter to test the continuity and insulation resistance of the repaired cables.
    - The trainer assesses the quality of the repairs and provides feedback.
6. Discussion and Q&A (15 minutes)
    - Trainees regroup for a discussion on their experiences during the hands-on practice.
    - The trainer encourages trainees to share any challenges faced and how they overcame them.
    - A Q&A session allows trainees to seek clarification on cable repair techniques.
7. Conclusion and Recap (10 minutes)
    - The trainer summarizes the key points of the activity.
    - Trainees are reminded of the importance of efficient cable repair for electrical safety and reliability.

Tips for Trainees:

- Pay close attention to the cable repair demonstration to understand the correct procedures.
- Ensure that cable preparation, stripping, and crimping are done accurately for a reliable joint.
- Test the repaired cables using a multimeter to confirm continuity and insulation resistance.
- Seek guidance and clarification from the trainer if you encounter challenges during the hands-on practice.
- Maintain safety precautions and use the provided safety equipment throughout the activity.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

1) MCB (Miniature Circuit Breakers) protect electrical circuits from overloads and short circuits by interrupting the flow of current when these conditions occur. RCCB (Residual Current Circuit Breakers) and ELCB (Earth Leakage Circuit Breakers) are designed to detect leakage current, which can indicate an electrical fault, and disconnect the circuit to prevent electrical shocks and fires.
2) Capacitive AC circuits have a phase angle where the current leads the voltage by 90 degrees. These circuits are characterized by the use of capacitors, which store and release energy as the voltage changes. Inductive AC circuits have a phase angle where the current lags the voltage by 90 degrees. These circuits use inductors or coils and exhibit the property of electromagnetic induction. The key difference is in the relationship between current and voltage phase angles.
3) Different types of electric motors find applications in construction equipment based on their specific characteristics. For example, induction motors are commonly used in conveyor belts, while synchronous motors are preferred for compressors and pumps. DC motors may be used in applications like hoists and cranes due to their speed control capabilities.
4) Star and delta connections are two common ways to connect three-phase electrical loads. In a star connection, the ends of the three windings are connected together at a common point, and the load is connected between each winding and the common point. In a delta connection, the load is connected directly between the three winding terminals. Star connections provide a neutral point and are suitable for systems with a neutral conductor. Delta connections do not have a neutral point and are used for loads that do not require a neutral connection.
5) A DOL (Direct-On-Line) starter for DC motors directly connects the motor to the power supply without any initial reduction in voltage. The working principle of a DOL starter is to provide full voltage to the motor at start-up, allowing it to reach its operating speed immediately.

Fill-in-the-Blanks:

1) In capacitive circuits, the phase angle between current and voltage leads by 90 degrees.
2) Transformers are used to change the voltage of the voltage in electrical circuits.
3) Earth tester is a method to measure the earth resistance using a specific device.
4) An ELCB is used to detect and protect against earth leakage faults in electrical circuits.
5) To join damaged armoured cables efficiently, straight-through joints are often used for heavy electricity loads.

True/False Questions:

1) True: MCBs are used to protect electrical circuits from overloads and short circuits.
2) False: Delta connections in three-phase circuits typically have a higher current capacity.
3) True: The working principle of a DOL starter is to directly connect a motor to the power supply without any initial reduction in voltage.
4) True: Earth testers are used to measure the resistance of the earth, ensuring safe electrical grounding.
5) False: ELCBs are primarily used to detect earth leakage faults, not overload conditions.

Notes

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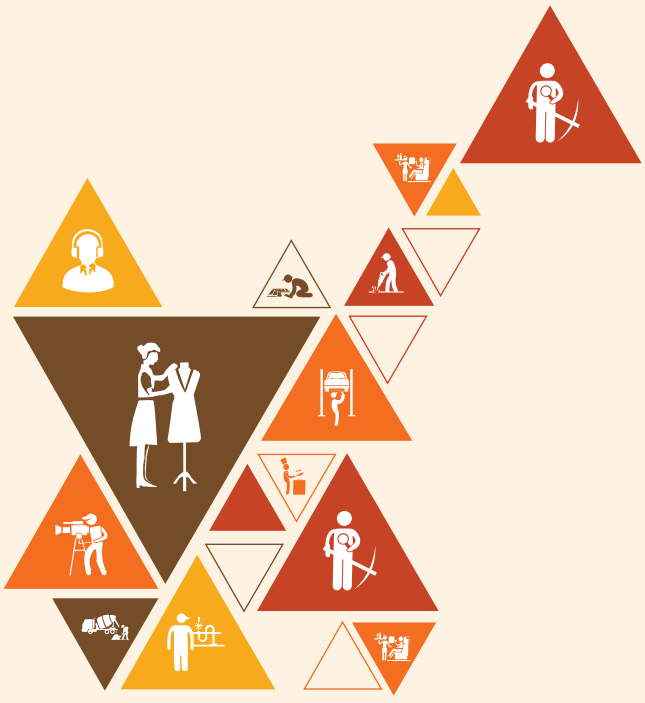
5. Carry out LV Electrical Wiring and Assist the Foreman in Building Electrification Works

UNIT 5.1: Understanding Wiring Principles and Requirements

UNIT 5.2: Preparing for Wiring Installation

UNIT 5.3: Wiring Installation and Post-Wiring Activities



(CON/N0610)

Key Learning Outcomes

At the end of this module, trainer will ensure that participant will be able to:

- Describe statutory guidelines provided by ISI for LV wiring operations.
- List common electrical wiring accessories and their specifications in line with National Electrical Codes (NEC) guidelines.
- Explain applicable manufacturer's guidelines/ specifications for the use of hand/power tools and measuring devices.
- Explain applicable manufacturer's guidelines/ specifications for the use of electrical fittings and fixtures.
- Explain the specification, and colour coding of cables to be used in the wiring system according to load on circuit requirement.
- Explain the properties of different components used in electrical earthing work.
- Explain standard practices of cable laying through conduits.
- Explain the area of application and specification of protective devices like fire alarms, MCB, ELCB, and MCCB in the house wiring.
- Explain the lighting arrangement which enables maximum use of natural lights.
- Explain standard house wiring procedures and best practices.
- Show how to perform visual checks of the house wiring components before their use in concealed wiring.
- Demonstrate how to interpret drawings, circuit diagrams and/or related schematics for single and three-phase LV house wiring systems.
- Show how to mark the walls for chasing for concealed wiring, and monitor the chasing work.
- Show how to plan for electrification, and mark locations for installation of raceways and electrical fixtures/ fittings on the walls.
- Demonstrate the calculation of electrical material requirements based on electrical fittings and layouts.
- Shown how to prepare the budget for household wiring.
- Demonstrate how to lay flexible conduit pipes through RCC structures (slabs, beams, walls) or chased wall (brick wall) surfaces.
- Demonstrate installation of electrical fixtures, fittings (such as DBs, switch boards, switches, sockets, lights and wall brackets) at specified locations.
- Perform necessary tests to ensure safe condition of electrical circuit during and post wiring activity using appropriate tools.
- Demonstrate how to measure earth resistance and leakage using appropriate electrical devices.
- Demonstrate electrical earthing work for household appliances adopting standard procedure and using appropriate earthing components.
- Demonstrate how to establish new LV connection as per circuit load requirement.
- Demonstrate installation of household appliances including fan, water pump, refrigerator, fire alarm system, security systems, etc.
- Demonstrate documentation of relevant readings and fill up the checklist.

UNIT 5.1: Understanding Wiring Principles and Requirements

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Describe statutory guidelines provided by ISI for LV wiring operations.
- List common electrical wiring accessories and their specifications in line with National Electrical Codes (NEC) guidelines.
- Explain applicable manufacturer's guidelines/specifications for the use of hand/power tools and measuring devices.
- Explain applicable manufacturer's guidelines/specifications for the use of electrical fittings and fixtures.
- Explain the specification and color coding of cables to be used in the wiring system according to the load on the circuit requirement.
- Explain the properties of different components used in electrical earthing work.
- Explain standard practices of cable laying through conduits.
- Explain the area of application and specification of protective devices like fire alarms, MCB, ELCB, and MCCB in house wiring.
- Explain the lighting arrangement which enables maximum use of natural lights.
- Explain standard house wiring procedures and best practices.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Wall Chasing Chisel, Hammer, Hacksaw, File Marking Tools, Table Vice, Stock And Die Set, Pipe, Cutter to Cut Pipes, Hand Brooms, Shovels, Screw Driver Set, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Cutting Machine, Drilling Machine, Power Source, Rigid Conduits, Flexible Conduit, Clamps For Conduits, Screws, Pliers, Screw Drivers (Set), Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets.

Do

- Stay updated with the statutory guidelines provided by ISI (Indian Standards Institute) for LV wiring operations.
- Emphasize the importance of adhering to these guidelines for safety and compliance.
- Provide a comprehensive list of common electrical wiring accessories and their specifications in line with the National Electrical Codes (NEC) guidelines.
- Encourage trainees to understand the importance of selecting the right accessories for specific applications.
- Explain applicable manufacturer's guidelines and specifications for the use of hand and power tools.
- Ensure trainees are well-versed in the correct use and maintenance of measuring devices.
- Educate trainees on the manufacturer's guidelines and specifications for the installation and use of electrical fittings and fixtures.
- Stress the significance of following these guidelines for proper functioning and safety.
- Teach trainees about the specification and color coding of cables according to the load on the circuit requirement.
- Provide practical examples and exercises for hands-on learning.
- Explain the properties of different components used in electrical earthing work, including materials like copper rods, earthing plates, and chemical compounds.
- Emphasize the role of proper earthing in electrical safety.

- Describe the standard practices for cable laying through conduits, including techniques, spacing, and bending radius considerations.
- Organize practical demonstrations for hands-on experience.
- Elaborate on the area of application and specification of protective devices like fire alarms, Miniature Circuit Breakers (MCB), Earth Leakage Circuit Breakers (ELCB), and Molded Case Circuit Breakers (MCCB) in house wiring.
- Ensure trainees comprehend the role of these devices in enhancing electrical safety.
- Explain how to design lighting arrangements that maximize the use of natural light sources, such as windows and skylights.
- Provide a comprehensive overview of standard house wiring procedures and best practices.
- Encourage trainees to follow safety protocols and deliver quality workmanship.
- Promote an interactive teaching approach, including hands-on activities, practical demonstrations, and real-world examples.
- Foster a learning environment where trainees can ask questions and seek clarification.
- Throughout the training, prioritize safety and emphasize the importance of following safety guidelines and using personal protective equipment (PPE).
- Conduct regular assessments and evaluations to ensure trainees have grasped the concepts and can apply them effectively.
- Encourage trainees to stay updated with the latest industry standards and innovations in electrical wiring practices.
- Suggest additional resources and further learning opportunities.
- Facilitate practical exercises where trainees can apply what they have learned in a controlled environment, ensuring competence in real-world scenarios.
- Teach trainees how to maintain accurate records and documentation of their work, as this is crucial for compliance and quality assurance.
- Instill a strong sense of professional ethics and integrity among trainees, emphasizing the importance of honesty and responsibility in electrical work.
- Develop the communication skills of trainees to ensure effective collaboration with clients, team members, and other stakeholders.

Notes for Facilitation

- Use the 'Construction Electrician (LV)' PHB and refer unit 5.1 to explain Understanding Wiring Principles and Requirements.

- **Statutory Guidelines for LV Wiring Operations:**
  Statutory guidelines established by the ISI (Indian Standards Institute) play a crucial role in ensuring the safety and compliance of low voltage (LV) wiring operations. These guidelines are designed to standardize LV wiring procedures and promote safe practices. Here's an explanation of some key aspects along with tips for trainers:
  - Safety Regulations: ISI provides regulations aimed at ensuring the safety of electrical wiring operations. These regulations cover various aspects, including grounding, conductor size, and protection against overcurrent and short circuits. Trainers should emphasize the importance of compliance with these safety regulations to protect both the equipment and personnel.
  - Material Standards: ISI also outlines standards for the materials used in LV wiring. This includes specifications for cables, conduits, switches, and outlets. Trainers should educate trainees on how to select and work with materials that meet ISI standards to maintain quality and safety.
  - Compliance Inspection: ISI guidelines often require compliance inspections of wiring installations. Trainees should be taught how to perform these inspections, highlighting the significance of quality control and adherence to standards.
  - Documentation: Encourage trainees to maintain proper records and documentation throughout LV wiring projects. This ensures traceability and is essential for compliance with ISI regulations.

- Common Electrical Wiring Accessories and NEC Guidelines:
  National Electrical Codes (NEC) provide guidelines for electrical wiring in the United States. It is important for trainees to understand common electrical wiring accessories and their specifications in line with NEC guidelines. Tips for trainers:
  - Outlet Types: Explain the different types of electrical outlets, such as duplex receptacles, GFCI

outlets, and AFCI outlets. Provide a practical demonstration of how to install these outlets following NEC requirements.
    - Switches: Detail the specifications for switches, including single-pole, double-pole, and three-way switches. Trainees should be able to identify which switch is suitable for a given application based on NEC standards.
    - Conduit Types: Describe various conduit types like PVC, EMT, and rigid metal conduits. Teach trainees the NEC requirements for conduit installation, such as minimum bend radius and support spacing.
    - Box Types and Sizing: NEC standards dictate the size and type of electrical boxes based on the number of conductors and switches or outlets. Trainees should understand how to choose and install appropriate electrical boxes.
    - Cable Types: Explain the NEC requirements for different cable types, such as NM cable (Romex), MC cable, and THHN wire. Trainees should learn how to identify these cables and understand their applications.

- **Manufacturer's Guidelines for Tools and Measuring Devices:**
  Understanding and following manufacturer's guidelines for tools and measuring devices is essential for safety and accurate electrical work. Here's how trainers can explain this topic:
    - Selection and Use: Teach trainees to select the right tools for the job based on the manufacturer's guidelines. For example, a manufacturer may specify the correct torque settings for a torque wrench. Explain that using the wrong tools or using them incorrectly can lead to equipment damage and safety hazards.
    - Calibration: Emphasize the importance of calibrating measuring devices like multimeters and clamp meters as per the manufacturer's recommendations. Out-of-calibration devices can produce inaccurate readings.
    - Maintenance: Trainees should learn about the manufacturer's maintenance instructions for tools and devices. Stress the significance of regular maintenance to ensure tool longevity and performance.
    - Safety Features: Point out the safety features incorporated into tools and devices and explain how to use them properly. For instance, modern digital multimeters often have safety mechanisms for high-voltage measurements.

- **Manufacturer's Guidelines for Electrical Fittings and Fixtures:**
  Electrical fittings and fixtures in LV wiring must conform to manufacturer's guidelines to ensure proper installation and safe operation. Tips for trainers:
    - Understanding Labels: Trainees should learn how to interpret labels and markings on electrical fittings and fixtures. Labels provide essential information such as voltage rating, maximum current, and installation instructions.
    - Installation Instructions: Emphasize that adherence to manufacturer-provided installation instructions is crucial. Incorrect installation can lead to malfunctions and safety hazards.
    - Overcurrent Protection: Explain the importance of using the appropriate overcurrent protection devices (such as circuit breakers and fuses) based on the manufacturer's guidelines. Trainees should understand the role of these devices in safeguarding the electrical system.
    - Environmental Considerations: Manufacturers may specify environmental conditions for fittings and fixtures. Trainees should be aware of these requirements to ensure longevity and reliability.

- **Cable Specification and Color Coding:**
  Understanding cable specifications and color coding is essential for proper LV wiring. Tips for trainers:
    - Specification Compliance: Trainees should grasp the importance of using cables that meet specifications related to voltage rating, insulation, and conductor size. Non-compliant cables can result in safety risks.
    - Load Requirements: Teach trainees to match cable selection to the load requirements of the circuit. Different loads require different cable sizes and specifications.
    - Color Coding: Describe the color-coding conventions for different types of cables. For example, in the U.S., black is commonly used for hot (live) wires, white for neutral wires, and green or bare for ground wires.
    - Hands-on Exercises: Conduct hands-on exercises where trainees can identify cables, their specifications, and understand the color codes.

- **Properties of Different Components in Electrical Earthing:**
  Electrical earthing components play a critical role in safety. Trainers should explain the properties and functions of these components. Tips:
  - Earthing Rods: Describe the properties of earthing rods, such as their conductivity and corrosion resistance. Emphasize the importance of selecting materials that withstand environmental conditions.
  - Earthing Compounds: Explain the properties of earthing compounds, including their conductivity and moisture retention capabilities. Trainees should understand how to apply these compounds effectively.
  - Earth Resistance: Teach trainees how to measure earth resistance using an earth tester. Explain the factors that influence earth resistance, including soil type and moisture levels.
  - Equipotential Bonding: Discuss the concept of equipotential bonding and how it ensures that all exposed conductive parts in an electrical installation are at the same potential, reducing the risk of electrical shock.

- **Standard Practices of Cable Laying through Conduits:**
  Cable laying through conduits is a common practice in LV wiring. Trainers should explain standard practices for this procedure. Tips for trainers:
  - Conduit Sizing: Teach trainees how to select the right conduit size for the number and size of conductors. Oversized or undersized conduits can result in installation difficulties and reduced protection.
  - Bend Radius: Explain the concept of the minimum bend radius for conductors within a conduit. Stress that exceeding this limit can damage conductors and reduce their lifespan.
  - Spacing and Support: Describe how to maintain proper spacing between conduits and provide adequate support to avoid sagging and stress on the wires.
  - Pulling Techniques: Trainees should learn efficient and safe techniques for pulling cables through conduits to prevent damage to the conductors and insulation.

- **Application and Specification of Protective Devices:**
  Protective devices, such as fire alarms, MCBs, ELCBs, and MCCBs, are essential in LV house wiring. Trainers can explain their area of application and specifications. Tips:
  - Circuit Protection: Explain the function of devices like Miniature Circuit Breakers (MCBs), Earth Leakage Circuit Breakers (ELCBs), and Molded Case Circuit Breakers (MCCBs) in protecting circuits from overcurrent and short circuits.
  - Earth Leakage Protection: Trainees should understand that ELCBs are primarily used to detect and protect against earth leakage faults. Emphasize the importance of proper installation and testing.
  - Fire Alarm Systems: Describe the use and operation of fire alarm systems in residential and commercial buildings. Ensure trainees understand the role of these systems in fire safety.
  - Load Calculation: Trainees should know how to calculate the appropriate protective device rating based on load requirements, conductors, and wiring type.

- **Maximizing Natural Light in Lighting Arrangements:**
  Lighting arrangements that make the most of natural light sources are energy-efficient and cost-effective. Tips for trainers:
  - Daylighting Principles: Explain the principles of daylighting, including window placement, light redirection, and light diffusion.
  - Energy Savings: Emphasize the energy-saving benefits of maximizing natural light. Trainees should understand how this approach contributes to sustainability.
  - Fixture Selection: Describe how fixture selection can enhance the distribution of natural light within a space. Energy-efficient fixtures, such as skylights and light shelves, should be discussed.
  - Simulated Exercises: Conduct exercises that simulate the design of lighting arrangements for spaces with ample natural light sources.

- **Standard House Wiring Procedures and Best Practices:**
  Trainees should learn the standard procedures and best practices for house wiring. Tips for trainers:
  - Understanding Circuits: Explain the layout of typical house wiring circuits, including lighting circuits, receptacle circuits, and dedicated circuits (e.g., for appliances).
  - Circuit Planning: Trainees should understand how to plan circuits, considering factors like load distribution, receptacle placement, and safety.

- Grounding and Bonding: Teach the importance of grounding and bonding in house wiring. Ensure that trainees understand how these practices protect against electrical hazards.
- Documentation: Stress the significance of maintaining detailed documentation of house wiring projects. Proper records aid in maintenance, troubleshooting, and future modifications.
- Safety Protocols: Throughout the training, prioritize safety protocols, including proper handling of tools, Personal Protective Equipment (PPE) use, and safe work practices.

- By providing comprehensive explanations and practical tips on these topics, trainers can effectively convey the knowledge and skills necessary for safe and compliant LV wiring operations. Training should be a combination of theory and hands-on practice, enabling trainees to apply what they have learned in real-world scenarios.

Activity 5.1.1

Name: "Cable Specification and Color Coding Challenge"

Purpose: To test the trainees' knowledge of cable specification and color coding and reinforce their understanding of how to select cables based on load requirements.

Resources Required:

- Various cables with different specifications.
- Labels with cable types and load ratings.
- Whiteboard or screen for displaying questions.

Tentative Duration: 2 Hours

Procedure:

1) Introduction (10 minutes): The trainer introduces the importance of proper cable selection and color coding based on the load requirements of electrical circuits. Explain the significance of this knowledge in ensuring electrical safety and functionality.
2) Question and Answer Session (15 minutes): The trainer conducts a brief question and answer session to assess the trainees' current knowledge of cable specification and color coding. This session also serves as a refresher.
    - Trainer: "Can anyone name a few common types of electrical cables and their applications?"
    - Trainees provide responses.
    - Trainer: "Why is it important to use the right type of cable in a specific circuit?"
    - Trainees respond.
3) Challenge (30 minutes): The main activity begins. The trainer presents various cables, each with a different specification, and labels indicating their load ratings. Trainees are divided into groups or pairs.
    - Trainer: "Your challenge is to match the cables with the correct load requirements based on their color coding and specifications. You'll need to explain why you made each selection."

    For example, trainees might receive the following questions:
    - "Match the cable with brown insulation and a load rating of 20A."
    - "Identify the cable suitable for a 15A load with blue insulation."
4) Group Discussions (20 minutes): Trainees work in their groups or pairs, examining the cables and consulting any reference materials provided.
5) Presentations (20 minutes): Each group presents their selected cables along with explanations of why they believe the cables are suitable for the specified load. This encourages discussion and peer learning.
6) Feedback and Discussion (15 minutes): The trainer provides feedback, clarifies any misconceptions, and encourages trainees to discuss their findings. Emphasize the importance of accurate cable selection and the role of color coding in quickly identifying cable types.
7) Wrap-up (10 minutes): The trainer summarizes the key points learned during the activity, highlighting the importance of adhering to cable specifications and color coding in real-world electrical work.

Tips for Trainers:

- Ensure that the cables and labels used in the activity are clear and easy to identify.
- Encourage active participation, discussion, and critical thinking during the group presentations.

- Discuss any misconceptions or errors in a constructive manner to enhance learning.
- Use this activity as an opportunity to reiterate the significance of cable selection for safety and efficiency in electrical installations.

Notes

UNIT 5.2: Preparing for Wiring Installation

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Show how to perform visual checks of the house wiring components before their use in concealed wiring.
- Demonstrate how to interpret drawings, circuit diagrams, and/or related schematics for single and three-phase LV house wiring systems.
- Show how to mark the walls for chasing for concealed wiring, and monitor the chasing work.
- Show how to plan for electrification, and mark locations for installation of raceways and electrical fixtures/fittings on the walls.
- Demonstrate the calculation of electrical material requirements based on electrical fittings and lay-outs.
- Show how to prepare the budget for household wiring.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Wall Chasing Chisel, Hammer, Hacksaw, File Marking Tools, Table Vice, Stock And Die Set, Pipe, Cutter to Cut Pipes, Hand Brooms, Shovels, Screw Driver Set, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Cutting Machine, Drilling Machine, Power Source, Rigid Conduits, Flexible Conduit, Clamps For Conduits, Screws, Pliers, Screw Drivers (Set), Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets.

Do

- Trainees should inspect wiring components for physical damage or defects before concealing them in walls.
- Emphasize the importance of identifying and replacing faulty components to ensure safety.
- Guide trainees in reading and comprehending electrical drawings, circuit diagrams, and schematics.
- Encourage practice in translating these technical documents into practical wiring actions.
- Instruct trainees to mark walls accurately for chasing concealed wiring while adhering to safety standards.
- Highlight the need to supervise the chasing work to maintain precision and avoid damage.
- Teach trainees how to plan the layout of electrical raceways, fixtures, and fittings in a systematic and organized manner.
- Emphasize the significance of considering factors like load distribution and safety regulations during planning.
- Trainees should learn to calculate the quantity of materials required, such as wires, cables, conduits, and fittings, based on project specifications.
- Encourage trainees to estimate materials accurately to avoid overstocking or shortages.
- Provide guidance on creating a comprehensive budget that covers all expenses associated with household wiring projects.
- Highlight the importance of including costs for materials, labor, equipment, and any unforeseen contingencies.

Notes for Facilitation

- Use the Construction Electrician (LV) PHB and refer unit 5.2 to explain 'Preparing for Wiring Installation'.

- **Performing Visual Checks of House Wiring Components:**
  Explanation: Trainees need to inspect all electrical components for visible defects or issues that might impact safety. This includes checking cables, wires, switches, outlets, conduits, and junction boxes for signs of wear, damage, or poor connections.

  Tips:
  - Look for frayed wires, exposed conductors, or damaged insulation.
  - Ensure that connections are secure and properly insulated.
  - Pay attention to the integrity of conduits and junction boxes to prevent hazards.
  - Make use of testing tools like multimeters to verify the continuity of conductors.

- **Interpreting Drawings, Circuit Diagrams, and Schematics:**
  Explanation: Understanding electrical drawings and diagrams is crucial for planning and implementing wiring systems. Trainees should become proficient in reading and interpreting these technical documents.

  Tips:
  - Teach the meaning of common electrical symbols and notations.
  - Emphasize the importance of accurate interpretation to avoid errors in the wiring.
  - Provide examples of various single and three-phase LV circuit diagrams.

- **Marking Walls for Concealed Wiring:**
  Explanation: The process of marking walls involves accurately indicating the locations where concealed wiring will be placed. Proper markings are vital for a tidy and efficient wiring job.

  Tips:
  - Use a spirit level to ensure markings are level and straight.
  - Confirm that marked positions align with the electrical plans.
  - Explain how markings should be made using non-permanent methods like pencils or chalk.

- **Planning Electrification Layout:**
  Explanation: Planning the layout of raceways, conduits, and fixture locations is essential for efficient and safe electrical distribution. Proper planning helps avoid obstacles, ensures even lighting, and minimizes unsightly wiring.

  Tips:
  - Consider the electrical load requirements for each area when marking locations for switches and outlets.
  - Account for local electrical codes and safety standards in planning.
  - Encourage trainees to use digital tools or software for accurate layout planning.

- **Calculating Electrical Material Requirements:**
  Explanation: This step involves calculating the quantity of materials required based on the electrical fittings and layout. Accurate calculations prevent material shortages or wastage.

  Tips:
  - Create a checklist of materials needed for the project.
  - Emphasize the importance of double-checking calculations to avoid errors.
  - Encourage the use of estimating software or tools for more complex projects.

- **Preparing a Budget for Household Wiring:**
  Explanation: Trainees should learn to prepare a comprehensive budget for household wiring projects, which includes costs for materials, labor, tools, permits, and unforeseen expenses.

  Tips:
  - Teach budgeting software or techniques for accurate cost estimation.

- Explain the importance of including a contingency budget for unexpected issues during the project.
- Discuss the process of obtaining quotes and pricing materials accurately.

Activity 5.2.1

Name: "Marking Walls for Chasing Concealed Wiring"

Purpose: To teach trainees how to mark walls for concealed wiring accurately.

Resources Required:

- Chalk or pencil
- Spirit level
- Sample electrical layout plan

Tentative Duration: 90 minutes

Procedure:

1. Introduction (10 minutes):
   - The trainer explains the importance of marking walls accurately before concealed wiring.
   - Discuss the significance of precise markings for safety and aesthetic reasons.
   - Highlight the tools and materials to be used for this activity.
2. Explanation (10 minutes):
   - The trainer provides an overview of electrical layout plans and the areas to be marked on the walls.
   - Trainees learn about the use of a spirit level to ensure markings are level and straight.
3. Demonstration (15 minutes):
   - The trainer demonstrates how to interpret electrical layout plans.
   - Trainees observe how to make precise marks on the walls, ensuring that they correspond to the plan.
4. Hands-On Practice (20 minutes):
   - Trainees are divided into groups.
   - Each group receives a sample electrical layout plan.
   - They use chalk or pencils to mark walls according to the plan.
   - The spirit level is employed to guarantee accuracy.
5. Monitoring (10 minutes):
   - The trainer walks around to supervise the trainees' marking process.
   - Corrections or guidance are provided where needed.
6. Discussion and Feedback (15 minutes):
   - The trainer leads a discussion about the importance of precise markings.
   - Trainees share their experiences and any challenges they faced.
   - Feedback on the activity is collected.
7. Debriefing (10 minutes):
   - The trainer recaps the key points of the activity.
   - Trainees are encouraged to ask questions or seek clarification on marking walls for concealed wiring.

Tips:

- Emphasize the importance of accuracy and alignment with the layout plan.
- Encourage the use of a spirit level to ensure level markings.
- Promote teamwork and communication among trainees during the hands-on practice.
- Highlight the potential consequences of inaccurate markings, such as rework and safety hazards.

Notes

UNIT 5.3: Wiring Installation and Post-Wiring Activities

Unit Objectives

At the end of this module, trainer will ensure that participant will be able to:

- Demonstrate how to lay flexible conduit pipes through RCC structures (slabs, beams, walls) or chased wall (brick wall) surfaces.
- Demonstrate installation of electrical fixtures, fittings (such as DBs, switchboards, switches, sockets, lights, and wall brackets) at specified locations.
- Perform necessary tests to ensure the safe condition of electrical circuits during and post-wiring activity using appropriate tools.
- Demonstrate how to measure earth resistance and leakage using appropriate electrical devices.
- Demonstrate electrical earthing work for household appliances adopting a standard procedure and using appropriate earthing components.
- Demonstrate how to establish a new LV connection as per the circuit load requirement.
- Demonstrate installation of household appliances including a fan, water pump, refrigerator, fire alarm system, security systems, etc.
- Demonstrate documentation of relevant readings and fill up the checklist.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts
- **Practical**
  - Wall Chasing Chisel, Hammer, Hacksaw, File Marking Tools, Table Vice, Stock And Die Set, Pipe, Cutter to Cut Pipes, Hand Brooms, Shovels, Screw Driver Set, Measuring Tape, Spirit Level, Plumb-Bob, Mason's Line, Cutting Machine, Drilling Machine, Power Source, Rigid Conduits, Flexible Conduit, Clamps For Conduits, Screws, Pliers, Screw Drivers (Set), Crimping Tools, Wire Strippers, Neon Tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong Tester, Measuring Tape, Spirit Level, Marking Tools, Drilling Machine, Cutting Machine, Chasing Machine, Electrical Socket (Set), Tungsten Bulb/ CFL/FSL Bulb, Halogen Lamp, Wall Socket, Simple Switchboard, Mains Breaker Switch, Earth Leakage Circuit Breaker (ELCB), Miniature Circuit Breaker (MCB), Helmet, Face Shield, Safety Goggles, Safety Shoes, Safety Belt, Insulated Rubber Gloves, Ear Plugs, Particle Masks, Reflective Jackets, Safety Message Boards, Fire Extinguishers, Sand Buckets.

Do

- Familiarize yourself with the course content and practical aspects.
- Ensure that you have a comprehensive understanding of each topic and its practical applications.
- Emphasize the importance of safety throughout the training.
- Ensure that trainees follow safety procedures while working with electrical components.
- Personally demonstrate each skill and technique mentioned in the learning outcomes.
- Provide clear, step-by-step instructions during demonstrations.
- Encourage trainees to actively participate in practical sessions.
- Ask questions, promote discussions, and address any doubts or concerns.
- Create real-world scenarios for trainees to practice the skills they've learned.
- Use mock setups or actual wiring situations to enhance their understanding.
- Stress the importance of accuracy when laying conduit pipes, installing fixtures, and performing tests.
- Remind trainees that precision is crucial for safety and effectiveness.
- Monitor trainees' work closely and offer constructive feedback during practical exercises.
- Correct any mistakes promptly to ensure proper learning.
- Encourage trainees to maintain a record of their work, such as documenting readings and checklist completion.
- Explain the significance of documentation in the electrical field.
- Emphasize the importance of following industry standards and guidelines when performing electrical work.
- Trainees should understand and apply these standards in their tasks.

- Teach trainees how to diagnose and troubleshoot electrical problems.
- Provide them with guidance on identifying and resolving issues in circuits and appliances.
- Encourage trainees to communicate effectively within a team, especially when working on household appliance installations and new LV connections.
- Highlight the importance of clear communication in minimizing errors.
- Be available to address any questions or concerns that trainees may have after the training.
- Provide resources for further learning and skill development.
- Conduct periodic assessments to gauge trainees' understanding and skill development.
- Adjust the training approach as needed based on their progress.
- Stress the importance of ethical conduct in the electrical field, including safety, honesty, and professionalism.
- Encourage trainees to uphold these values in their work.
- Continuously update your knowledge and skills to ensure that you're teaching the latest industry practices.
- Share any updates or advancements with trainees.
- Boost trainees' confidence by acknowledging their progress and achievements.
- Help them build self-assurance in their abilities.

Notes for Facilitation

- Use the Construction Electrician (LV) PHB and refer unit 5.3 to explain 'Wiring Installation and Post-Wiring Activities'.

- **Laying Flexible Conduit Pipes:**
  This topic is essential for trainees to learn how to properly install flexible conduit pipes through various construction elements such as RCC structures (slabs, beams, walls) and chased wall surfaces (brick walls). The process involves securing the conduit pipes, ensuring they are properly aligned, and avoiding sharp bends, which can damage or constrict the wires running within.

  Tips:
  - Conduit Security and Alignment: It's critical to securely fasten the conduit in place while keeping it properly aligned with the intended path.
  - Pipe Benders: Utilize pipe benders for creating smooth, gradual bends, as sharp bends can damage wires or make future maintenance difficult.
  - Avoid Sharp Bends or Kinks: Avoid making sharp bends or kinks in the conduit, as this can put undue stress on the wires inside, potentially leading to damage over time.

- **Installation of Electrical Fixtures and Fittings:**
  This segment focuses on demonstrating the correct installation of electrical fixtures and fittings, including Distribution Boards (DBs), switchboards, switches, sockets, lights, and wall brackets. Trainees will learn to install these components according to manufacturer guidelines, ensuring secure attachment and proper electrical connections.

  Tips:
  - Follow Manufacturer Instructions: Adhering to the manufacturer's guidelines is crucial for proper installation, as these instructions ensure safety and functionality.
  - Use Appropriate Mounting Hardware: Always use the correct hardware for mounting these fixtures securely. Loose or unstable fixtures can pose safety risks.
  - Verify Correct Electrical Connections: Ensure that the electrical connections are correctly made, avoiding loose or exposed wires.

- **Testing of Electrical Circuits:**
  This topic covers the essential testing of electrical circuits. Trainees will learn how to use tools such as multimeters and continuity testers to perform tests, ensuring the safety of the circuits during and after wiring.

  Tips:
  - Test Step by Step: When testing electrical circuits, it's crucial to do so step by step, ensuring that the circuit is properly de-energized to avoid accidents.

- Interpret Test Results: Trainees should also be adept at interpreting test results. This skill is vital for identifying any issues or faults within the circuits.

- **Measuring Earth Resistance and Leakage:**
  This segment introduces trainees to the use of specialized electrical measuring devices to gauge earth resistance and detect earth leakage. These measurements are critical for the safety of electrical grounding systems.

  Tips:
  - Follow Correct Testing Procedures: The proper testing procedures must be followed to obtain accurate measurements of earth resistance and detect leakage.
  - Regularly Calibrate Measuring Devices: It's important to ensure that measuring devices are regularly calibrated to maintain their accuracy.
  - Document Test Results: Keep a record of test results to establish a history and easily identify any anomalies.

- **Electrical Earthing Work:**
  This topic focuses on the standard procedures for electrical earthing work, including the installation and maintenance of grounding systems. Proper electrical earthing is critical for preventing electrical faults and ensuring the safety of the entire system.

  Tips:
  - Choose Appropriate Earthing Components: Selecting the right components and ensuring their secure installation is essential for effective earthing.
  - Secure, Corrosion-Resistant Connections: Connections should be securely made and protected against corrosion, which can degrade the effectiveness of earthing systems.

- **Establishing New LV Connections:**
  This section educates trainees on the process of establishing new Low Voltage (LV) connections, considering load requirements, cable selection, and safety regulations. Accurate calculations and adherence to electrical codes are emphasized.

  Tips:
  - Accurately Calculate Load Requirements: Thoroughly assess the load requirements to avoid overloading or underutilizing the circuit.
  - Follow Electrical Codes and Standards: Adhere to the electrical codes and standards relevant to the specific region to ensure safety and compliance.

- **Installation of Household Appliances:**
  This topic covers the correct installation of various household appliances, such as fans, water pumps, refrigerators, fire alarm systems, security systems, and more. The focus is on adhering to voltage, current requirements, and secure anchoring.

  Tips:
  - Adhere to Appliance Requirements: Ensure that appliances are installed according to the manufacturer's specifications, particularly regarding electrical requirements and placement.
  - Ensure Secure Anchoring: Properly anchor appliances to prevent accidents or damage due to instability.

- **Documentation and Checklist Filling:**
  This topic highlights the importance of organized documentation. Trainees will learn how to maintain records of relevant readings and complete checklists systematically. This organized record-keeping is essential for both tracking the work done and ensuring that all steps have been completed.

  Tips:
  - Maintain Organized Records: Keep records well-organized for easy reference and future maintenance.
  - Ensure Complete, Accurate Checklists: Checklists must be thorough and accurate, ensuring that all tasks and tests are accounted for.

Activity 5.2.1

Name: " Earth Resistance Measurement Challenge"

Purpose: To test the trainees' knowledge of measuring earth resistance and leakage using electrical devices in a practical scenario.

Resources Required:

- Earth tester or multimeter with an earth resistance measurement function
- Electrical grounding system setup (earth electrode, wires, etc.)
- A simulated electrical fault or leakage scenario

Tentative Duration: 60 minutes

Procedure:

- The trainer prepares a setup with an electrical grounding system, including an earth electrode, wires, and a controlled fault or leakage point.
- Trainees are divided into small groups, and each group is provided with an earth tester or a multimeter capable of measuring earth resistance.
- The trainer explains the importance of measuring earth resistance and how it is done using the provided devices.
- Each group is given a specific scenario where they need to measure the earth resistance at a particular point in the grounding system and detect any leakage or faults.
- Trainees use the devices to measure earth resistance and check for leakage as per the given scenario.
- They must record the readings accurately and make a decision based on their measurements regarding the safety of the electrical grounding system.
- Once the measurements are complete, each group presents their findings to the trainer, explaining their results and safety assessments.
- The trainer provides feedback and discusses the importance of accurate measurements in ensuring electrical safety.

Tips for Trainees:

- Ensure that the device you're using for measurements is properly calibrated.
- Follow the testing procedure step by step to obtain accurate measurements.
- Record your measurements meticulously and make a clear safety assessment.
- Don't forget to consider the scenario and whether it could lead to safety hazards.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

1. The statutory guidelines provided by ISI (Indian Standards Institute) for LV (Low Voltage) wiring operations include specifications and safety standards that must be followed during electrical work. They are important to ensure the safety, reliability, and compliance of electrical installations.
2. Three common electrical wiring accessories according to National Electrical Codes (NEC) guidelines are:
    - Receptacles: These are electrical outlets for connecting devices. NEC specifies their configuration, location, and wiring requirements.
    - Switches: NEC defines rules for the installation and use of switches, including requirements for switching devices, accessibility, and safety.
    - Conduits: NEC guidelines outline the types and installation of conduits used for protecting and routing electrical wires.
3. Following the manufacturer's guidelines and specifications for the use of hand/power tools and measuring devices is essential to ensure the safe and effective operation of these tools. It helps prevent accidents, maintain tool reliability, and ensures accurate measurements.
4. Electrical fittings and fixtures in household wiring play a crucial role in providing power distribution, control, and lighting. Adhering to applicable manufacturer's guidelines is vital to guarantee proper installation, functionality, and safety of these components.
5. The significance of cable specification and color coding lies in effectively identifying and differentiating various cables based on their load-bearing capacity and function. This aids in preventing electrical overloads, improving circuit safety, and facilitating maintenance and repairs.

Fill-in-the-Blanks:

1) The properties of different components used in electrical earthing work are essential for ensuring electrical safety.
2) Standard practices of cable laying through conduits help protect wires and ensure a neat and organized installation.
3) Protective devices like fire alarms, MCBs, ELCBs, and MCCBs play a vital role in enhancing wiring, enhancing safety.
4) Maximizing the use of natural light in a lighting arrangement is achieved through strategic design.
5) When preparing a budget for household wiring, it's crucial to account for all costs, including materials and labor.

True/False:

1) False: Visual checks of house wiring components are important for both exposed and concealed wiring to ensure safety and compliance.
2) False: The interpretation of drawings and circuit diagrams is essential in LV house wiring to understand the layout and connections, ensuring correct installations.
3) True: The use of appropriate hand/power tools and measuring devices in electrical work can indeed enhance efficiency and safety.
4) False: The color coding of cables in a wiring system primarily serves functional and safety purposes, not aesthetics.
5) True: Electrical earthing work is a critical aspect of household appliance installation, providing a safe path for electrical faults to protect users and equipmen6. Work Effectively in a Team to Deliver Desired Results at the Workplace (CON/N8001)

Notes

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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

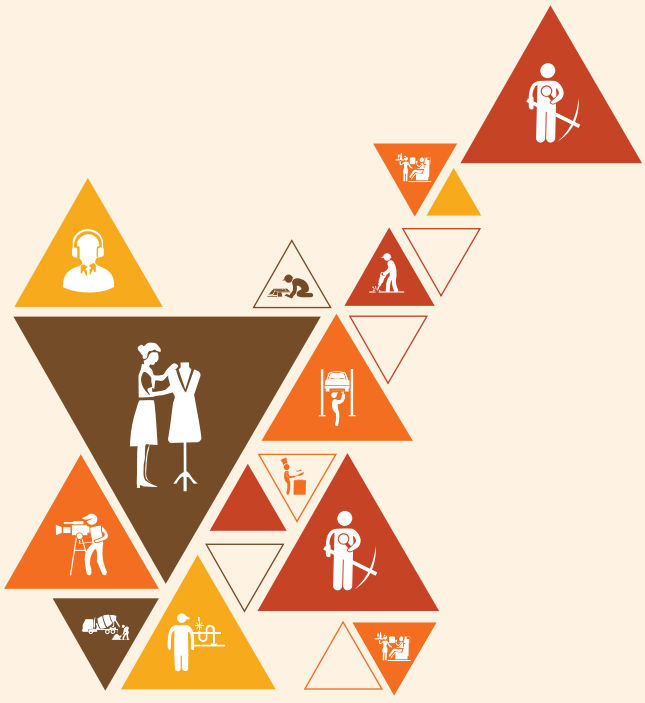
N·S·D·C
National
Skill Development
Corporation
Transforming the skill la

6. Work Effectively in a Team to Deliver Desired Results at the Workplace

UNIT 6.1: Effective Communication and Teamwork

UNIT 6.2: Working Effectively and Maintaining Discipline at Work

UNIT 6.3: Maintaining Social Diversity at Work



(CON/N8001)

Key Learning Outcomes

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

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

UNIT 6.1: Effective Communication and Teamwork

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

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

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts

Do

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

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 6.1 to explain Effective Communication and Teamwork.
- As a Construction Electrician - LV, it is crucial to understand and fulfill various roles and responsibilities to ensure the successful completion of projects. Let's explore these responsibilities and other related aspects:
  - Roles and Responsibilities:
    - A Construction Electrician - Low Voltage (LV) is responsible for planning, installing, and maintaining low voltage electrical systems in construction projects. Their duties include interpreting blueprints, wiring, component installation, ensuring safety and compliance, troubleshooting and maintenance, grounding and earthing, quality assurance, documentation, and adhering to safety protocols. They work with a range of electrical tools and collaborate with other trades, project managers, and clients. Staying updated with electrical codes and technologies is essential, and they aim to complete projects on time and with a strong focus on safety and quality.
  - Importance of Effective Communication: Effective communication is vital in the construction industry for several reasons:
    - Safety: Clear communication helps prevent accidents and ensures that everyone understands and follows safety procedures.
    - Efficiency: It streamlines work processes, reduces errors, and minimizes delays.
    - Quality: Precise communication helps maintain quality standards in installations.
    - Problem-Solving: It enables quick resolution of issues and prevents them from escalating.
    - Team Cohesion: Effective communication fosters better teamwork and collaboration.
  - Different Modes of Communication:
    - Verbal Communication: Spoken instructions, discussions, and meetings.
    - Written Communication: Emails, reports, work instructions, and project documentation.
    - Visual Communication: Diagrams, drawings, blueprints, and sketches.

        - Digital Communication: Messaging apps, project management software, and virtual meetings.
    - Consequences of Poor Teamwork: Poor teamwork can have detrimental effects on project outcomes, timelines, safety, and overall construction site efficiency:
        - Delays: Miscommunication and lack of coordination can lead to project delays.
        - Errors: Inadequate teamwork may result in mistakes and rework, affecting the project's quality.
        - Safety Risks: A breakdown in teamwork can compromise safety, leading to accidents.
        - Low Morale: Poor teamwork can negatively impact team morale and job satisfaction.
    - Passing on Work-Related Information: To pass on information clearly:
        - Use precise language and terms relevant to the task.
        - Provide context and details to ensure understanding.
        - Confirm that team members acknowledge and comprehend the information.
    - Reporting Unresolved Problems: When encountering issues beyond your control or expertise:
        - Immediately inform your supervisor or relevant authority.
        - Clearly describe the problem, its impact, and any attempted solutions.
        - Collaborate with colleagues and supervisors to find a resolution.
- In summary, effective communication, teamwork, and the fulfilment of roles and responsibilities are essential for success in the role of a Construction Electrician - LV. Clear communication and proactive teamwork contribute to safe, efficient, and high-quality project outcomes.

Activity 6.1.1

Name: "Effective Communication Workshop"

Purpose: This activity aims to enhance the learners' understanding of the importance of effective communication, the various modes of communication in the workplace, the impact of poor teamwork, and practical communication skills. It also encourages them to report issues promptly.

Resources Required:

- Whiteboard and markers
- Flipcharts and sticky notes
- Projector and screen (optional)
- Scenario cards (pre-written workplace scenarios)
- Notepads and pens
- Supervisor or facilitator

Tentative Duration: 2 hours

Procedure:

1. Introduction (15 minutes):
    - Begin with a brief introduction to the importance of effective communication in construction work.
    - Highlight the consequences of poor teamwork and communication on project outcomes, timelines, and safety.
2. Modes of Communication (20 minutes):
    - Discuss different modes of communication used at the workplace, including verbal, written, visual, and non-verbal communication.
    - Use examples to illustrate when each mode is most appropriate.
3. Interactive Scenarios (30 minutes):
    - Divide learners into small groups.
    - Provide scenario cards describing workplace situations involving communication challenges or teamwork issues.
    - Each group discusses how they would address the scenario and improve communication/teamwork.
    - Groups present their solutions to the whole class.
4. Demonstration (15 minutes):
    - The facilitator demonstrates how to pass on work-related information clearly to team members

using effective communication techniques.
- Learners can observe and ask questions.

5. Role-Playing Activity (30 minutes):
   - Each group is given a different communication challenge scenario.
   - They role-play the scenario, focusing on effective communication and teamwork.
   - After each role-play, the facilitator and peers provide feedback.
6. Reporting Issues (15 minutes):
   - Discuss the importance of reporting issues to supervisors promptly.
   - Explain the reporting process in the workplace.
   - Encourage learners to ask questions and clarify doubts.
7. Q&A and Discussion (15 minutes):
   - Open the floor for questions and discussions.
   - Address any queries or concerns related to communication and teamwork.

Expected Outcome: Learners will have a deeper understanding of effective communication, various communication modes, teamwork, and the significance of reporting issues promptly. They will also acquire practical communication skills to apply in their work.

Notes

UNIT 6.2: Working Effectively and Maintaining Discipline at Work

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

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

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts

Do

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

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 6.2 to explain Working Effectively and Maintaining Discipline at Work.
- A healthy and cooperative work environment fosters teamwork, improves morale, and enhances productivity. In construction, where tasks are often interdependent, a positive work atmosphere is essential for safety and project success.

  Tips: Encourage open communication, resolve conflicts promptly, and promote a culture of respect among co-workers.

- Understanding the techniques, materials, tools, and safety standards relevant to the job is essential for efficient and safe work. Construction Electricians (LV) should have a solid grasp of these aspects to perform their tasks effectively.

  Tips: Stay updated on industry best practices, attend relevant training sessions, and seek guidance from experienced colleagues.

- Effective communication ensures that tasks are carried out correctly, on time, and safely. Poor communication can lead to mistakes, delays, and even accidents on construction sites.

  Tips: Practice active listening, be clear in your messages, and encourage co-workers to communicate openly.

- Supporting co-workers facing challenges is crucial for maintaining project progress and morale. A construction project's success often hinges on the ability of the team to overcome obstacles together.

  Tips: Offer assistance when you see a co-worker struggling, seek help when needed, and foster a culture of mutual support.

- Efficient handovers are essential to ensure smooth transitions between tasks and teams. Construction Electricians (LV) should know how to pass on materials and information effectively.

  Tips: Clearly communicate what is needed, provide proper documentation, and conduct thorough handover briefings.

- Synchronized teamwork is critical in construction to avoid clashes, improve efficiency, and ensure safety. Construction Electricians (LV) should know how to coordinate their tasks with other trades and workers on the site.

  Tips: Plan tasks together with other teams, establish clear workflows, and communicate any changes promptly to maintain synchronization.

Notes

UNIT 6.3: Maintaining Social Diversity at Work

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

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

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts

Do

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

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 6.3 to explain Maintaining Social Diversity at Work.
- Gender equality is the principle that all individuals, regardless of their gender, should have equal rights, opportunities, and treatment in all aspects of life. It promotes fairness and prevents discrimination based on gender, ensuring that everyone can reach their full potential.
  - Tips: Foster a workplace culture that values diversity, provides equal opportunities, and actively combats gender bias.
- Recognizing and being sensitive to issues related to disability culture and gender requires empathy, education, and a willingness to understand the unique experiences and challenges faced by different individuals. It involves acknowledging diversity and respecting the perspectives of others.
  - Tips: Engage in diversity training, actively listen to others' experiences, and avoid making assumptions about people based on their gender or disability.
- Understanding the legal and organizational frameworks that address gender sensitivity and cultural diversity is essential. It involves being aware of anti-discrimination laws, company policies, and procedures that promote inclusion and fairness.
  - Tips: Familiarize yourself with relevant laws and policies, and ensure compliance to create a more inclusive and respectful workplace.
- Implementing gender-neutral practices involves creating an environment where individuals are treated equally regardless of their gender. This includes fair hiring practices, unbiased decision-making, and providing equal opportunities for career growth.
  - Tips: Review hiring and promotion processes for gender bias, promote diversity in leadership roles, and actively address any gender-related issues that arise.
- Addressing discriminatory and offensive behavior is crucial for maintaining a respectful work environment. It involves addressing such behavior promptly, professionally, and in alignment with organizational policies.
  - Tips: Report incidents following company procedures, engage in constructive dialogue with offenders when appropriate, and support colleagues who experience discrimination or offensive behavior.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

1. Effective communication is essential in construction job roles to ensure that tasks, instructions, and safety protocols are understood and followed, preventing errors, delays, and accidents.
2. The consequences of poor teamwork on project outcomes and safety at a construction site can include project delays, compromised quality, reduced efficiency, increased safety risks, and potentially higher costs.
3. Work-related information can be passed on clearly to team members by using concise and structured communication methods, such as written instructions, diagrams, or verbal explanations, ensuring that critical details are not omitted or misunderstood.
4. Different modes of communication used in the workplace include verbal communication (spoken or face-to-face), written communication (emails, reports), visual communication (diagrams, charts), and digital communication (instant messaging, video conferences).
5. Creating a healthy and cooperative work environment among gangs of workers is important because it fosters efficient collaboration, enhances productivity, improves worker morale, and can lead to safer and more successful construction projects.

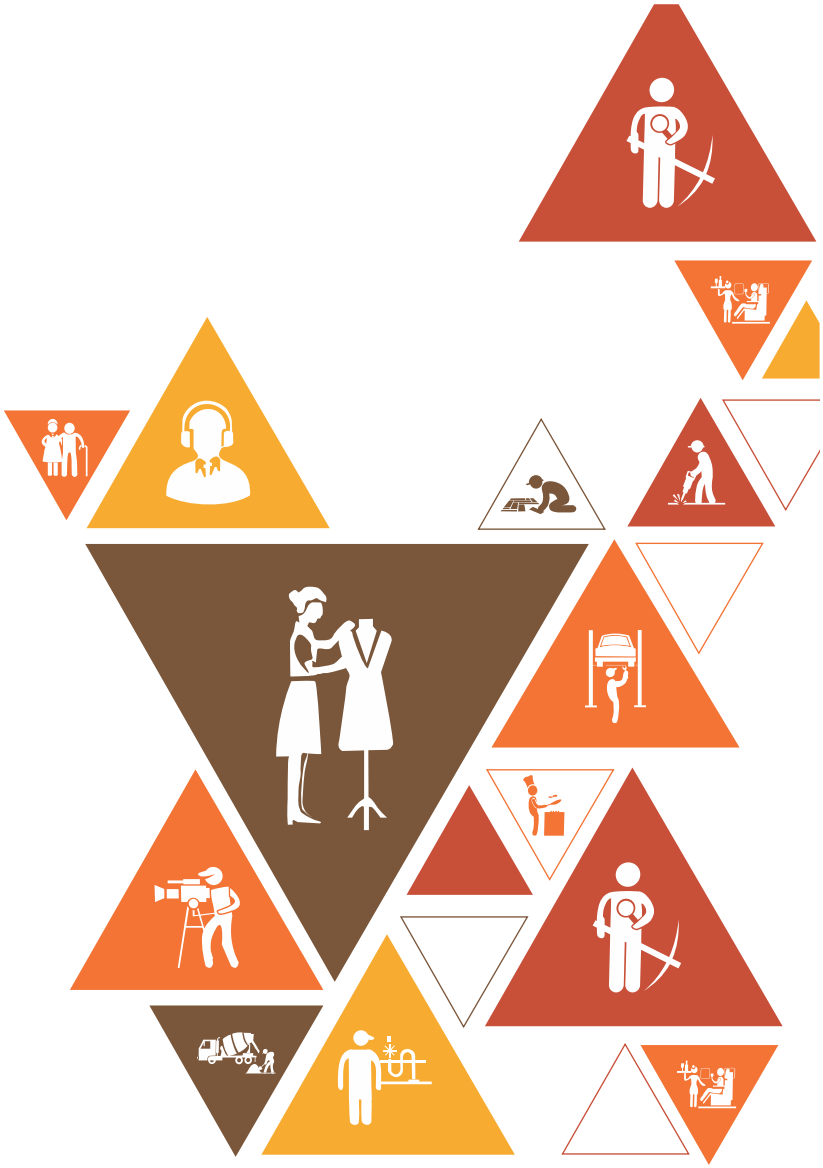
Fill-in-the-Blanks:

A. Effective communication ensures that project goals and tasks are understood by everyone.
B. Poor teamwork can lead to delays, compromised quality, and increased safety risks.
C. To ensure clarity, it's essential to provide work-related information to team members in a concise manner.
D. Communication modes include verbal, written, visual, and digital forms.
E. Creating a cooperative work environment fosters efficient collaboration and unity among workers.

True/False Questions:

1. False: Effective communication is important for all job roles in construction, not just supervisory roles.
2. False: Poor teamwork can significantly affect project timelines and safety on a construction site.
3. False: Passing on work-related information is crucial for effective coordination and understanding among team members.
4. False: Communication modes in the workplace encompass various forms, including verbal, written, visual, and digital.
5. True: A cooperative work environment can indeed enhance productivity and worker morale, leading to better outcomes.

Notes



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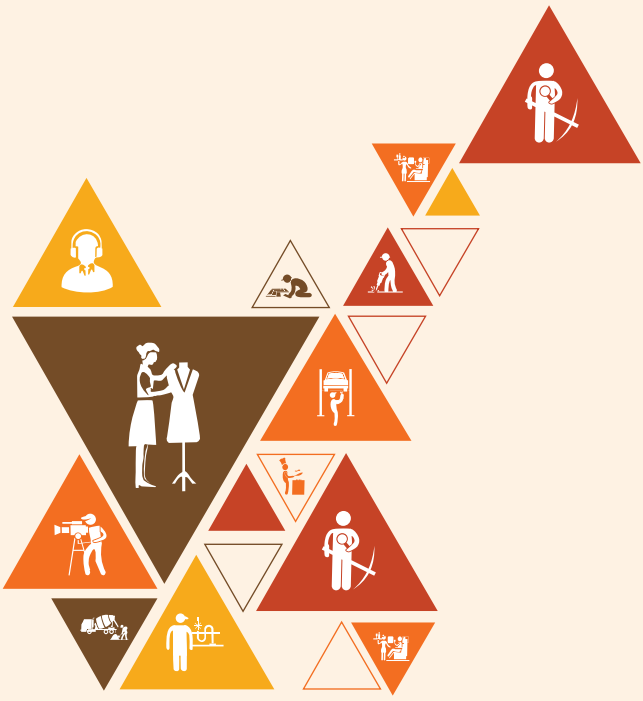
7. Prioritise Activities and Organise Resources

UNIT 7.1: Prioritise Work Activities to Achieve Desired Results

UNIT 7.2: Organising Resources



(CON/N8002)

Key Learning Outcomes

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

- Explain methods to upkeep, store and stack tools, materials used for domain specific works.
- Explain the process of planning of the given tasks and activities relevant to the trade/job role within defined scope and duration.
- Demonstrate the planning for various activities relevant to task as per the scope and schedule.
- Demonstrate how to organise the required tool, manpower and material resources for the assigned task.
- Select required quantity of materials, tools or devices for defined work activities.
- Explain the procedure adopted for prioritizing an activity and sequencing of activities.
- Demonstrate how to prioritize all works/ activities to maximise output.
- Explain the work plan and flow of activities in sequence for the assigned work.
- Explain basic concept of labour productivity and work productivity.
- Identify the work target and plan activities to achieve the desired productivity.
- Explain requisition of resources, reporting for requirement of resources orally and in written to concerned authority.
- Demonstrate requisition of resource citing an example.
- Explain how to minimise wastage of resources.
- Demonstrate optimum use of resources while performing domain specific work activities.
- Demonstrate waste collection and disposal as per organisational norms.
- Explain the plan for waste collection and disposal after task.
- Demonstrate completion of work within stipulated time and plan.

UNIT 7.1: Prioritise Work Activities to Achieve Desired Results

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

- Explain the basic concept of labor productivity and work productivity.
- Identify the work target and plan activities to achieve the desired productivity.
- Explain the process of planning the given tasks and activities relevant to the trade/job role within the defined scope and duration.
- Demonstrate the planning for various activities relevant to the task as per the scope and schedule.
- Explain the work plan and flow of activities in sequence for the assigned work.
- Explain methods to upkeep, store, and stack tools, materials used for domain-specific works.
- Select the required quantity of materials, tools, or devices for defined work activities.
- Explain the procedure adopted for prioritizing an activity and sequencing of activities.
- Demonstrate how to prioritize all works/activities to maximize output.
- Explain requisition of resources, reporting for the requirement of resources orally and in writing to the concerned authority.
- Demonstrate requisition of resources citing an example.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts

Do

- Explain the basic concept of labor productivity and work productivity.
- Identify the work target and plan activities to achieve the desired productivity.
- Explain the process of planning the given tasks and activities relevant to the trade/job role within the defined scope and duration.
- Demonstrate the planning for various activities relevant to the task as per the scope and schedule.
- Explain the work plan and flow of activities in sequence for the assigned work.
- Explain methods to upkeep, store, and stack tools, materials used for domain-specific works.
- Explain the required quantity of materials, tools, or devices for defined work activities.
- Explain the procedure adopted for prioritizing an activity and sequencing of activities.
- Demonstrate how to prioritize all works/activities to maximize output.
- Explain requisition of resources, reporting for the requirement of resources orally and in writing to the concerned authority.
- Demonstrate requisition of resources citing an example.

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 7.1 to explain Prioritise Work Activities to Achieve Desired Results.
- As a Construction Electrician - LV, understanding labor productivity and work productivity is essential for efficient project management and successful task execution. Let's delve into these concepts and related aspects:
  - Labor Productivity and Work Productivity:
    - Labor Productivity: It refers to the efficiency of labor in performing specific tasks. It's typically measured by the amount of work completed in a given time by a worker or a team.
    - Work Productivity: This is a broader concept that encompasses the efficiency of all work processes, including labor, materials, and equipment. It evaluates the overall efficiency of a project or job site.
  - Identifying Work Targets and Planning Activities:
    - Identify specific project goals and objectives.
    - Break down the project into manageable tasks and activities.

        - Set realistic targets for completion based on project scope, deadlines, and available resources.
    - Planning Tasks and Activities:
        - Analyze the scope of work for each task.
        - Determine the sequence of activities required to achieve the task.
        - Allocate resources, including labor, materials, and equipment, to each activity.
        - Create a schedule that outlines when each task will be completed.
    - Planning for Various Activities:
        - Develop detailed task plans for activities within your trade, such as framing, panel installation, and finishing.
        - Consider factors like material availability, skill requirements, and safety precautions.
        - Create contingency plans for potential delays or issues.
    - Work Plan and Activity Flow:
        - Establish a clear work plan that outlines the flow of activities from start to finish.
        - Ensure that activities are sequenced logically to maximize efficiency.
        - Define dependencies between tasks to avoid bottlenecks.
    - Storing and Managing Tools and Materials:
        - Implement a system for organizing and storing tools, materials, and equipment.
        - Regularly inspect and maintain tools to ensure they are in good working condition.
        - Store materials in a secure and organized manner to prevent damage or loss.
    - Quantity of Materials and Resources:
        - Calculate the required quantity of materials based on project specifications.
        - Estimate the number of labourers, tools, and equipment needed for each activity.
        - Ensure that resources are procured in advance to avoid delays.
    - Prioritizing and Sequencing Activities:
        - Prioritize tasks based on criticality and project goals.
        - Sequence activities logically to minimize downtime and resource conflicts.
        - Adjust the sequence as needed to accommodate changing project conditions.
    - Requisition of Resources:
        - Communicate resource requirements to the relevant authority, such as a project manager or procurement department.
        - Clearly articulate the type, quantity, and timing of resource needs.
        - Use both oral and written communication to ensure clarity and documentation.
    - Demonstrating Requisition of Resources:
        - Provide an example of a situation where you identified a need for additional resources.
        - Describe how you communicated this need to the appropriate authority.
        - Highlight the positive impact of timely resource allocation on project productivity.
- In conclusion, as a Construction Electrician - LV, effective planning, resource management, and communication are essential for optimizing labor and work productivity. By understanding these concepts and implementing best practices, you can contribute to the successful completion of projects within defined scopes and timelines.

Notes

UNIT 7.2: Organising Resources

Unit Objectives

At the end of this unit, trainer will ensure that participant will be able to:

- Explain how to minimize wastage of resources.
- Demonstrate optimum use of resources while performing domain-specific work activities.
- Demonstrate waste collection and disposal as per organizational norms.
- Explain the plan for waste collection and disposal after the task.
- Demonstrate completion of work within stipulated time and plan.

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Computer, Registers, and Trade specific charts

Do

- Explain how to minimize wastage of resources.
- Demonstrate optimum use of resources while performing domain-specific work activities.
- Demonstrate waste collection and disposal as per organizational norms.
- Explain the plan for waste collection and disposal after the task.
- Demonstrate completion of work within stipulated time and plan.

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 7.2 to explain Organising Resources.
- As a Construction Electrician - LV, efficient resource management and waste reduction are crucial for maintaining a cost-effective and environmentally responsible work environment.
- Here's how you can minimize wastage of resources, optimize resource use, and handle waste collection and disposal:
  1. Minimizing Wastage of Resources:
     - Materials:
       - Carefully calculate and order materials to avoid overstocking or understocking.
       - Store materials properly to prevent damage, spoilage, or theft.
       - Use leftover materials from one job for smaller projects or keep them for future use.
     - Tools and Equipment:
       - Regularly maintain and service tools to prolong their lifespan.
       - Train workers to use tools correctly to prevent damage and accidents.
       - Implement a tracking system to monitor tool usage and ensure accountability.
     - Labor:
       - Efficiently allocate labor resources to tasks based on skills and expertise.
       - Provide adequate training to minimize errors and rework.
       - Schedule work shifts and breaks to maximize productivity.
  2. Demonstrating Optimum Use of Resources:
     - Planning:
       - Develop a detailed work plan that outlines resource requirements for each task.
       - Assign tasks to workers with the necessary skills and experience.
     - Supervision:
       - Supervise work activities to ensure that resources are used efficiently.
       - Provide guidance and instructions to workers on resource optimization techniques.
     - Adaptation:
       - Be flexible and adapt to changing project conditions or unforeseen challenges.
       - Adjust resource allocation as needed to meet project goals.
  3. Waste Collection and Disposal:

- Collection:
  - Set up designated waste collection areas on the job site.
  - Separate different types of waste, such as construction debris, packaging materials, and hazardous substances.
  - Provide workers with clear guidelines on waste segregation.
- Disposal:
  - Follow organizational norms and local regulations for waste disposal.
  - Arrange for the proper disposal of hazardous materials through authorized disposal services.
  - Coordinate with waste management companies or local authorities for regular waste pickup.

4. Planning for Waste Collection and Disposal:
   - Develop a Waste Management Plan:
     - Create a comprehensive plan that outlines how waste will be collected, segregated, and disposed of during and after the project.
     - Specify responsibilities for waste management tasks.
     - Include a timeline for waste collection and disposal activities.
5. Demonstrating Completion of Work within Stipulated Time and Plan:
   - Time Management:
     - Adhere to the project schedule and deadlines.
     - Monitor progress regularly and identify potential delays.
     - Take proactive measures to address delays and keep the project on track.
   - Quality Assurance:
     - Ensure that work is completed according to specifications and quality standards.
     - Conduct inspections and quality checks to verify compliance.
     - Rectify any defects or issues promptly to avoid rework and additional resource consumption.

- By implementing these strategies, you can contribute to reducing resource wastage, optimizing resource use, and ensuring that waste is collected and disposed of responsibly. This not only benefits your organization's bottom line but also promotes sustainability and environmental responsibility in your work as a Construction Electrician - LV.

Exercise:

Key Solutions to PHB Exercise:

Short Questions:

1) Methods for the upkeep and storage of tools and materials used in construction electrical work include regular cleaning, proper organization, and avoiding exposure to harsh environmental conditions.
2) Planning is essential for a construction electrician to ensure efficient use of resources, timely project completion, and adherence to safety standards.
3) Organizing required resources involves listing necessary tools, materials, and skilled manpower and coordinating their availability before starting an electrical task.
4) Prioritizing and sequencing activities in construction electrical work ensures that critical tasks are completed first, optimizing workflow and project schedules.
5) Resource wastage is minimized by accurately calculating material requirements, avoiding overstocking, and reducing unnecessary rework.

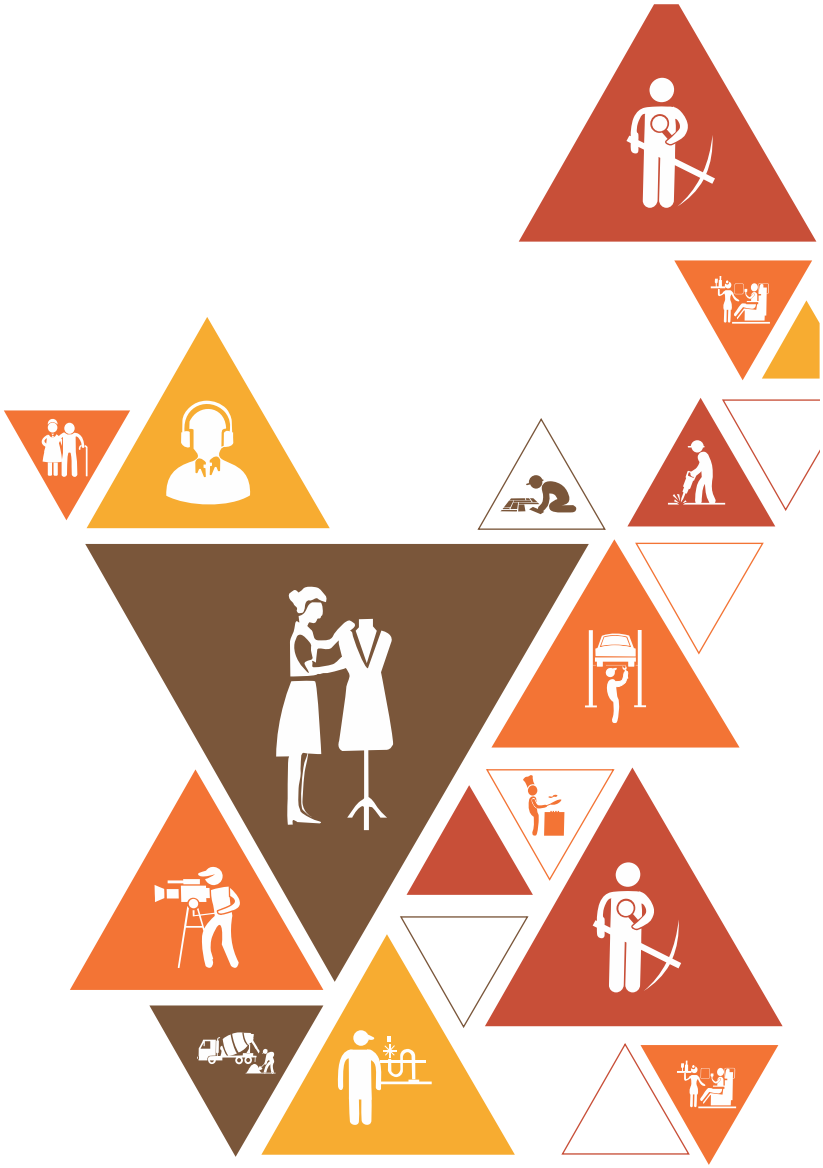
Fill-in-the-Blanks:

1) To maximize output, it's important to prioritize and sequence activities efficiently.
2) When requisitioning resources, it's crucial to specify the quantity of materials or tools required.
3) In construction electrical work, maintaining low resource wastage is critical for cost-effectiveness.
4) The process of planning and organizing resources is key to completing tasks within the stipulated time.
5) Waste collection and disposal should adhere to national norms and regulations.

True/False Questions:

1) True: Proper storage of tools and materials can help prolong their lifespan.
2) False: Planning for a construction electrician's tasks involves determining not just the required resources but also the overall strategy.
3) False: Minimizing resource wastage in construction electrical work is essential for cost-effectiveness.
4) True: Prioritizing activities in construction electrical work significantly impacts overall project schedules.
5) False: Reporting resource requirements in writing is typically more effective and avoids miscommunication.

Notes



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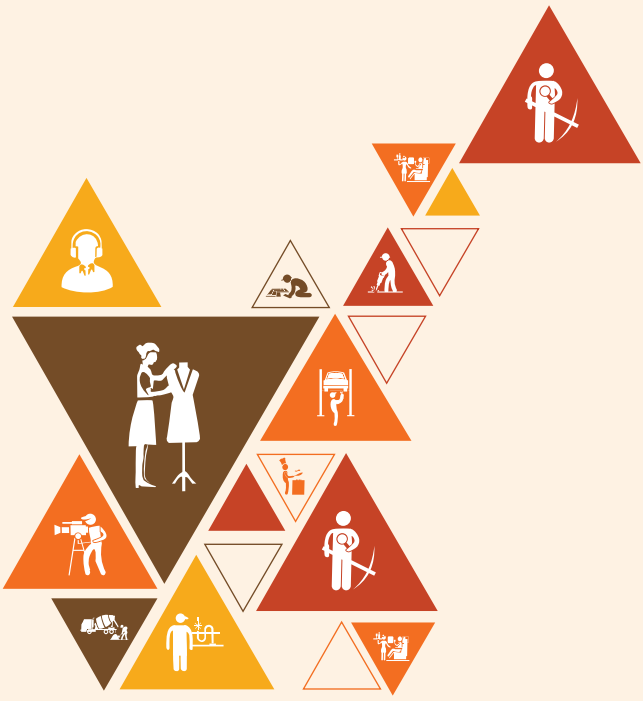
8. Follow Safety Norms as defined by organization, Adopt Healthy and Safe Work Practices

Unit 8.1 - Hazards and Emergency Situations

Unit 8.2 - Safety Drills, PPEs and Fire Safety

Unit 8.3 - Hygiene and Safe Waste Disposal Practices

Unit 8.4 - Infectious Disease and Its Cure



(CON/N9001)

Key Learning Outcomes

- Describe the reporting procedures in cases of breaches or hazards for site safety, accidents, and emergencies as per guidelines.
- Explain different types of safety hazards at construction sites.
- Demonstrate how to follow emergency and evacuation procedures in case of accidents, fires, or natural calamities.
- Discuss basic ergonomic principles as per applicability.
- Describe the procedure for responding to accidents and other emergencies at the site.
- Explain the importance of handling tools, equipment, and materials as per applicable norms.
- Explain the effect of construction material on health and environments as per applicability.
- Describe various environmental protection methods as per applicability.
- Explain the storage requirement of waste including non-combustible scrap material and debris, combustible scrap material and debris, general construction waste and trash (non-toxic, non-hazardous), any other hazardous wastes and any other flammable wastes at the appropriate location.
- Show how to collect, segregate and deposit construction waste into appropriate containers based on their toxicity or hazardous nature.
- Explain how to use hazardous material in a safe and appropriate manner as per applicability.
- Explain types of fire.
- Describe the procedure of operating different types of fire extinguishers.
- Show how to operate different types of fire extinguishers corresponding to various types of fires as per EHS guidelines.
- State safety relevant to tools, tackles, and equipment as per applicability.
- Demonstrate the use of appropriate Personal Protective Equipment (PPE) as per work requirements for Head Protection, Ear Protection, Fall Protection, Foot Protection, Face and Eye Protection, Hand and Body Protection, and Respiratory Protection (if required).
- Demonstrate how to check and install all safety equipment as per standard guidelines.
- List housekeeping activities relevant to the task.
- Elucidate ways of transmission of infection Explain the ways to manage infectious risks at the workplace.
- Describe different methods of cleaning, disinfection, sterilization, and sanitization.
- Show how to clean and disinfect all materials, tools and supplies before and after use.
- List the symptoms of infection like fever, cough, redness, swelling, and inflammation.

Unit 8.1 - Hazards and Emergency Situations

Objectives:

At the end of this unit, trainer will ensure that participant will be able to:

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

Topic Introduction

- Give the participants a brief overview of this unit
- Applications in various job environment

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass, Fire Extinguisher, Fire prevention kit, First Aid box, Safety tags and Safety Notice board.

Do

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

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 8.1 to explain Hazards and Emergency Situations.
- As a Construction Electrician (LV), safety is of utmost importance to ensure your well-being, the safety of your colleagues, and the successful completion of construction projects. Here are key aspects of safety awareness and response in your role:
  - Identifying Electrical Hazards:
    - Construction sites can be inherently hazardous, particularly with electrical components. Be vigilant in recognizing potential dangers, including:
    - Electrical Shocks: Always be aware of exposed wires, damaged cables, and faulty electrical equipment. Avoid contact with live circuits.
    - Overloaded Circuits: Overloading electrical circuits can lead to fires and accidents. Ensure the circuits are appropriately rated for the connected devices.
    - Faulty Wiring: Damaged or improperly installed wiring poses serious risks. Report any frayed wires, loose connections, or exposed conductors immediately.
  - Safety Control Measures:
    - Personal Protective Equipment (PPE): Always wear the necessary PPE, such as safety glasses, insulated gloves, and flame-resistant clothing when working with electrical systems.
    - Training: Stay updated on safety training, including electrical safety procedures and emergency response protocols.
    - Emergency Response: Understand the emergency procedures on the construction site, including the location of fire extinguishers, first-aid kits, and evacuation routes.
  - Responding to Electrical Emergencies:

        - Stay Calm: In the event of an electrical emergency, remain calm to think and act rationally.
        - Alert Others: If you encounter a hazardous electrical situation, alert your colleagues immediately to prevent further accidents.
        - Follow Procedures: Adhere to established emergency procedures, including the safe shutdown of electrical equipment and evacuation routes.
        - First Aid: If someone is injured due to an electrical incident, provide appropriate first aid or seek assistance from trained personnel.
    - Reporting Procedures:
        - Reporting Electrical Hazards: If you identify an electrical hazard that poses a safety risk, report it to your supervisor or safety officer immediately.
        - Emergency Reporting: In case of an electrical emergency, use the designated communication channels to report the situation promptly.
        - Incident Reports: If an electrical accident or near-miss occurs, complete an incident report detailing the event, any injuries, or damages. This aids in identifying root causes and preventing future incidents.
- By understanding the specific electrical hazards in your role as a Construction Electrician (LV), recognizing safety control measures, and knowing how to respond to electrical emergencies and report issues, you contribute to a safer work environment, reduce the risk of electrical accidents, and ensure the successful completion of construction projects while prioritizing the well-being of all involved.

Activity 8.1.1

Say

Let's engage in a practical activity focused on the reporting procedures that a Construction Electrician (LV) should follow during emergency situations. This activity underscores the importance of effective communication and coordination to ensure the safety and well-being of all individuals on the construction site.

Activity: Reporting Emergency Situations for Construction Electricians (LV)

Purpose: This activity aims to provide Construction Electricians (LV) with hands-on experience in understanding and practicing the reporting procedures essential for effective emergency response in the context of electrical work.

Resources Required: Scenario cards describing emergency situations, writing materials.

Tentative Duration: 45 Minutes

Procedure:

1. Introduction: Begin by emphasizing the significance of prompt and accurate reporting during emergencies to maintain a safe work environment for Construction Electricians (LV).
2. Scenario Distribution: Distribute scenario cards, each depicting a unique emergency situation, to participants.
3. Internal Communication Role Play:
    - Form pairs among participants.
    - Assign roles in each pair: one as the Construction Electrician (LV) and the other as the supervisor or project manager.
    - Construction Electricians (LV) practice communicating the emergency to their supervisor using the established reporting procedures.
4. Discussion on Established Protocol:
    - Gather participants for a discussion about the organization's established protocol for reporting emergencies.
    - Emphasize the significance of adhering to these protocols for an organized response.
5. Documentation Practice:
    - Participants individually document the specifics of the emergency scenario assigned to them.
    - They note down the time, location, incident nature, and any injuries if applicable.
6. Cooperation with Authorities Exercise:

- Present a scenario involving cooperation with emergency responders.
- Participants engage in role-play, providing accurate information and following instructions from the responders.

7. Group Discussion and Sharing:
   - Participants share their experiences and insights from the role-playing exercises.
   - Facilitate a discussion on challenges faced and best practices for reporting emergencies.
8. Reflection and Conclusion:
   - Engage participants in reflecting on the significance of precise reporting for maintaining safety during emergencies.
   - Summarize the key learnings and underscore the importance of following reporting procedures.

Expected Outcome: Through this activity, Construction Electricians (LV) will gain practical familiarity with reporting procedures during emergency situations in the context of electrical work. They will comprehend the importance of effective communication, documentation, and cooperation with authorities to ensure the safety and well-being of themselves and their colleagues on the construction site.

Notes

Unit 8.2 - Safety Drills, PPEs and Fire Safety

Objectives:

At the end of this unit, trainer will ensure that participant will be able to:

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

Topic Introduction

- Give the participants a brief overview of this unit
- Applications in various job environment

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass, Fire Extinguisher, Fire prevention kit, First Aid box, Safety tags and Safety Notice board.

Do

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

Notes for Facilitation

- Use the Construction Electrician - LV PHB and refer unit 8.2 to explain Safety Drills, PPEs and Fire Safety.
- Classes of Fire: Fires are classified into different classes based on the type of fuel involved:
  - Class A: Fires involving common combustible materials like wood, paper, and cloth.
  - Class B: Fires involving flammable liquids, gases, or greases.
  - Class C: Fires involving energized electrical equipment.
  - Class D: Fires involving combustible metals.
  - Class K: Fires involving cooking oils and fats, commonly found in kitchens.
- Types of Fire Extinguishers: Different types of fire extinguishers are designed to handle specific classes of fire:
  - Water Extinguishers (Class A): Suitable for Class A fires, but not for fires involving flammable liquids or electrical equipment.
  - Foam Extinguishers (Class A and B): Effective on Class A and B fires, but not for electrical fires.
  - Dry Powder Extinguishers (Class A, B, C, and D): Suitable for a range of fires, including electrical fires and flammable liquids.

    - CO_2 Extinguishers (Class B and Electrical Fires): Effective for flammable liquid and electrical fires, but not for Class A fires.
    - Wet Chemical Extinguishers (Class K): Specifically designed for kitchen fires involving cooking oils and fats.
- Operating Procedure of Fire Extinguishers:
    - Pull: Pull the pin to break the seal and unlock the operating lever.
    - Aim: Aim the nozzle at the base of the fire where the fuel source is.
    - Squeeze: Squeeze the operating lever to release the extinguishing agent.
    - Sweep: Sweep the nozzle from side to side while directing the agent at the base of the fire until it's extinguished.
- Importance of Participation in Safety Drills: Participation in safety drills is important for several reasons:
    - Familiarity: Workers become familiar with evacuation routes and emergency procedures.
    - Response Practice: Workers practice how to respond to emergencies, minimizing confusion during real incidents.
    - Efficiency: Regular drills improve the efficiency of evacuation and emergency response.
    - Identification of Weaknesses: Drills help identify areas that need improvement in the emergency plan.
- Basic Medical Tests Required for Construction Site: Common medical tests for construction site workers include:
    - Physical Examination: Overall health assessment.
    - Vision and Hearing Tests: Ensuring good visual and auditory health.
    - Lung Function Test: Assessing respiratory health.
    - Blood Pressure and Heart Rate Check: Monitoring cardiovascular health.
- Purpose and Importance of Vertigo Test: A vertigo test assesses a worker's balance and susceptibility to dizziness, which is crucial for working at heights. Vertigo can lead to accidents and falls, making this test vital for maintaining site safety.
- Types and Benefits of Basic Ergonomic Principles: Ergonomic principles for construction tasks include proper lifting techniques, maintaining neutral body positions, and using suitable tools. Benefits include reducing strain, preventing musculoskeletal injuries, and enhancing overall worker well-being.
- Demonstrating Use of PPEs: Proper PPE usage involves:
    - Selection: Choose the appropriate PPE for the task.
    - Fitting: Ensure PPE fits correctly and comfortably.
    - Wearing: Wear PPE consistently throughout the task.
    - Adjusting: Make necessary adjustments for comfort and effectiveness.
    - Maintaining: Regularly inspect and maintain PPE to ensure it functions properly.
- Using PPE correctly safeguards workers from potential hazards like head injuries, respiratory issues, and more, contributing to a safer work environment for Construction Electrician - LV.

Activity - 1

General Safety at a Construction Site

Conduct a role play activity on following emergency procedure in case of accidental fire at work place.

- Ask the participants to assemble at a designated place.
- Distribute the 'Practical Activity Format' which includes task, duration allowed, specific instructions, method statements, etc.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Ask two persons who are very much interactive to participate in the role play.
- Explain the roles to each of them.
- Rotate the roles after completing one cycle.

Sub Activity	Time	Resources
Start the fire alarm	1 hour	Stationary items, Fire extinguisher, wood and paper pieces, match box
Use fire extinguisher	6 hours	
Call for medical help and carryout primary first aid for the injured person	2 hours	
Instruct co-workers to gather at the collection point	2 hours	

Table 8.2.1 – General safety at a construction site

Specific Instructions

- Select four persons from the group.
- Name the persons selected as Peron A, B, C and D.
- Explain and demonstrate the method to perform the sub activities.
- Consider Person A to be a Fabricator and the rest are co-workers.
- Start the role play and check whether it is happening as per the plan.
- Guide closely wherever needed.
- Complete the activity as per scheduled time.
- Ask the watching group to explain the steps that are performed.
- Clarify doubts, if any.

Activity - 2

Working at Heights

Conduct a skill practice activity on using ladder safely at heights with proper PPE.

- Ask the participants to assemble at a designated place.
- Distribute the 'Practical Activity Format' which includes task, duration allowed, specific instructions, method statements, etc.
- List and explain the safety guidelines followed at heights.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Maximum duration mentioned in the below table is for extensive practice and corresponding guidance until the skill is acquired by the participants.

Sub Activity	Time	Resources
Practice wearing PPE	2 hours	Ladder, PPE
Erect the ladder	2 hours	
Practice climbing the ladder safely	2 hours	

Table 8.2.2 – Working at heights

Specific Instructions

- Show the PPE matrix that has to be followed at a construction site.
- Demonstrate the standard procedure for wearing the PPE.
- Demonstrate the important checks that are to be performed while erecting the ladder.
- Ask the participants to practice wearing PPE, check and ensure that there is no deviation of standard procedure.
- Ask the participant to practice using ladder.
- Guide and correct the participants wherever necessary.
- List the advantages of using PPE.
- Clarify doubts, if any.

Notes

Unit 8.3 - Hygiene and Safe Waste Disposal Practices

Objectives:

At the end of this unit, trainer will ensure that participant will be able to:

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

Topic Introduction

- Give the participants a brief overview of this unit
- Applications in various job environment

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass, Fire Extinguisher, Fire prevention kit, First Aid box, Safety tags and Safety Notice board.

Do

- Explain the practices to maintain personal hygiene, workplace hygiene and site/ workplace sanitization
- Describe the importance of housekeeping works
- Discuss the safe housekeeping practices and ask them to follow
- Explain different types of waste at construction sites and their disposal method
- Explain safe waste disposal practices followed at construction site

Notes for Facilitation

- Use the Construction Electrician – LV PHB and refer unit 8.3 to explain Hygiene and Safe Waste Disposal Practices.
- Personal Hygiene: Maintaining personal hygiene involves practices such as washing hands before and after work, wearing clean and appropriate clothing, and using personal protective equipment (PPE) to prevent contamination and protect oneself from hazards.
- Workplace Hygiene: Workplace hygiene includes keeping work areas clean, organized, and free from hazards. Regular cleaning of tools, equipment, and surfaces helps prevent accidents, maintain efficiency, and promote a healthy work environment.
- Site Sanitization: Site sanitization involves cleaning and disinfecting shared areas to prevent the spread of germs and ensure a safe working environment. This is especially important in light of health concerns and global events.
- Importance of Housekeeping Works: Housekeeping works are crucial in the construction industry for several reasons:
  - Safety: A clean and organized workspace reduces the risk of slips, trips, falls, and other accidents.
  - Efficiency: Proper organization of tools, materials, and equipment improves work efficiency.
  - Prevention: Regular cleaning prevents the build-up of dust, debris, and potential fire hazards.
  - Morale: A clean and organized work environment boosts worker morale and job satisfaction.
- Safe Housekeeping Practices:

  - Daily Clean-up: Clean-up work areas at the end of each day to ensure a fresh start the next day.
  - Tool Storage: Properly store tools, equipment, and materials after use to prevent tripping hazards and damage.
  - Waste Disposal: Dispose of waste properly and promptly to prevent clutter and hygiene issues.
- Different Types of Waste at Construction Sites and Their Disposal:
  - General Waste: Regular construction debris like paper, packaging, and non-hazardous materials.
  - Hazardous Waste: Includes chemicals, solvents, paints, and materials that pose health or environmental risks.
  - Electronic Waste: Old or broken electronic equipment, requiring proper disposal due to environmental concerns.
- Safe Waste Disposal Practices at Construction Site:
  - Separation: Segregate waste into different categories for appropriate disposal.
  - Labelling: Clearly label hazardous waste containers to prevent accidents.
  - Storage: Store waste in designated areas to avoid contamination and health hazards.
  - Legal Compliance: Follow local regulations and guidelines for waste disposal.
- Maintaining personal and workplace hygiene, implementing proper housekeeping practices, and ensuring safe waste disposal contribute to a safer and more organized construction site environment, benefitting both workers and the overall project.

Activity – 8.3.1

Activity: Understanding and Implementing Safe Waste Disposal Practices

Purpose: This activity aims to educate trainees on the importance of safe waste disposal practices at construction sites and provide them with hands-on experience in correctly identifying and disposing of different types of waste materials.

Resources Required: Various waste materials, labelled bins or containers for waste separation, personal protective equipment (PPE), safety signs.

Tentative Duration: 60 Minutes

Procedure:

1) Introduction (10 minutes):
   - Start by discussing the significance of proper waste disposal at construction sites, emphasizing safety, environmental responsibility, and compliance with regulations.
   - Explain the importance of segregating waste materials to facilitate recycling and safe disposal.
2) Waste Identification (15 minutes):
   - Display a variety of waste materials commonly found at construction sites, including non-recyclable and recyclable items, hazardous materials, and general debris.
   - Engage trainees in identifying and classifying these waste materials into different categories.
3) Waste Separation (10 minutes):
   - Provide labelled bins or containers for waste separation, including categories such as recyclables, hazardous waste, general waste, and debris.
   - Instruct trainees to sort the waste materials into the appropriate containers.
4) Safe Disposal Practices (15 minutes):
   - Discuss safe disposal practices for each waste category, emphasizing the importance of following industry and environmental regulations.
   - Explain the use of personal protective equipment (PPE) when handling hazardous waste.
5) Hands-On Practice (10 minutes):
   - Allow trainees to dispose of waste materials they've sorted into the appropriate containers.
   - Ensure they follow proper safety procedures and use PPE as required.
6) Group Discussion (10 minutes):
   - Conclude with a group discussion on the challenges and best practices encountered during the activity.
   - Encourage trainees to share their insights on the importance of safe waste disposal at construction sites.

7) Recap and Conclusion (5 minutes):
   - Summarize the key points of the activity, emphasizing the significance of adhering to safe waste disposal practices in the construction industry.
   - Provide additional resources or references for trainees to further their understanding of waste disposal regulations.

Expected Outcome: Trainees will gain a practical understanding of different waste categories found at construction sites and the importance of proper waste disposal. They will learn to segregate waste materials correctly, use PPE when handling hazardous waste, and understand the significance of environmental responsibility and regulatory compliance in the construction industry.

Notes

Unit 8.4 - Infectious Disease and Its Cure

Objectives:

At the end of this unit, trainer will ensure that participant will be able to:

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

Topic Introduction

- Give the participants a brief overview of this unit
- Applications in various job environment

Resources to be Used

- **Theory**
  - Training Kit - Trainer Guide & Participant Handbook, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films.
- **Practical**
  - Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass, Fire Extinguisher, Fire prevention kit, First Aid box, Safety tags and Safety Notice board.

Do

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

Notes for Facilitation

- Use the Construction Electrician (LV) PHB and refer unit 8.4 to explain Infectious Disease and Its Cure.
- Infectious diseases that can spread or originate at construction sites include:
  - Respiratory Infections: Such as the flu, common cold, and COVID-18.
  - Skin Infections: Like bacterial infections, fungal infections, and rashes.
  - Gastrointestinal Infections: Including foodborne illnesses due to poor hygiene.
  - Vector-Borne Diseases: Like mosquito-borne diseases (e.g., Zika, dengue) due to stagnant water.
- Ways of Transmission of Infectious Diseases:
  - Airborne Transmission: Respiratory infections can spread through respiratory droplets released when an infected person coughs, sneezes, or talks.
  - Direct Contact: Skin infections can be transmitted through direct skin-to-skin contact or contact with contaminated surfaces.
  - Faecal-Oral Route: Gastrointestinal infections can spread through contaminated food, water, or surfaces.
  - Vector-Borne Transmission: Insects like mosquitoes can carry and transmit diseases from person to person.
- Methods to Check the Spread of Infectious Diseases:
  - Hand Hygiene: Regularly washing hands with soap and water or using hand sanitizers.

  - Respiratory Hygiene: Covering mouth and nose when coughing or sneezing.
  - Personal Protective Equipment (PPE): Wearing appropriate PPE like masks and gloves.
  - Disinfection: Regularly cleaning and disinfecting surfaces and shared equipment.
- Understanding Symptoms and Cure of Infectious Diseases:
  - Respiratory Infections: Symptoms include fever, cough, sore throat, and shortness of breath. Treatment includes rest, fluids, and in severe cases, medical attention.
  - Skin Infections: Symptoms include redness, swelling, itching, and rashes. Treatment depends on the type of infection and may involve antibiotics or antifungal medications.
  - Gastrointestinal Infections: Symptoms include nausea, vomiting, diarrhea, and abdominal pain. Treatment involves staying hydrated and in severe cases, medical intervention.
  - Vector-Borne Diseases: Symptoms vary based on the disease. Treatment ranges from supportive care to specific antiviral or antibiotic medications.
- Reporting Infectious Disease Outbreaks to Concerned Authorities:
  - Immediate Reporting: If an infectious disease outbreak is suspected, immediately inform your supervisor, manager, or the designated health and safety personnel.
  - Follow Protocols: Follow the organization's protocols for reporting infectious diseases or pandemics, including informing co-workers who may have been exposed.
  - Health Authorities: If necessary, local health authorities should be contacted to ensure proper containment and response.
- Understanding, preventing, and reporting infectious diseases is crucial to maintaining a healthy and safe working environment in the Masonry industry. It protects both workers and the community from potential health risks.

Activity 8.4.1.

Activity: Preventing the Spread of Infectious Diseases at Construction Sites

Purpose: This activity aims to educate trainees on the various aspects of infectious disease prevention and management at construction sites, emphasizing the importance of workplace safety and well-being.

Duration: Approximately 60 minutes

Resources Required: Presentation materials or whiteboard, markers, scenario cards.

Procedure:

1. Introduction (10 minutes):
   - Start with a brief introduction to the importance of understanding and preventing infectious diseases at construction sites.
   - Explain that the activity will cover different aspects, including recognizing types of infectious diseases, understanding transmission methods, methods to check the spread, and reporting procedures.
2. Types of Infectious Diseases (10 minutes):
   - Divide trainees into small groups.
   - Provide each group with a set of scenario cards describing different infectious diseases.
   - Ask them to categorize the diseases based on their types (e.g., airborne, waterborne, vector-borne) and discuss potential sources at construction sites.
3. Transmission Methods (10 minutes):
   - Bring the groups back together.
   - Discuss the various transmission methods of infectious diseases (e.g., direct contact, contaminated surfaces, respiratory droplets).
   - Ask each group to share examples from their scenario cards and how these diseases can be transmitted.
4. Preventing Disease Spread (15 minutes):
   - Introduce safe practices and measures to prevent the spread of infectious diseases at construction sites. Discuss topics such as:
     i. Hand hygiene and sanitation
     ii. Proper use of personal protective equipment (PPE)

iii. Vaccination and immunization
iv. Isolation and quarantine measures
- Encourage a group discussion on how these measures can be implemented on a construction site.

5. Symptoms and Cure (10 minutes):
   - Provide information about common infectious disease symptoms and potential treatments.
   - Discuss the importance of early detection and seeking medical attention.
   - Ask trainees to identify scenarios from their cards where early detection and treatment could have made a difference.
6. Reporting Procedures (5 minutes):
   - Explain the importance of promptly reporting any outbreaks or hazards related to infectious diseases or pandemics.
   - Emphasize the role of trainees in notifying the concerned authority.
   - Share the procedures and contact information for reporting.
7. Scenario Discussion (5 minutes):
   - Ask each group to present one of their scenario cards to the larger group.
   - Discuss how the infectious disease in the scenario could have been prevented or managed on a construction site.
8. Conclusion (5 minutes):
   - Summarize the key takeaways from the activity.
   - Highlight the importance of practicing good hygiene and safety measures to prevent the spread of infectious diseases at construction sites.

By engaging in this activity, trainees will gain a better understanding of infectious disease prevention, transmission, and response measures, which are crucial for maintaining a safe and healthy work environment on construction sites.

Exercise:

Key Solutions to PHB Exercise

A. Short Questions' Answer:

1) Reporting procedures for breaches or hazards at the construction site involve notifying supervisors or management immediately as per established guidelines.
2) Common safety hazards at construction sites include falls, electrical hazards, confined spaces, struck-by or caught-in-between incidents, and chemical exposure.
3) Demonstrating emergency and evacuation procedures involves knowing evacuation routes, using fire alarms, assisting injured individuals, and assembling at designated safe areas.
4) Basic ergonomic principles focus on designing workspaces and tasks to fit the worker's abilities, reducing strain and discomfort during construction activities.
5) In response to accidents and emergencies, steps include assessing the situation, providing first aid if necessary, notifying supervisors, securing the area, and cooperating with emergency responders.

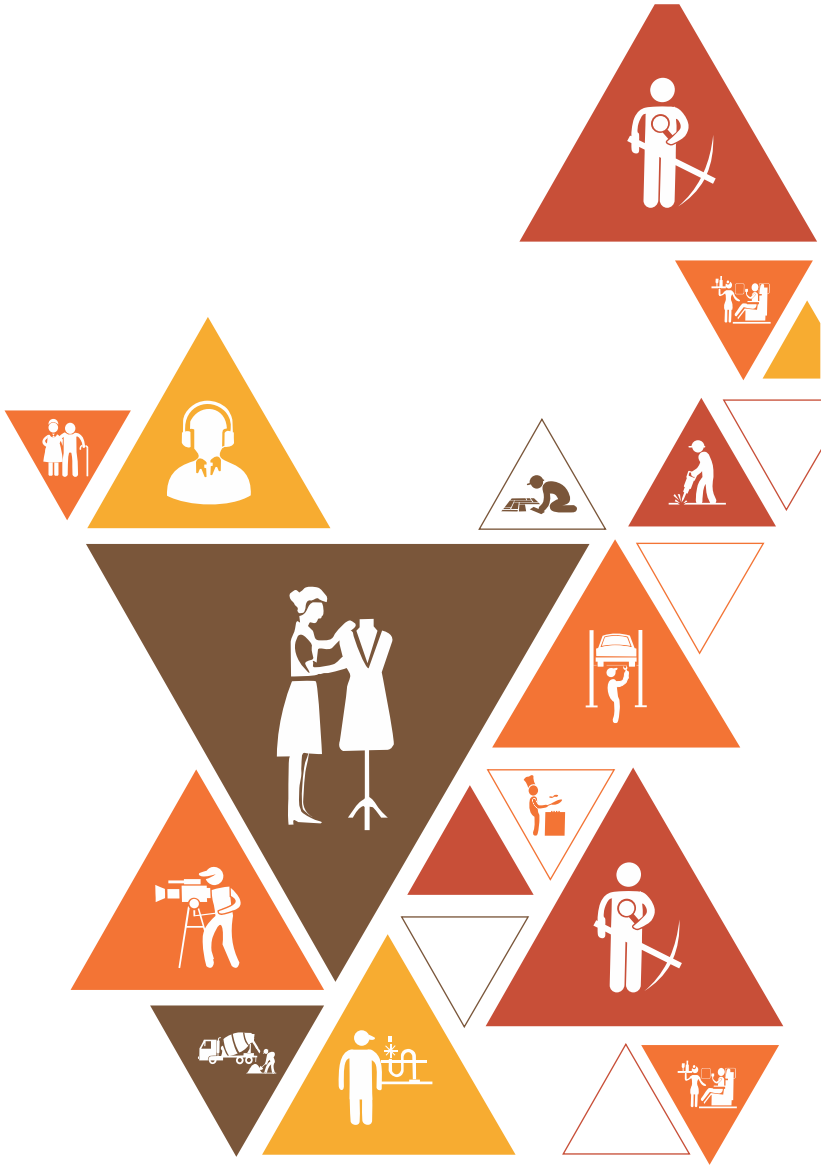
B. Fill-in-the-Blanks Questions' Answer:

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

C. True/False Questions' Answer:

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

Notes



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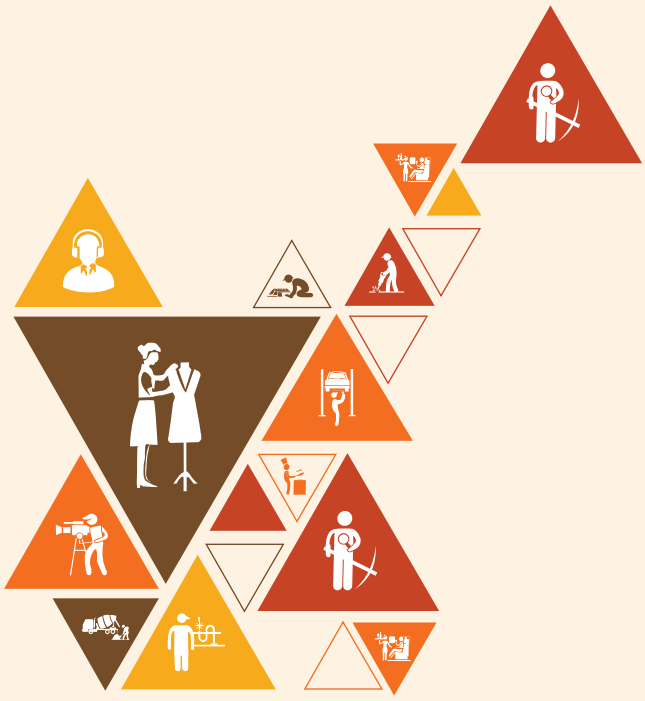
9. Employability Skills (60 Hours)

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



DGT/VSQ/N0102

Annexure – I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Construction Electrician - LV		
Qualification Pack Name & Ref. ID	Construction Electrician - LV, CON/Q0603		
Version No.	4	**Version Update Date**	31/03/2022
Pre-requisites to Training (if any)	11th Grade pass OR Completed 1st year of 3-year diploma after 10th OR 10th-grade pass and pursuing continuous schooling OR 8th Grade pass with 3-year relevant experience OR Previous relevant Qualification of NSQF Level 2.5 with 3-year relevant experience OR Previous relevant Qualification of NSQF Level 3 with 1.5-year relevant experience		
Training Outcomes	**By the end of this program, the participants will be able to:**		
	1. Lay (single/ three phases) cable and provide electrification for equipment at construction sites		
	2. Inspect electrical maintenance of construction equipment as per requirement		
	3. Carry out LV electrical wiring and assist the foreman in building electrification works		
	4. Work effectively in a team to deliver desired results at the workplace		
	5. Plan and organize work to meet expected outcomes		
	6. Work according to personal health, safety and environment protocols at the construction site		
	7. Employability Skills (60 Hours)		

Sl. No.	Module	Unit	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools / Aids	Duration (hours)
1	Introduction to the job role of Construction Electrician LV T- 05:00 (HH: MM)	Unit 1.1 – Construction Industry in Indiaw	1. Overview of Construction Industry	Understand the size and scope of the construction industry and its sub-sectors	CON/ N0608, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12, KU13, KU14, KU15, KU16, KU17, KU18, KU19, KU20, KU21, KU22, KU23, KU24, KU25, KU26. GS1, GS2, GS3, GS4,	Computer, printer, projector, white-board/ flip chart, marker and duster	Training Kit – Trainer Guide, Presentations, White-board, Marker, Projector, Laptop, Video Films	T- 02:00

		Unit 1.2 – Roles & Responsibilities of Construction Electrician - LV	2. Duties of a Construction Electrician - LV	Understand the role and responsibilities of a Construction Electrician LV		Classroom lecture, games, group participation, group activity		T- 02:00
			3. About Career progression	Understand future possible progression and career development options of a construction electrician LV		Classroom lecture, games, group participation, group activity		T- 01:00
2	Core/ Generic Skills T- 03:00 (HH: MM)	Unit 2.1 – Unit Conversion and Measurement	1. Metric and Imperial Conversion Mastery	To empower Learners with the capability to seamlessly and accurately convert between metric and imperial measurement systems, enhancing their versatility in construction.		Classroom lecture, games, group participation, group activity	Training Kit – Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films, Measurement tape	T- 01:00

		Unit 2.2 – Basic Geo-metrical Shapes and its Proper-ties	2. Exploring Geometric Shapes in Construction	To provide Learners with a compre-hensive grasp of geometric princi-ples and shapes, enabling them to make informed decisions and excel in con-struction tasks.		Class-room lecture, games, group partici-pation, group activity		T- 02:00

3	Lay (single/ three phases) Cable and Provide Electrification for Equipment at Construction Sites (CON/ N0608) T- 30:00 P- 52:00 (HH: MM)	Unit 3.1 – Preparatory Activities and Safety Measures	1. Site Safety and Assessment	Participants will understand the importance of inspecting the work area and identify potential hazards like embedded service lines, water tables, and flammable items before cable laying.		Classroom lecture, games, group participation, group activity	Pliers, Screw Drivers (set), Crimping tools, Wire strippers, Neon tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong tester, Measuring tape, Spirit level Marking tools, Drilling machine, Cutting machine, Chasing machine, Electrical socket (set), Tungsten	T- 02:00 P- 03:00

			2. Tool, Equipment, and Material Safety	Participants will comprehend the safety rules and regulations for handling and storing tools, equipment, and materials in the context of electrical works.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 03:00
			3. Cable Laying Procedures and Documentation	Participants will be able to explain the permits and checklists required both before and after cable laying activities, ensuring proper documentation.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			4. Cable Installation Planning and Execution	Participants will learn to assist in the planning of cable laying activities at construction sites, including the demonstration of preparatory activities like trench digging, conduit laying, and pole erection.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00
		Unit 3.2 – Cable Laying and Installation	5. Cable Installation Techniques	Participants will learn how to lay cables according to standard practice through trenches, conduits, or using poles at construction sites.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 03:00

			6. Quality Control and Safety in Cable Installation	Participants will demonstrate the ability to check for the rigidity of poles, condition of exposed cables and fittings, depth, and backfilling of trenches, and establish proper barricading as per safety norms.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 03:00
			7. Electrical Drawings and Specifications Interpretation	Participants will be able to demonstrate how to read and interpret electrical drawings, specifications, and manufacturer's guidelines for effective cable installation.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			8. Cable Selection and Laying Planning	Participants will explain the types of cables (single/3 phase) used as per electrical load requirements, as well as the method, material specifications, and time requirements for cable laying, ensuring efficient planning and execution.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00
		Unit 3.3 – Electrical Safety, Compliance, Quality Assurance, and Component Installation	9. Electrical Safety and Isolation Procedures	Participants will demonstrate the process of isolating the power source at the construction site in accordance with electrical safety norms.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 03:00

			10. Cable Connection and Equipment Wiring	Participants will demonstrate the methods to connect cables to power sources and electrical equipment/machinery following manufacturer's guidelines and standard practices.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 05:00
			11. Earthing and Equipment Protection	Participants will demonstrate methods for providing earthing to various equipment and explain the standard practice for safeguarding installed electrical equipment from external damaging effects.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			12. Electrical Testing and Compliance	Participants will demonstrate electrical testing methods during the inspection and trial run of installed equipment while ensuring compliance with safety parameters and Indian Standard Code of Practice.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

4	Inspect and maintain construction equipment as per requirement (CON/ N0609) T- 35:00 P- 55:00 (HH: MM)	Unit 4.1 – Electrical Principles and Systems in Construction Equipment	1. Electrical Circuits and Components Fundamentals	Participants will understand the working principle and power rating of electrical circuits, MCB, RCCB, ELCB, and various components and fixtures used in construction equipment.	CON/ N0609, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12, KU13, KU14, KU15, KU16, KU17, KU18, KU19, KU20. GS1, GS2, GS3, GS4, GS5, GS6, GS7, GS8, GS9, GS10.	Classroom lecture, games, group participation, group activity	Screw driver set, measuring tape, spirit level, plumb-bob, mason's line, cutting machine, drilling machine, Pliers, Screw Drivers (set), Crimping tools, Wire strippers, Neon tester, Ammeter, Voltmeter, Wattmeter, Ohmmeter, Digital Multimeter, Megger, Tong tester, Measuring tape,	T- 03:00 P- 03:00

			2. Testing and Connections in AC and DC Circuits	Participants will learn the type of connections and tests to be carried out in capacitive, inductive AC and DC circuits for safe and efficient electrical systems.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 03:00
			3. Motor Types and Applications	Participants will explain different types of motors, their respective uses, and the underlying working principles in the context of construction applications.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 04:00

			4. Star-Delta and Motor Connections	Participants will understand the principles of star and delta connections and their practical applications in electrical circuits, particularly in motor control.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00
			5. Motor Starters and Control	Participants will discuss the working principles of various starter types used in both DC motors (3-point, 4-point) and 3-phase squirrel cage induction motors (DOL, Star-Delta), facilitating effective motor control.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			6. Transformers and Their Applications	Participants will explain the working principles of different types of 3-phase transformers, their connections (star-star, delta-delta, delta-star), and the components involved, while also understanding transformer applications and relevant terminologies essential in construction electrical work.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

		Unit 4.2 – Electrical Equipment Maintenance and Fault Diagnosis	7. Earthing Methods and Measurement	Participants will describe various methods of earthing, including the measurement of earth resistance using an earth tester and the testing of earth leakage using ELCB and relay, ensuring proper grounding techniques.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00
			8. Armoured Cable Repair and Maintenance	Participants will demonstrate efficient techniques for joining damaged armoured cables bearing heavy electricity loads using straight-through joints.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			9. Earthing Inspection and Fault Rectification	Participants will learn how to inspect and rectify faults in the earthing of construction equipment, referencing manufacturer's guidelines for effective grounding.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00
			10. LV Power Distribution Wiring Inspection	Participants will show how to inspect and detect leakage and faults in LV single/three-phase power distribution wirings following directions and standard practices.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 05:00

			11. Transformer Operation and Fault Detection	Participants will demonstrate how to operate and inspect transformers to detect faults under close supervision, ensuring reliable transformer maintenance.		Classroom lecture, games, group participation, group activity		T- 03:00 P- 05:00

			12. Motor Maintenance and Trouble-shooting	Partici-pants will demon-strate the skill of winding armatures in mo-tors per motor specifi-cations, under-standing motor mainte-nance, and appropri-ate starter selection based on motor specifica-tion and power rating during mainte-nance.		Class-room lecture, games, group partici-pation, group activity		T- 03:00 P- 05:00

5	Carry out LV electrical wiring and assist in building electrification works (CON/ N0610) T- 50:00 P- 100:00 (HH: MM)	Unit 5.1 – Understanding Wiring Principles and Requirements	1. Statutory Guidelines and Electrical Codes	Participants will describe the statutory guidelines provided by ISI for LV wiring operations and understand the importance of compliance with legal standards.	CON/ N0610, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12, KU13, KU14, KU15, KU16, KU17, KU18, KU19, KU20, KU21, KU22. GS1, GS2, GS3, GS4, GS5, GS6, GS7, GS8,	Classroom lecture, games, group participation, group activity	Wall chasing chisel, hammer, hacksaw, file marking tools, table vice, Stock and die set, Pipe , cutter to cut pipes, Hand brooms, Shovels, Screw driver set, measuring tape, spirit level, plumb-bob, mason's line, cutting machine, drilling machine, power source, rigid conduits, flexible conduit, clamps for con-	T- 02:00 P- 04:00

			2. Electrical Wiring Accessories and NEC Standards	Participants will list common electrical wiring accessories and their specifications according to the National Electrical Codes (NEC) guidelines, ensuring adherence to industry standards.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			3. Guidelines for Hand/ Power Tools and Measuring Devices	Participants will explain applicable manufacturer's guidelines and specifications for the safe and effective use of hand/ power tools and measuring devices in electrical work.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			4. Electrical Fittings and Fixtures Specifications	Participants will describe manufacturer's guidelines and specifications for the use of electrical fittings and fixtures, emphasizing quality and safety.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			5. Cable Specification and Color Coding	Participants will explain the specification and color coding of cables based on circuit load requirements, ensuring proper cable selection and organization.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			6. Electrical Earthing Components and Practices	Participants will understand the properties of components used in electrical earthing work and explain the standard practices for safe and effective cable laying through conduits.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			7. Protective Devices in House Wiring	Participants will explain the area of application and specifications of protective devices such as fire alarms, MCB, ELCB, and MCCB in house wiring for enhanced safety.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			8. Maximizing Natural Lighting and House Wiring Best Practices	Participants will describe lighting arrangements that maximize the use of natural light and understand standard house wiring procedures and best practices for efficient electrical installations.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
		Unit 5.2 – Preparing for Wiring Installation	9. Visual Inspection of Wiring Components	Participants will learn to perform visual checks of house wiring components before their use in concealed wiring, ensuring safety and quality.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			10. Interpreting Drawings and Circuit Diagrams	Participants will demonstrate the ability to interpret drawings, circuit diagrams, and schematics for single and three-phase LV house wiring systems, enabling accurate installations.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			11. Chasing and Wall Marking for Concealed Wiring	Participants will show how to mark walls for chasing in concealed wiring and monitor the chasing work, ensuring precise installation.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			12. Electrification Planning and Fixture Installation	Participants will learn how to plan for electrification, mark locations for the installation of raceways, electrical fixtures, and fittings on walls, facilitating an organized layout.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			13. Electrical Material Requirement Calculation	Participants will demonstrate the calculation of electrical material requirements based on electrical fittings and layouts, optimizing resource utilization.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			14. Budget Preparation for Household Wiring	Participants will show how to prepare a budget for household wiring projects, effectively managing costs during electrical installations.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			15. Safety Measures in House Wiring	Participants will learn and apply safety measures to ensure secure and reliable house wiring, promoting a hazard-free environment.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			16. Practical Implementation of House Wiring Plans	Participants will apply their knowledge by practically implementing house wiring plans, demonstrating competence in real-world construction electrical scenarios.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
		Unit 5.3 – Wiring Installation and Post-Wiring Activities	17. Flexible Conduit Installation in RCC and Walls	Participants will demonstrate how to lay flexible conduit pipes through RCC structures or chased wall surfaces, ensuring a well-organized and concealed wiring.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			18. Electrical Fixtures and Fittings Installation	Participants will demonstrate the installation of electrical fixtures, fittings, and distribution boards at specified locations for a functional electrical system.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			19. Electrical Circuit Testing and Safety	Participants will perform necessary tests to ensure the safe condition of electrical circuits during and post-wiring using appropriate tools, prioritizing safety and compliance.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			20. Earth Resistance and Leakage Measurement	Participants will demonstrate how to measure earth resistance and leakage using appropriate electrical devices, ensuring the integrity of the electrical grounding system.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			21. Electrical Earthing for Appliances	Participants will demonstrate electrical earthing work for household appliances following standard procedures and using suitable earthing components, enhancing safety.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			22. New LV Connection Establishment	Participants will demonstrate how to establish a new LV connection in alignment with circuit load requirements, ensuring a reliable power supply.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			23. Household Appliance Installation	Participants will demonstrate the installation of various household appliances including fans, water pumps, refrigerators, fire alarm systems, and security systems, ensuring proper functionality.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

			24. Documentation and Checklist Completion	Participants will demonstrate the ability to document relevant readings and fill out checklists, ensuring comprehensive records for future reference and maintenance.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00
			25. Electrical Troubleshooting and Maintenance	Participants will learn how to diagnose and troubleshoot common electrical issues in LV systems, and perform routine maintenance to ensure the long-term reliability of electrical installations.		Classroom lecture, games, group participation, group activity		T- 02:00 P- 04:00

6	Work effectively in a team to deliver desired results at the workplace (CON/ N8001) T- 09:00 P- 21:00 (HH: MM)	Unit 6.1 – Effective Communication and Teamwork	1. Roles and Responsibilities in the Workplace	By the end of this session, learners should be able to elucidate their own roles and responsibilities within the construction project, ensuring a clear understanding of their individual contributions to the team.	CON/ N8001, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12. GS1, GS2, GS3, GS4, GS5, GS6, GS7, GS8, GS9, GS10. GS11.	Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 03:00
			2. Effective Communication at the Workplace	The goal of this session is for learners to explain the importance of effective communication in a construction setting, highlighting its impact on project success, safety, and efficiency.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			3. Teamwork and Problem Reporting	After this session, learners should be able to demonstrate the ability to effectively communicate work-related information to team members and show how to report any unresolved problems or issues to their supervisor promptly, fostering a culture of collaboration and timely issue resolution in the workplace.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

		Unit 6.2 – Working Effectively and Maintaining Discipline at Work	4. Creating a Cooperative Work Environment	By the end of this session, learners should be able to explain the importance of fostering a healthy and cooperative work environment among gangs of workers, promoting teamwork and collaboration on construction projects.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			5. Knowledge Sharing and Effective Communication	The goal of this session is for learners to elucidate techniques related to work methods, material properties, tools, tackles, and safety standards that co-workers might need, emphasizing the importance of sharing knowledge and information for improved project quality, safety, and efficiency.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			6. Synchronized Work and Support	After this session, learners should be able to demonstrate the ability to work together in a synchronized manner with co-workers, support colleagues facing problems, and efficiently hand over required materials, tools, equipment, and work fronts to interfacing teams, ensuring seamless project operations and problem resolution.		Classroom lecture, games, group participation, group activity	NA	T- 00:00 P- 02:00

		Unit 6.3 – Maintaining Social Diversity at Work	7. Understanding Gender Equality	By the end of this session, learners should have a fundamental understanding of the concept of gender equality, including its importance, principles, and relevance in the workplace.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00
			8. Promoting Diversity and Inclusion	The goal of this session is to explain how to recognize and be sensitive to issues related to disability, culture, and gender, fostering an inclusive and respectful work environment.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			9. Gender Sensitivity in the Work-place	In this session, learners will dis-cuss leg-islation, policies, and pro-cedures related to gender sensitiv-ity and cultural diversity, and un-derstand their impact on the work-place, ensuring compli-ance with relevant regula-tions and organi-zational stan-dards.		Class-room lecture, games, group partici-pation, group activity	NA	T- 01:00 P- 02:00

			10. Implementing Inclusive Practices	After this session, learners should be able to demonstrate effective implementation of gender-neutral practices in the workplace, promoting diversity, and ensuring that all employees are treated fairly and equitably. Additionally, they should be able to address discriminatory and offensive behavior professionally and in ac-		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

7	Plan and Organize Work to meet Expected Outcomes (CON/ N8002) T- 09:00 P- 21:00 (HH: MM)	Unit 7.1 – Prioritise Work Activities to Achieve Desired Results	1. Understanding Labor and Work Productivity	By the end of this session, learners will be able to explain the basic concepts of labor productivity and work productivity in the context of their trade or job role.	CON/ N8002, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8. GS1, GS2, GS3, GS4, GS5, GS6, GS7, GS8, GS9, GS10.	Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 03:00
			2. Planning for Productivity	In this session, learners will identify work targets and plan activities to achieve the desired productivity levels, ensuring efficient task execution.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			3. Task Planning and Scope	After this session, learners will have the knowledge to explain the process of planning tasks and activities within the defined scope and duration of their trade or job role.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00
			4. Effective Activity Planning	This session will enable learners to demonstrate effective planning for various activities according to the project scope and schedule, ensuring organized and timely execution.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			5. Prioritization and Resource Requisition	By the end of this session, learners will be able to explain the procedures for prioritizing activities and sequencing them to maximize output. They will also understand how to requisition resources and report resource requirements to the concerned authority, with practical examples.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00
		Unit 7.2 – Organising Resources	6. Resource Efficiency and Minimization of Waste	In this session, learners will gain an understanding of how to minimize wastage of resources in their do-		Classroom lecture, games, group participation, group activity	NA	T- 00:00 P- 02:00

			7. Optimal Resource Utilization	After this session, learners will be able to demonstrate the optimal use of resources while carrying out do-		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00
			8. Proper Waste Collection and Disposal	This session will teach learners how to collect and dispose of waste in accordance with organizational norms, ensuring a clean and safe work environment.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

			9. Waste Management Planning	By the end of this session, learners will be equipped to explain the plan for waste collection and disposal following the completion of their tasks.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00
			10. Timely Completion and Efficiency	In this session, learners will demonstrate their ability to complete work within the stipulated time and according to the planned schedule, enhancing overall project efficiency.		Classroom lecture, games, group participation, group activity	NA	T- 01:00 P- 02:00

8	CON/ N9001: Follow safety norms as defined by organization, adopt healthy and safe work practices T- 09:00 P- 21:00 (HH: MM)	Unit 8.1 – Hazards and Emergency Situations	1. Types of hazards at the construction sites and identify the hazards specific to the domain related works	Understand and categorize various types of hazards commonly found at construction sites, including physical, chemical, biological, and ergonomic hazards. Identify hazards specific to the domain-related works being carried out, such as electrical hazards for electricians or fall hazards for roofers. Recognize the potential	CON/ N9001, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12, KU13, KU14, KU15, KU16, KU17, KU18, KU19. GS1, GS2, GS3, GS4, GS5, GS6, GS7.	Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety goggles, Nose mask, Ear protection, Safety tags, Safety Notice board	T- 01:00 P- 02:00

			2. Recognize the safety control measures and actions to be taken under emergency situation	Familiarize oneself with safety control measures and precautions to mitigate identified hazards. Learn the actions to be taken under emergency situations, including evacuation procedures, first aid response, and alerting the appropriate authorities. Understand the importance of quick and effective responses in emergency scenarios		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Fire extinguishers, Fire prevention kit, Safety Notice board	T- 01:00 P- 01:00

			3. Reporting procedure to the concerned authority in case of emergency situations	Comprehend the step-by-step reporting procedure to inform the concerned authorities in the event of emergencies, accidents, or hazardous incidents. Learn how to provide accurate and timely information, including location, nature of the emergency, and the number of individuals affected.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety Notice board, Safety tags	T- 00:00 P- 01:00

		Unit 8.2 - Safety Drills, PPEs and Fire Safety	4. The classes of fire and types of fire extinguishers	Explore the different classes of fires (e.g., Class A, B, C, D, and K) and their characteristics. Identify the suitable types of fire extinguishers corresponding to each fire class and their appropriate use.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Fire extinguishers, Safety Notice board	T- 01:00 P- 01:00

			5. The operating procedure of the fire extinguishers	Understand the step-by-step procedure for safely operating fire extinguishers, including pulling the pin, aiming at the base of the fire, squeezing the handle, and sweeping from side to side. Learn when and how to use fire extinguishers effectively to suppress fires and prevent their spread.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Fire extinguishers, Safety Notice board	T- 01:00 P- 01:00

			6. The importance of participation of workers in safety drills	Recognize the significance of active participation in safety drills and training exercises. Understand how safety drills enhance preparedness and ensure that workers know how to respond during emergencies.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety Notice board	T- 00:00 P- 01:00

			7. Basic medical tests required for working at construction site	Identify the essential medical tests that may be required before starting work at a construction site, such as physical examinations, vision tests, hearing tests, and drug screenings. Understand how these tests contribute to worker health and safety.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, First Aid box, Safety Notice board	T- 00:00 P- 01:00

			8. Purpose and importance of vertigo test at construction site	Learn about vertigo tests and their relevance in assessing a worker's balance and coordination, especially for tasks involving heights. Understand how vertigo tests help prevent accidents related to dizziness or loss of balance.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety goggles, Safety Notice board	T- 01:00 P- 01:00

			9. Types and benefits of basic ergonomic principles, which should be adopted while carrying out specific task at the construction sites	Explore various ergonomic principles applicable to specific tasks at construction sites, such as proper lifting techniques, posture, and equipment adjustments. Understand the benefits of adopting ergonomic practices, including reduced risk of musculoskeletal injuries and increased productivity.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety goggles, Safety tags, Safety Notice board	T- 00:00 P- 01:00

			10. Use of PPEs as per work requirements	Identify the specific PPE items required for different work conditions and tasks, such as helmets, safety goggles, ear protection, gloves, and respiratory protection. Learn when and how to correctly wear and use PPE to safeguard against workplace hazards.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Leather Hand Gloves, Jumpsuit, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Welding helmet, Welding glass, Safety tags, Safety Notice board	T- 00:00 P- 01:00

		Unit 8.3 - Hygiene and Safe Waste Disposal Practices	11. Follow the practices to maintain personal hygiene, workplace hygiene and site/ workplace sanitization	Understand the importance of personal hygiene and the role it plays in preventing the spread of illnesses in the workplace. Learn about best practices for maintaining cleanliness in the workplace, including sanitization measures to reduce health risks.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Nose mask, Safety tags, Safety Notice board	T- 01:00 P- 01:00

			12. The importance of housekeeping works	Recognize the significance of housekeeping in maintaining a safe and organized work environment. Understand how proper housekeeping practices contribute to accident prevention, improved efficiency, and overall site safety.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Sand buckets, Safety tags, Safety Notice board	T- 01:00 P- 01:00

			13. Keep an eye on safe housekeeping practices	Learn how to proactively observe and ensure the implementation of safe housekeeping practices at construction sites. Identify potential hazards related to housekeeping and take corrective actions or report issues to maintain a safe working environment.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety tags, Safety Notice board	T- 00:00 P- 01:00

			14. Different types of waste at construction sites and their disposal method	Identify various types of waste generated at construction sites, including		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Sand buckets, Flashback arrestors, Safety tags, Safety Notice board	T- 00:00 P- 01:00

			15. Know safe waste disposal practices followed at construction site	Familiarize oneself with safe waste disposal practices and regulations governing waste management at construction sites. Learn how to segregate, handle, and dispose of different types of waste materials in compliance with environmental standards.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Sand buckets, Safety tags, Safety Notice board	T- 00:00 P- 01:00

		Unit 8.4 - Infectious Disease and Its Cure	16. Different types of infectious disease that can spread/ originate at a construction site	Learn about various infectious diseases that can potentially spread or originate at construction sites, including respiratory infections, skin diseases, and vector-borne diseases. Understand the health risks associated with infectious diseases and their potential impact on the workforce.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Nose mask, Ear protection, Safety tags, Safety Notice board	T- 01:00 P- 01:00

			17. The ways of transmission of the various infectious disease	Explore the different modes of transmission for infectious diseases, such as direct contact, airborne transmission, and vector-borne transmission. Recognize how infectious diseases can spread among workers and the importance of preventive measures.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Nose mask, Ear protection, Safety tags, Safety Notice board	T- 01:00 P- 01:00

			18. Methods to check the spread of the infectious disease	Learn effective methods and preventive measures to control the spread of infectious diseases at construction sites, including vaccination programs, hygiene practices, and sanitation measures. Understand the role of personal and collective responsibility in disease prevention.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Nose mask, Ear protection, Safety tags, Safety Notice board	T- 00:00 P- 01:00

			19. Symptoms and cure of the various infectious disease	Identify common symptoms associated with infectious diseases and the importance of early detection. Gain knowledge about available treatments, preventive measures, and the importance of seeking medical attention when symptoms arise.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, First Aid box, Safety tags, Safety Notice board	T- 00:00 P- 01:00

			20. Procedure to report to the concerned authority regarding the outbreak/ hazard of any infectious disease/ pandemic	Understand the procedure for promptly reporting outbreaks or hazards related to infectious diseases to the concerned authorities. Learn how to provide essential information and follow reporting protocols during a disease-related emergency or pandemic.		Classroom lecture, games, group participation, group activity, field visit	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Safety tags, Safety Notice board	T- 00:00 P- 01:00

9	DGT/ VSQ/ N0102: Employ-ability Skills (60 Hours)	Unit 9.1: Employ-ability Skills	1. Introduc-tion to Em-ployability Skills	Discuss the Em-ployabil-ity Skills required for jobs in various indus-tries. List different learning and em-ployabili-ty related GOI and private portals and their usage.	DGT/VSQ/ N0102, PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC22, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33. KU1, KU2, KU3, KU4, KU5, KU6, KU7, KU8, KU9, KU10, KU11, KU12, KU13, KU14,	Class-room lecture, games, group partici-pation, group activity, field visit	Hand-book	2

			2. Constitutional values - Citizenship	Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen. Show how to practice different environmentally sustainable practices.		Classroom lecture, games, group participation, group activity, field visit	Handbook	2

			3. Becoming a Professional in the 21st Century	Discuss importance of relevant 21st century skills. Exhibit 21st century skills like		Classroom lecture, games, group participation, group activity, field visit	Handbook	2
			4. Basic English Skills	Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone. Read and interpret text written in basic English. Write a short note/ paragraph / letter/e-mail using basic English.		Classroom lecture, games, group participation, group activity, field visit	Handbook	4

			5. Career Development & Goal Setting	By the end of this course, participants will have the knowledge and skills to set clear, achievable career goals and develop a structured career development plan, enabling them to advance in their chosen career path and make informed decisions about their professional future.		Classroom lecture, games, group participation, group activity, field visit	Handbook	4

			6. Communication Skills	Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette. Explain the importance of active listening for effective communication. Discuss the significance of working collaboratively with others in a team.		Classroom lecture, games, group participation, group activity, field visit	Handbook	4

			7. Diversity & Inclusion	Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD. Discuss the significance of escalating sexual harassment issues as per POSH act.		Classroom lecture, games, group participation, group activity, field visit	Handbook	2

			8. Financial and Legal Literacy	Outline the importance of selecting the right financial institution, product, and service. Demonstrate how to carry out offline and online financial transactions, safely and securely. List the common components of salary and compute income, expenditure, taxes, investments etc. Discuss the legal rights, laws, and		Classroom lecture, games, group participation, group activity, field visit	Handbook	8

			9. Essential Digital Skills	Describe the role of digital technology in today's life. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely.		Classroom lecture, games, group participation, group activity, field visit	Handbook	6

			10. Entrepreneurship	Explain the types of entrepreneurship and enterprises. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement. Create a sample business plan,		Classroom lecture, games, group participation, group activity, field visit	Handbook	14

			11. Customer Service	Describe the significance of analysing different types and needs of customers. Explain the significance of identifying customer needs and responding to them in a professional manner. Discuss the significance of maintaining hygiene and dressing appropriately.		Classroom lecture, games, group participation, group activity, field visit	Handbook	8

			12. Getting Ready for apprenticeship & Jobs	Create a professional Curriculum Vitae (CV). Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively. Discuss the significance of maintaining hygiene and confidence during an interview. Perform a mock interview. List the steps for searching and regis-		Classroom lecture, games, group participation, group activity, field visit	Handbook	4

Annexure – II

Assessment Weightage	
Job Role	Construction Electrician - LV
Qualification Pack	CON/Q0603
Sector Skill Council	Construction

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the knowledge part will be based on knowledge bank of questions created by Assessment
3	Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on assessment criteria.
5	The passing percentage for each QP will be 50%. To pass the Qualification Pack, every trainee should score a minimum of 50% individually in each NOS.
6	The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final outcome
7	The trainee shall be provided with a chance to repeat the test to correct his procedures in case of improper performance, with a deduction of marks for each iteration.
8	After the certain number of iteration as decided by SSC the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.
9	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack within the specified timeframe set by SSC.
10	Minimum duration of Assessment of each QP shall be of 4hrs/trainee.

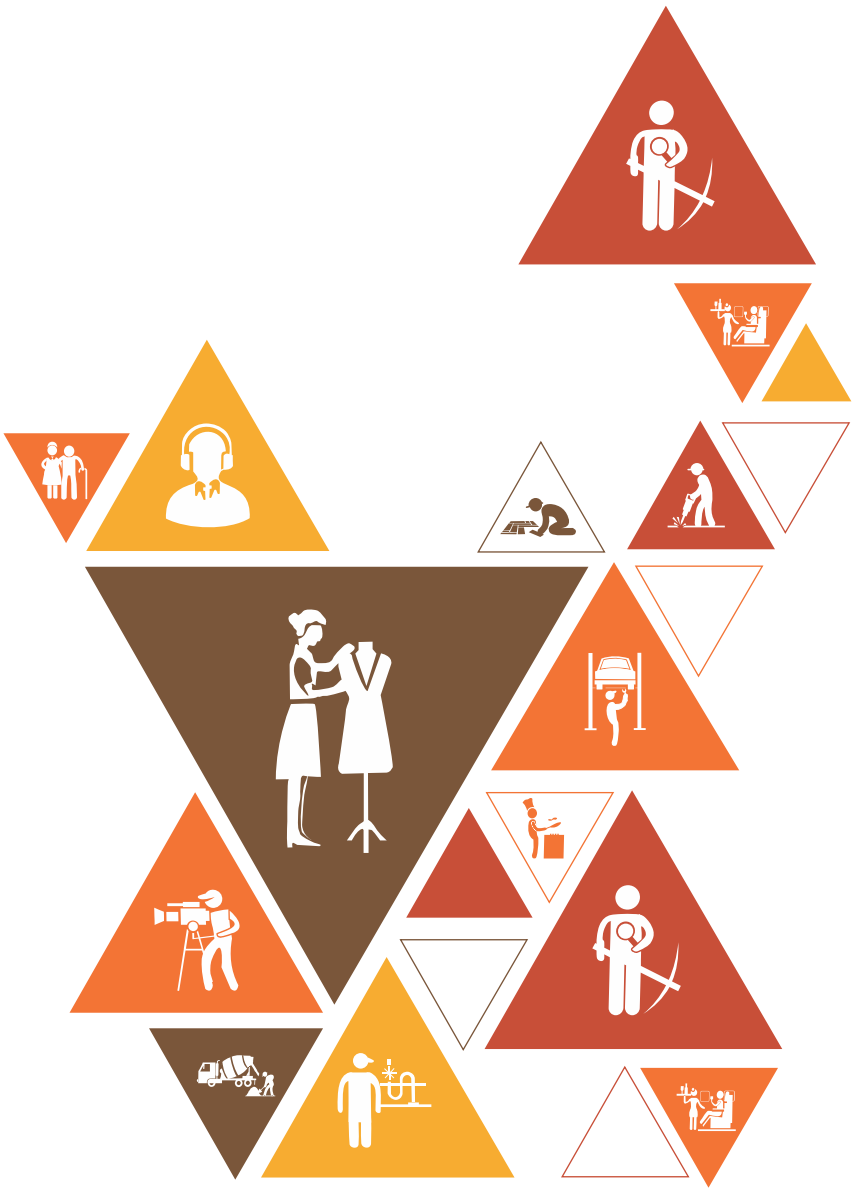
National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CON/N0608: Lay (single/ three phases) cable and provide electrification for equipment at construction sites	30	70	0	0	100	20
CON/N0609: Inspect electrical maintenance of construction equipment as per requirement	30	70	0	0	100	20
CON/N0610: Carry out LV electrical wiring and assist the foreman in building electrification works	30	70	0	0	100	25
CON/N8001: Work effectively in a team to deliver desired results at the workplace	30	70	-	-	100	10
CON/N8002: Plan and organize work to meet expected outcomes	30	70	-	-	100	10
CON/N9001: Work according to personal health, safety and environment protocols at the construction site	30	70	-	-	100	10
DGT/VSQ/N0102: Employability Skills	20	30	0	0	50	5
Total	200	450	0	0	650	100

Annexure - III

Chapter Name	Unit Name	Topic Name	URL	QR Code
Chapter 1: Introduction to the Role of a Construction Electrician - LV	UNIT 1.1: Construction Industry in India	Overview of Construction Sector in India	https://youtu.be/yhjDhav4Pfw	Overview of Construction Sector in India
	UNIT 1.2: Roles & Responsibilities of Construction Electrician - LV	About Construction Electrician LV	https://youtu.be/6tDynxzRHP0	About Construction Electrician LV
Chapter 2: Generic Mathematical Skills	Unit 2.1 – Unit Conversion and Measurement	Different System of Measurement	https://youtu.be/H1xo5UVJKVo	Different System of Measurement
	Unit 2.2 – Basic Geometrical Shapes and its Properties	Area, volume and perimeter of geometrical shapes	https://youtu.be/OhTubw4C0to	Area, volume and perimeter of geometrical shapes
	Unit 3.1: Preparatory Activities and Safety Measures	Building Site Temporary Electrical Supply	https://youtu.be/t5fO_kWw1Ko	Building Site Temporary Electrical Supply

Chapter 3: Lay (single/ three phases) Cable and Provide Electrification for Equipment at Construction Sites (CON/N0608)	Unit 3.2: Cable Laying and Installation	How to Cable Laying and Cable Dressing in Cable Tray	https://youtu.be/pxSwR5uR--0	How to Cable Laying and Cable Dressing in Cable Tray
			https://youtu.be/BRT6_W7x3tc	How to Cable Laying and Cable Dressing in Cable Tray
	Unit 3.3: Electrical Safety, Compliance, Quality Assurance, and Component Installation	Indian Electricity Rule	https://youtu.be/chX_58SWOTs	Indian Electricity Rule
		Electrical Circuit Lock-Out Tag-out	https://youtu.be/1gwq6IQ1_Qs	Electrical Circuit Lock-Out Tag-out
Chapter 4: Inspect Electrical Maintenance of Construction Equipment as per Requirement (CON/N0609)	Unit 4.1: Electrical Principles and Systems in Construction Equipment	Difference between MCB, MCCB, RCCB, ELCB, RCBO, RCD And MPCB	https://youtu.be/B27SOoI93XU	Difference between MCB, MCCB, RCCB, ELCB, RCBO, RCD And MPCB
		Star-Star and Star-Delta Transformers | About 3-Phase Power?	https://youtu.be/fvE0yMJT3t8	Star-Star and Star-Delta Transformers | About 3-Phase Power?

	Unit 4.2: Electrical Equipment Maintenance and Fault Diagnosis	Understanding electric motor Windings!	https://youtu.be/YYQayMrK4Fo	Understanding electric motor Windings!
Chapter 5: Carry out LV Electrical Wiring and Assist the Foreman in Building Electrification Works (CON/N0610)	Unit 5.1 – Understanding Wiring Principles and Requirements	Wiring related some ISI Rules	https://youtu.be/rcgQgU3I3yA	Wiring related some ISI Rules
	Unit 5.2 – Preparing for Wiring Installation	Understanding Distribution Boards & Calculation for Electrical Work	https://youtu.be/p7FKAL9cItM	Understanding Distribution Boards & Calculation for Electrical Work
	Unit 5.3 – Wiring Installation and Post-Wiring Activities	Earth Resistance? How to measure it?	https://youtu.be/-LCbv8v-Ulq	Earth Resistance? How to measure it?
		Install a New Ceiling Fan	https://youtu.be/1dfy6ldnWE4	Install a New Ceiling Fan
		Side-by-Side Refrigerator Installation	https://youtu.be/qUmLWJ-CtXU?feature=shared	Side-by-Side Refrigerator Installation



Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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