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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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Telecom Sector Skill Council

Facilitator Guide

Sector
Telecom

Sub-Sector
Passive Infrastructure

Occupation
Network (Passive) Installation

Reference ID: **TEL/Q4201,** Version **3.0**
NSQF level **4**

Infrastructure Technician – 5G Networks

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

Shri Narendra Modi
Prime Minister of India

Acknowledgements

Telecom Sector Skill Council (TSSC) would like to thank all the individuals and institutions who contributed in various ways towards the preparation of this facilitator guide. The facilitator guide could not have been completed without their active contribution. Special gratitude is extended to those who collaborated during the preparation of the different modules in the facilitator guide. Wholehearted appreciation is also extended to all who provided peer review for these modules.

The preparation of this guide would not have been possible without the Telecom Industry's support. Industry feedback has been extremely beneficial since inception to conclusion and it is with their guidance that we have tried to bridge the existing skill gaps in the industry. This facilitator guide is dedicated to the aspiring youth, who desire to achieve special skills which will be a lifelong asset for their future endeavours.

About this Guide

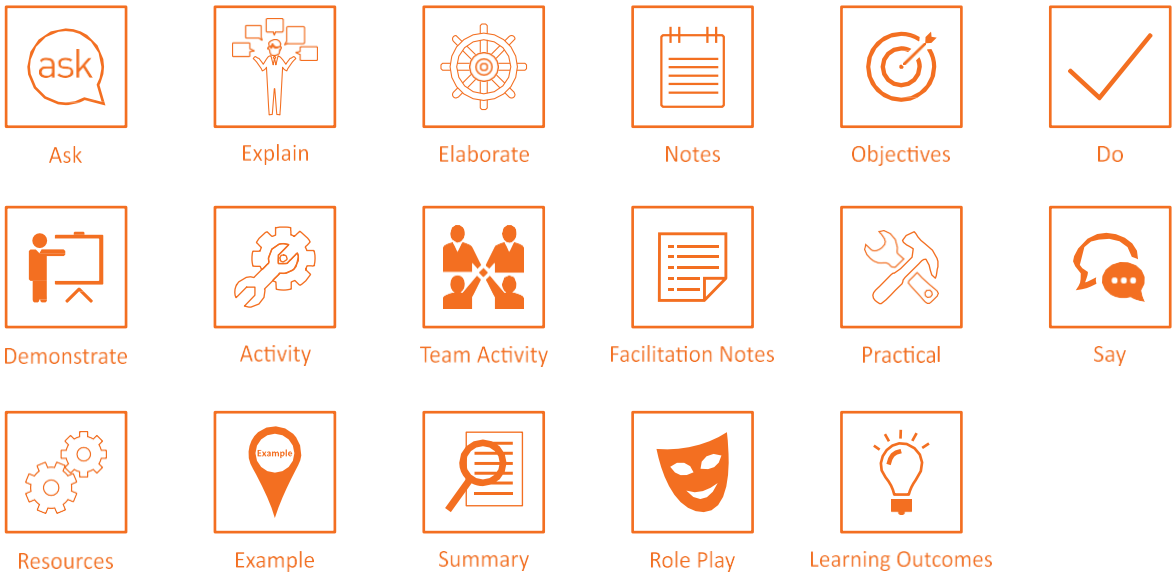
The facilitator guide (FG) for Infrastructure Technician - 5G Networks is primarily designed to facilitate skill development and training of people, who want to become professional Infrastructure Technician - 5G Networks in various stores. The facilitator guide is aligned to the Qualification Pack (QP) and the National Occupational Standards (NOS) as drafted by the Sector Skill Council (TSSC) and ratified by National Skill Development Corporation (NSDC).

It includes the following National Occupational Standards (NOSs)-

1. TEL/N4202: Prepare for the Installation of 5G Network Infrastructure
2. TEL/N4203: Install and Set up Passive Infrastructure Equipment with the 5G Equipment
3. TEL/N4204: Maintain Passive Infrastructure Equipment
4. TEL/N9109: Follow Sustainable Practices in Telecom Infrastructure Management
5. DGT/VSQ/N0101: Employability Skills (30 Hours)

Post this training, the participants will be able to perform tasks as professional Infrastructure Technician – 5G Networks. We hope that this Facilitator Guide provides a sound learning support to our young friends to build a lucrative career in the Telecom Skill Sector of our country.

Symbols Used



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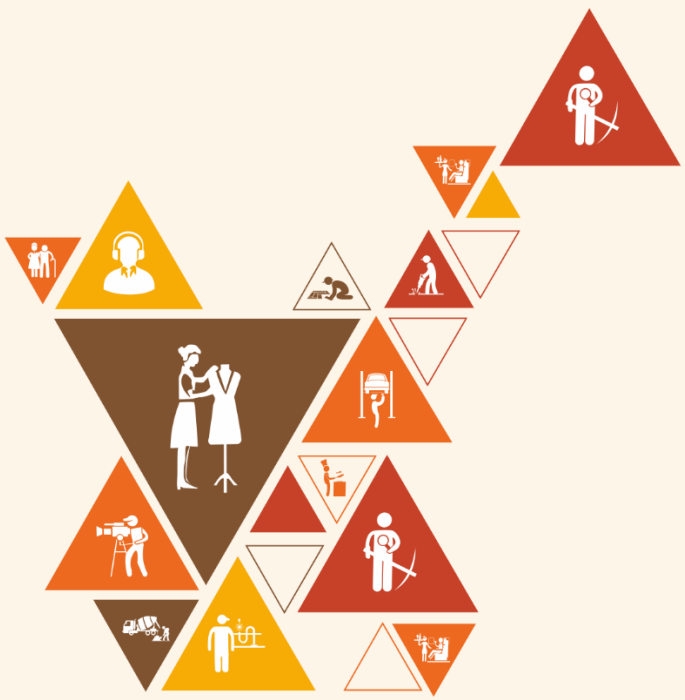
1. Introduction to the Sector & the Job Role of an Infrastructure Technician - 5G Networks

Unit 1.1 - Telecom Industry and Infrastructure Technician Responsibilities



TEL/N4202

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Describe the size and scope of the Telecom industry and its sub-sectors.
2. Discuss the role and responsibilities of an Infrastructure Technician – 5G Networks.
3. Identify various employment opportunities for an Infrastructure Technician – 5G Networks.
4. Describe the process workflow in the organization and the role of Infrastructure Technician – 5G Networks in the process.
5. List the various daily, weekly, monthly operations/activities that take place at the site under an Infrastructure Technician – 5G Networks.
6. Role play based on case studies, outlining the scope, responsibilities, and challenges of an Infrastructure Technician – 5G Networks.
7. Discuss the organizational policies on workplace ethics, managing sites, quality standards, personnel management, and public relations (PR).
8. Analyze the requirements for the course and prepare for the pre- requisites of the course.
9. Explain the role of an Infrastructure Technician in deploying and maintaining 5G network infrastructure.
10. Elucidate the key components and architecture of 5G networks, including small cells, fiber backhaul, and Massive MIMO.
11. Describe the processes of installing, testing, and troubleshooting 5G network hardware, such as antennas, base stations, and fiber optic connections.
12. Identify the challenges in network densification, signal interference, and maintaining low-latency communication in 5G technology.
13. Discuss safety protocols, electromagnetic field (EMF) exposure limits, and best practices for working with high-frequency 5G equipment.

UNIT 1.1: Telecom Industry and Infrastructure Technician Responsibilities

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the size and scope of the Telecom industry and its sub-sectors.
2. Discuss the role and responsibilities of an Infrastructure Technician – 5G Networks.
3. Identify various employment opportunities for an Infrastructure Technician – 5G Networks.
4. Describe the process workflow in the organization and the role of Infrastructure Technician – 5G Networks in the process.
5. List the various daily, weekly, monthly operations/activities that take place at the site under an Infrastructure Technician – 5G Networks.
6. Role play based on case studies, outlining the scope, responsibilities, and challenges of an Infrastructure Technician – 5G Networks.
7. Discuss the organizational policies on workplace ethics, managing sites, quality standards, personnel management, and public relations (PR).
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13. Discuss safety protocols, electromagnetic field (EMF) exposure limits, and best practices for working with high-frequency 5G equipment.

Resources to be Used

Presentation slides detailing the Telecom industry and Infrastructure Technician responsibili-ties, Case studies illustrating the role of an Infrastructure Technician in 5G Networks, White-board and markers, Handouts on organizational policies, Role-play scenarios related to Infra-structure Technician responsibilities.

Activity

1. **Activity Name:** Name Game (Ice Breaker)

2. **Objective:** This activity is focused on breaking the ice between the participants so that they can come up confidently in putting forward their opinion
3. **Type of activity:** Group activity
4. **Resources:** Participant Handbook, Pen, Notebook, Writing Pad, etc.
5. **Duration of the activity:** 60 minutes
6. **Instructions:**
   - Arrange the class in a semi-circle/circle
   - Say your name aloud and start playing the game with your name.
   - Say, Now, each of you shall continue with the game with your names till the last person in the circle/ semi-circle participates.
   - Listen to and watch the trainees while they play the game.
   - Ask questions and clarify if you cannot understand or hear a trainee.
   - Discourage any queries related to one's financial status, gender orientation or religious bias during the game
   - Try recognising each trainee by their name because it is not recommended for a trainer to ask the name of a trainee during every interaction
7. **Outcome:** This activity has focused on breaking the ice between the participants so that they can come up confidently, putting forward their opinion.

Say

- Welcome to today's session on Navigating the Telecom Industry and Infrastructure Technician Responsibilities. I'm excited to explore the dynamic world of telecom with you.
- Our objective today is to delve into the Telecom industry's size and scope, understand the re-sponsibilities of Infrastructure Technicians in 5G Networks, and explore the various opportuni-ties and challenges in this field.
- Understanding the Telecom industry and the crucial role of Infrastructure Technicians is key to thriving in this rapidly evolving field. It opens up exciting career opportunities and equips you with the knowledge to contribute effectively to the deployment and maintenance of 5G Net-works.

Ask

- Can you name any sub-sectors within the Telecom industry that you are familiar with?
- What challenges do you think Infrastructure Technicians might face in the context of 5G Net-works?
- Have you encountered any instances in your daily life where you've witnessed the impact of 5G technology?

Do

- Briefly introduce the Telecom industry's size and scope, emphasizing its sub-sectors.
- Discuss the role and responsibilities of Infrastructure Technicians in 5G Networks.
- Provide an overview of employment opportunities and the organizational process workflow.

Elaborate

- Describe daily, weekly, and monthly activities of Infrastructure Technicians.
- Discuss case studies through role-playing to highlight the scope, responsibilities, and challenges of Infrastructure Technicians.

Demonstrate

Demonstrate a basic 5G network setup or troubleshooting scenario to illustrate the practical aspects of an Infrastructure Technician's role.

Activity

1. **Activity Name:** Career Path Planning
2. **Objective:** To identify potential career paths within the Telecom industry.
3. **Type of Activity:** Group
4. **Resources:** Handouts on organizational policies, whiteboard, and markers.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - In groups, create a career path plan for an Infrastructure Technician.
   - Consider factors such as skills, certifications, and future trends. Present your plan to the class.
7. **Outcome:** Participants gain insights into career planning within the Telecom industry.

Notes for Facilitation

- Encourage active participation and open discussions.
- Foster a collaborative learning environment.
- Be prepared to answer questions related to current industry trends.
- Emphasize the importance of continuous learning and staying updated with technological advancements.
- Highlight the significance of soft skills, such as communication and problem-solving, in the role of an Infrastructure Technician.
- Discuss the relevance of organizational policies in maintaining quality standards and ethical practices.

Exercise

Answers to exercises for PHB

A. Multiple Choice Questions (MCQs)
1. b) Installing and maintaining network hardware
2. b) Small cells
3. c) Transmit and receive multiple signals simultaneously for better throughput
4. b) Network densification and signal interference
5. a) Wearing PPE and maintaining safe distance

B. Short Answer Questions
1. Explain the function of fiber backhaul in a 5G network.
Fiber backhaul connects the 5G cell sites (like small cells and macro cells) to the core network. It carries high-speed data traffic from the radio access network to the central network, ensuring fast, reliable, and low-latency communication.

2. Describe two methods used to troubleshoot signal interference in 5G networks.
- **Spectrum analysis:** Identifying sources of interference using spectrum analyzers to detect overlapping or unwanted signals.
- **Antenna optimization:** Adjusting antenna tilt, direction, or height to reduce interference and improve signal quality.

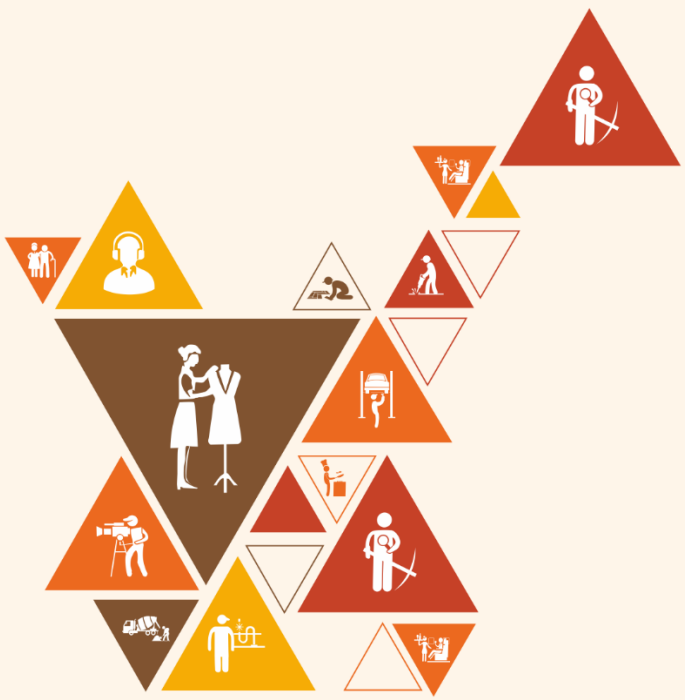
3. List three best practices for ensuring safety while installing or maintaining high-frequency 5G equipment.
- Use appropriate **PPE** such as helmet, gloves, harness, and RF-protective gear.
- Maintain a **safe distance** from active antennas and deactivate equipment when possible.
- Follow **manufacturer guidelines** and standard operating procedures (SOPs) strictly.

C. Fill in the Blanks
1. Small cells
2. Site testing / Commissioning (either is acceptable)
3. Signal attenuation / Interference
4. Low latency
5. Personal protective equipment (PPE) or safety practices

Notes

2. Conduct Site Surveys and Pre-Installation Activities for 5G Networks

Unit 2.1 - Preparing for the Installation of 5G Network Infrastructure



TEL/N4202

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the importance of a site survey in 5G network infrastructure installation.
2. Show how to conduct a site survey and assess site suitability for 5G network installation.
3. Describe the methods for assessing site suitability, including structural integrity and safety hazards.
4. Demonstrate the process of identifying potential hazards and risk mitigation strategies.
5. Define the key environmental factors affecting 5G infrastructure performance.
6. Show how to verify power supply availability and backhaul connectivity at a site.
7. Identify the tools, equipment, and accessories required for 5G network installation.
8. Show how to verify and document the availability of installation tools, equipment, and accessories.
9. List the pre-installation safety checks and regulatory compliance requirements.
10. Demonstrate the implementation of workplace safety protocols and use of protective gear.
11. Explain the process of obtaining authorizations and necessary paperwork for installation.
12. Show how to prepare and complete necessary documentation for installation approval.
13. Describe the procedure for inspecting and verifying the functionality of installation tools and equipment.
14. Demonstrate the method of inspecting and assembling network gear and infrastructure components.
15. Explain the documentation requirements for pre-installation activities and site readiness.
16. Demonstrate the process of coordinating with relevant personnel for tower erection and equipment positioning.
17. Identify best practices for handling telecom equipment and working at heights.
18. Demonstrate the implementation of workplace safety protocols and use of protective gear.

UNIT 2.1: Preparing for the Installation of 5G Network Infrastructure

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the importance of a site survey in 5G network infrastructure installation.
2. Show how to conduct a site survey and assess site suitability for 5G network installation.
3. Describe the methods for assessing site suitability, including structural integrity and safety hazards.
4. Demonstrate the process of identifying potential hazards and risk mitigation strategies.
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17. Identify best practices for handling telecom equipment and working at heights.
18. Demonstrate the implementation of workplace safety protocols and use of protective gear.

Resources to be Used

Presentation slides detailing advanced telecommunication infrastructure installation, A sample kit containing telecom installation tools and equipment, Relevant paperwork samples for tele-com infrastructure authorization, A demo kit for assembling and configuring networking gear, Whiteboard and markers.

Say

- Welcome to our session on Advanced Telecommunication Infrastructure Installation and Coor-dination. Today, we're diving into the intricacies of 5G network installation, an exciting and cru-cial aspect of the telecom industry.

- Our goal today is to explore the complexities of advanced telecommunication infrastructure installation. By the end of this session, you should have a solid understanding of the processes, tools, and coordination required for successful 5G network deployment.
- Understanding advanced telecommunication infrastructure installation is essential for telecom professionals. It not only ensures the smooth deployment of 5G networks but also contributes to the overall efficiency and effectiveness of the telecommunication industry.

Ask

- Can you name some key components required for the installation of 5G network infrastructure?
- Have you ever been involved in or observed any telecom infrastructure installation activities?
- What challenges do you think might arise during the installation of 5G cell towers?

Do

- Highlight the importance of determining the scope of work and selecting suitable sites for 5G network infrastructure installation.
- Discuss the relevance of equipment, tools, and authorization paperwork for the installation pro-cess.

Elaborate

- Explore topics such as equipment checks, coordination with personnel for tower erection, and recommended methods for installation.
- Describe the steps involved in assembling and configuring networking gear for infrastructure installation.

Demonstrate

Demonstrate a basic equipment check and assembly process.

Activity

1. **Activity name:** Infrastructure Installation Simulation
2. **Objective:** Simulate the process of installing telecom infrastructure.
3. **Type of Activity:** Group
4. **Resources:** Sample kit, demo kit, whiteboard, markers.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - In groups, simulate the installation of a 5G network infrastructure using the provided tools and equipment.
   - Discuss challenges faced and solutions found.
7. **Outcome:** Participants gain hands-on experience in a simulated installation scenario.

Notes for Facilitation

- Encourage active participation and hands-on learning.
- Foster a collaborative learning environment.
- Emphasize the practical application of knowledge.
- Stress the importance of thorough equipment checks to ensure successful installations.
- Discuss the significance of effective coordination, especially when dealing with tower erection.
- Highlight the need for precise documentation and paperwork for authorization in telecom in-frastructure installation.

Exercise

Answers to exercises for PHB

A. Multiple Choice Questions (MCQs)

b) To assess site suitability, safety, and coverage requirements
a) Cable labeling, battery performance, and calibration
c) No Objection Certificate (NOC) from Airport Authority of India (AAI)
c) Electrical Engineer
b) Spectrum analyzer

B. Short Answer Questions

1. Importance of documenting site surveys and installation procedures

- Documentation ensures accuracy, standardization, and traceability. It helps validate site conditions, confirm compliance with technical and safety guidelines, and enables smoother installation, future maintenance, audits, and troubleshooting.

2. Environmental factors affecting 5G infrastructure

- Temperature and humidity
- Physical obstructions (buildings, trees, terrain)
- Weather conditions (rain, storms, dust)
- Electromagnetic interference (EMI)
- *(Any three are acceptable.)*

3. Method for verifying power supply and backhaul connectivity

- Check the availability and rating of the power source, test voltage levels, confirm grounding, and ensure backup systems (UPS/DG sets) are functional. For backhaul, verify fiber or microwave link availability, check signal levels, and confirm active connectivity with the core network.

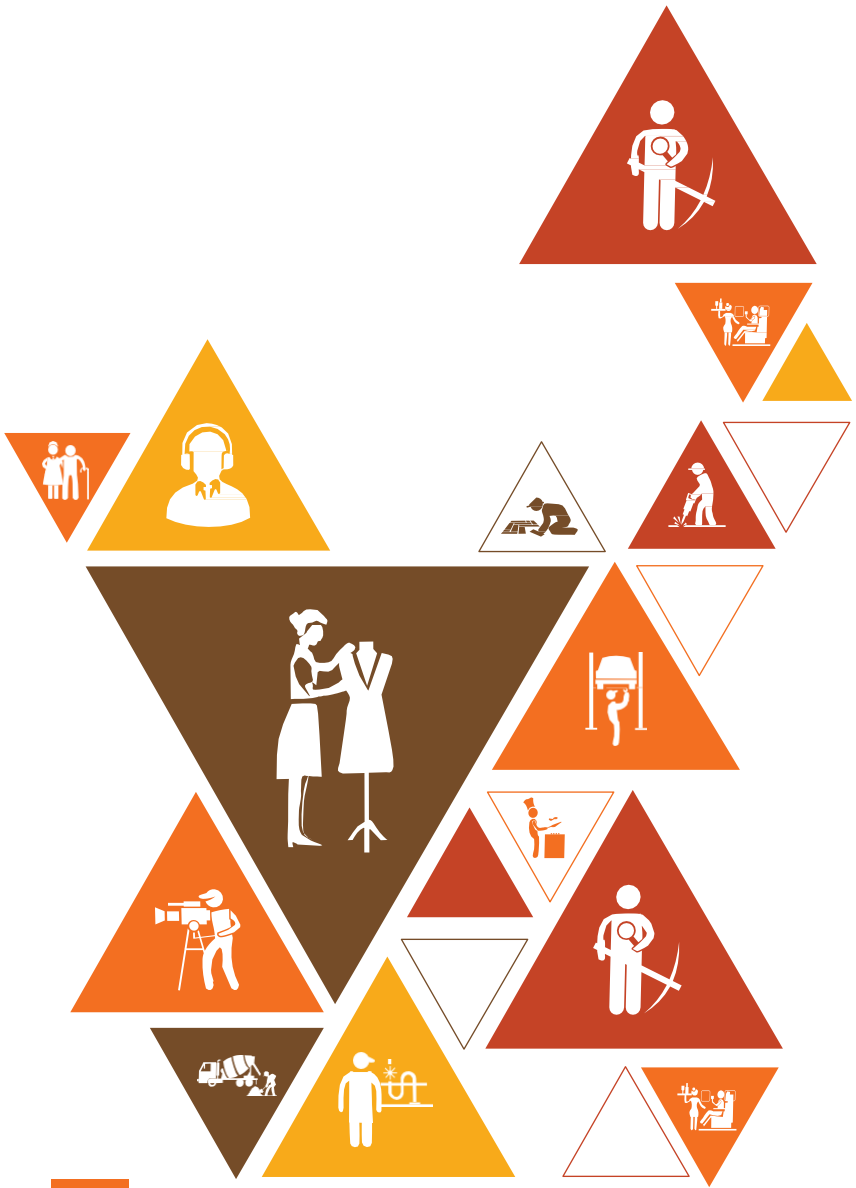
C. True / False Questions

1. **False**
2. **True**
3. **False**
4. **True**

D. Fill-in-the-Blank Questions

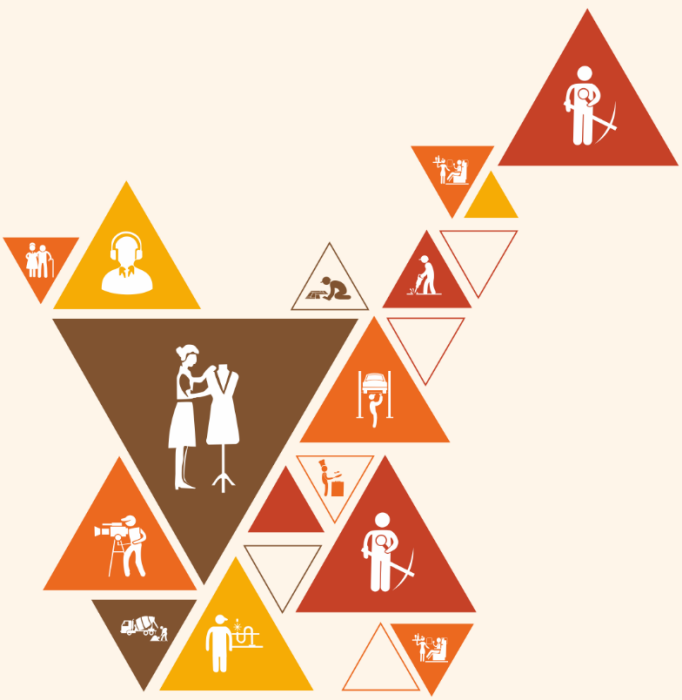
1. pre-installation check
2. Right of Way (RoW)
3. Infrastructure Technician / RF Engineer *(either is acceptable)*
4. grounding / earthing

Notes



3. Install Passive Infrastructure Equipment

Unit 3.1 - Passive Infrastructure Equipment Installation and Testing
Unit 3.2 - Diesel Generator (DG) Set Installation and Maintenance
Unit 3.3 - Power Connection and Equipment Integration
Unit 3.4 - Passive Infrastructure Equipment Testing and Installation
Unit 3.5 - Advanced Equipment Installation and Power Connection



TEL/N4203

Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the different types of passive infrastructure equipment used at telecom sites and their functions.
2. Show how to select appropriate passive infrastructure equipment based on site requirements.
3. Describe the importance of pre-installation testing for passive infrastructure equipment.
4. Demonstrate the pre-installation testing of passive infrastructure equipment to verify its functionality.
5. Elucidate the procedures for installing and maintaining battery banks, chargers, and stands.
6. Show the correct procedure for installing battery banks, chargers, and stands as per manufacturer guidelines.
7. Define the role of battery banks in power backup and their charging/discharging mechanisms.
8. Demonstrate the charging and testing of battery banks to confirm proper charging and discharging.
9. Identify the installation procedures for SMPS units and their function in regulating power supply.
10. Show the installation and verification of the SMPS unit to ensure regulated voltage output.
11. List the benefits of using a Power Interface Unit (PIU) to protect telecom equipment from voltage fluctuations.
12. Demonstrate the installation and testing of the PIU for voltage fluctuation protection.
13. Describe the significance of ensuring uninterrupted power supply for telecom networks and transmission equipment.
14. Show the connection of telecom equipment to the power source for continuous operation.
15. Explain the factors to consider when selecting installation locations for passive infrastructure equipment.
16. Show how to identify and prepare a suitable location for the DG set, ensuring ventilation and airflow.
17. Identify the conditions necessary for proper Diesel Generator (DG) set placement, including ventilation and dust control.
18. Demonstrate the installation of the DG set with air cleaners and anti-condensation heaters as required.
19. Describe the installation process for air cleaners and anti-condensation heaters based on environmental conditions.
20. Demonstrate the installation of the DG set with air cleaners and anti-condensation heaters as required.
21. Elucidate the role of Climate Control Units in maintaining optimal temperature and humidity for telecom equipment.
22. Show the process of installing Climate Control Units to regulate environmental conditions.
23. List structured cabling techniques used in telecom power infrastructure.
24. Demonstrate structured cabling techniques for passive infrastructure equipment.
25. Explain the safe and efficient distribution of power across telecom sites.
26. Demonstrate functionality tests on installed infrastructure equipment and rectification of any issues.

UNIT 3.1: Passive Infrastructure Equipment Installation and Testing

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the different types of passive infrastructure equipment used at telecom sites and their functions.
2. Describe the importance of pre-installation testing for passive infrastructure equipment.
3. Elucidate the procedures for installing and maintaining battery banks, chargers, and stands." Show the correct procedure for installing battery banks, chargers, and stands as per manufacturer guidelines.
4. Define the role of battery banks in power backup and their charging/discharging mechanisms.
5. Demonstrate the charging and testing of battery banks to confirm proper charging and discharging.
6. Identify the installation procedures for SMPS units and their function in regulating power supply. Show the installation and verification of the SMPS unit to ensure regulated voltage output.
7. List the benefits of using a Power Interface Unit (PIU) to protect telecom equipment from voltage fluctuations. Demonstrate the installation and testing of the PIU for voltage fluctuation protection.
8. Describe the significance of ensuring uninterrupted power supply for telecom networks and transmission equipment.
9. Explain the factors to consider when selecting installation locations for passive infrastructure equipment.
10. Show how to identify and prepare a suitable location for the DG set, ensuring ventilation and airflow.
11. Identify the conditions necessary for proper Diesel Generator (DG) set placement, including ventilation and dust control

Resources to be Used

Presentation slides detailing passive infrastructure equipment installation and testing, Physical samples of passive infrastructure equipment, Equipment for a live demonstration, including battery bank, SMPS unit, PIU, and battery charger, Relevant testing tools for the demonstration, Whiteboard and markers.

Say

- Today, we're delving into the world of Passive Infrastructure Equipment Installation and Test-ing. It's a crucial aspect of ensuring the smooth functioning of telecom infrastructure sites.
- Our objective is to understand the various passive infrastructure equipment, their installation processes, and the importance of testing to guarantee optimal performance. This knowledge is key to maintaining reliable 5G network infrastructure.
- Understanding the installation and testing of passive infrastructure equipment is fundamental for telecom professionals. It directly impacts the efficiency and reliability of the 5G network, which is at the core of modern telecommunication.

Ask

- Can you name some passive infrastructure equipment used in a 5G network installation?
- Why is testing crucial before the installation of passive infrastructure equipment?
- Have you encountered challenges related to passive infrastructure equipment installation and testing?

Do

- Present an overview of passive infrastructure equipment and its significance in 5G network in-stallations.
- Discuss the importance of testing before installation.

Elaborate

- Detail the processes of installing battery banks, SMPS units, PIUs, and the relevant tests associ-ated with each.
- Emphasize the importance of proper spacing and ventilation during installation.

Demonstrate

Perform relevant tests on the equipment to showcase the testing process.

Activity

1. **Activity name:** Installation and Testing Simulation
2. **Objective:** Simulate the installation and testing processes of passive infrastructure equip-ment.
3. **Type of Activity:** Group
4. **Resources:** Samples of equipment, testing tools, whiteboard.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - In groups, simulate the installation and testing of passive infrastructure equipment.
   - Discuss challenges and solutions.
7. **Outcome:** Participants gain hands-on experience in a simulated installation and testing sce-nario.

Notes for Facilitation

- Encourage active participation and hands-on learning.
- Promote collaboration among participants.
- Emphasize the real-world application of knowledge.
- Stress the importance of meticulous testing to identify potential issues before equipment instal-lation.
- Discuss the critical role of proper spacing and ventilation in ensuring the longevity and efficien-cy of passive infrastructure equipment.
- Highlight the significance of adhering to manufacturer's instructions for equipment installation locations.

UNIT 3.2: Diesel Generator (DG) Set Installation and Maintenance

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the process of installing the DG set.
2. Explain the importance and process of installing air cleaner for dusty environments and anti-condensation heaters in humid/coastal atmospheres.
3. Explain the importance of ensuring adequate space, good ventilation, and ease of operation and serviceability of the equipment.
4. Demonstrate the process of installing the DG set following the manufacturer's instructions.

Resources to be Used

Presentation slides detailing passive infrastructure equipment installation and testing, Physical samples of passive infrastructure equipment, Equipment for a live demonstration, including battery bank, SMPS unit, PIU, and battery charger, Relevant testing tools for the demonstration, Whiteboard and markers.

Say

- Today, we're diving into the world of Diesel Generator (DG) Set Installation and Maintenance. It's a critical aspect of ensuring uninterrupted power supply in various environments.
- Our objective is to understand the proper installation process of DG sets, the significance of additional components like air cleaners and anti-condensation heaters, and the importance of space and ventilation. This knowledge is crucial for reliable power generation.
- Understanding DG set installation and maintenance is vital for professionals involved in power generation. It ensures optimal performance, longevity, and reliability of the equipment, espe-cially in diverse environmental conditions.

Ask

- Can you name some factors to consider when installing a DG set in a dusty environment?
- Why is it important to install anti-condensation heaters in humid or coastal atmospheres?
- Have you ever faced challenges related to DG set installation or maintenance?

Do

- Present an overview of DG set installation, emphasizing its importance in ensuring uninterrupt-ed power supply.
- Discuss the significance of additional components like air cleaners and anti-condensation heat-ers.

Elaborate

- Detail the process of DG set installation, addressing factors like space, ventilation, and ease of operation.
- Explain the importance of air cleaners in dusty environments and anti-condensation heaters in humid or coastal atmospheres.

Demonstrate

Demonstration of installing a DG set, including the placement of air cleaner and anti-condensation heater.

Activity

1. **Activity name:** Installation Planning
2. **Objective:** Plan the installation of a DG set considering various environmental factors.
3. **Type of Activity:** Group
4. **Resources:** Whiteboard, markers.
5. **Time Duration:** 30 minutes
6. **Instructions:**
    - In groups, plan the installation of a DG set in different environmental conditions.
    - Consider space, ventilation, and additional components.
7. **Outcome:** Participants gain practical insights into the planning aspects of DG set installa-tion.

Notes for Facilitation

- Encourage open discussion and questions.
- Emphasize safety protocols during installation.
- Foster a collaborative learning environment.
- Highlight the critical role of space, ventilation, and adherence to manufacturer's instructions in DG set installation.
- Emphasize the necessity of planning for different environmental conditions to optimize DG set performance.
- Discuss the importance of regular maintenance for prolonged DG set functionality.

UNIT 3.3: Power Connection and Equipment Integration

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the power supply requirements for gNodeB/eNodeB and the best practices for installation.
2. Describe the importance of heat dissipation in 5G network equipment and the role of heat sinks.
3. Elucidate the secure connection protocols for integrating telecom power supply units and RF equipment.
4. Define cable selection techniques for power supply, considering environmental exposure and durability.
5. Identify the procedures for installing and powering 5G base stations, RF transceivers, and RRUs.
6. List the methods for integrating emergency power supply systems with 5G network infrastructure.
7. Describe protective measures for passive infrastructure, including shelters and telecom ducts.
8. Explain electrical safety protocols and the importance of PPE in power infrastructure handling.
9. Identify troubleshooting techniques for resolving power supply and equipment connection issues.
10. List the steps for coordinating with manufacturers to rectify equipment defects and malfunctions.

Resources to be Used

Presentation slides detailing power connection and equipment integration, Visual aids or sam-ples of cables, power supply units, heat sinks, and relevant equipment, Whiteboard and mark-ers.

Say

- Today, we're delving into the critical aspects of Power Connection and Equipment Integration. It's the backbone of a seamless and efficient telecom network.
- Our objective is to understand the meticulous cabling process for compatibility, safe power connections, and the integration of power supply units and heat sinks. This knowledge ensures reliable and uninterrupted operation.
- Power connection and equipment integration are at the heart of a robust telecom infrastruc-ture. This knowledge is crucial for maintaining connectivity, data integrity, and ensuring the smooth functioning of equipment.

Ask

- Can you think of a situation where an incompatible power connection might lead to equipment malfunction?
- Why is it important to conduct tests on passive infrastructure equipment before deployment?
- How do secure connections between various equipment contribute to the reliability of a net-work?

Do

- Present an overview of power connection and equipment integration, emphasizing the role in telecom infrastructure.
- Discuss the importance of compatibility in cabling and establishing secure power connections.

Elaborate

- Detail the process of ensuring compatibility through meticulous cabling.
- Explain the steps for safe and uninterrupted power connections between various telecom equipment and the power source.
- List relevant tests for passive infrastructure equipment to ensure correct functioning.

Demonstrate

- Demonstrate the installation of power supply units for gNodeB/eNodeB and the importance of compatibility.

Activity

1. **Activity name:** Secure Connection Challenge
2. **Objective:** Ensure participants understand the importance of secure connections.
3. **Type of Activity:** Group
4. **Resources:** Visual aids, cables, and sample equipment.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - In groups, participants simulate connecting various equipment securely.
   - Emphasize the significance of reliability and data integrity.
7. **Outcome:** Reinforced understanding of secure connections.

Notes for Facilitation

- Encourage active participation and questions.
- Foster a collaborative learning environment.
- Emphasize the practical application of knowledge in real-world scenarios.
- Stress the importance of meticulous cabling for compatibility.
- Highlight the critical role of secure power connections in maintaining uninterrupted operation.
- Discuss the significance of compatibility in power supply units and heat sinks for efficient equipment integration.

UNIT 3.4: Passive Infrastructure Equipment Testing and Installation

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Describe the importance of pre-installation testing for passive infrastructure equipment.
2. Demonstrate the pre-installation testing of passive infrastructure equipment to verify its functionality.
3. Elucidate the procedures for installing and maintaining battery banks, chargers, and stands.
4. Show the correct procedure for installing battery banks, chargers, and stands as per manufacturer guidelines.
5. Define the role of battery banks in power backup and their charging/discharging mechanisms.
6. Demonstrate the charging and testing of battery banks to confirm proper charging and discharging.
7. Identify the installation procedures for SMPS units and their function in regulating power supply.
8. Show the installation and verification of the SMPS unit to ensure regulated voltage output.
9. List the benefits of using a Power Interface Unit (PIU) to protect telecom equipment from voltage fluctuations.
10. Demonstrate the installation and testing of the PIU for voltage fluctuation protection.
11. Describe the significance of ensuring uninterrupted power supply for telecom networks and transmission equipment.
12. Show the connection of telecom equipment to the power source for continuous operation.
13. Explain the factors to consider when selecting installation locations for passive infrastructure equipment.
14. List structured cabling techniques used in telecom power infrastructure.
15. Demonstrate structured cabling techniques for passive infrastructure equipment.
16. Explain the safe and efficient distribution of power across telecom sites.
17. Demonstrate functionality tests on installed infrastructure equipment and rectification of any issues.

Resources to be Used

Passive infrastructure equipment samples (battery bank, SMPS unit, PIU, etc.), Equipment test-ing tools, Manufacturer's instructions for installation, Cables and connectors, Visual aids or presentation slides.

Say

- Today, we're diving into the world of Passive Infrastructure Equipment Testing and Installation. It's a hands-on session, and I'm excited to walk you through the essential processes.
- Our goal today is to master the crucial steps in testing and installing passive infrastructure equipment. This knowledge ensures the reliability and proper functioning of the equipment within a telecom network.
- Understanding the intricacies of testing and installing passive infrastructure equipment is vital for maintaining a robust and efficient telecom network. It ensures the seamless operation of the equipment, contributing to the overall reliability of the network.

Ask

- Can anyone share a situation where proper testing of equipment before installation could have prevented a network issue?
- Why is it crucial to follow manufacturer instructions during the installation process?
- In your opinion, how does compatibility in cabling contribute to the efficiency of installed equipment?

Do

- Provide an overview of the importance of testing and installing passive infrastructure equip-ment.
- Emphasize the role of proper testing in ensuring equipment functionality.

Elaborate

- Explain the process of performing the relevant tests on the passive infrastructure equipment to en-sure their proper functioning.
- Discuss the process of installing the battery bank, battery charger and battery stand following the manufacturer's instructions, ensuring an adequate number of batteries as per the power require-ments.
- Explain the process of carrying out charging of the battery to ensure it is able to get charged without any issues.
- Explain the process of performing the relevant tests on the SMPS unit to ensure it is able to provide regulated output voltage. As required.

Demonstrate

- Demonstration 1-3: Battery Bank Installation and Testing. Perform relevant tests on the bat-tery bank.

Activity

1. **Activity name:** Installation Challenge
2. **Objective:** Reinforce understanding of installation procedures.
3. **Type of Activity:** Group
4. **Resources:** Passive infrastructure equipment samples, tools, and cables.
5. **Time Duration:** 30 minutes
6. **Instructions:**
    - In groups, participants simulate the installation of passive infrastructure equipment, ensur-ing correct procedures are followed.
7. **Outcome:** Increased confidence in executing installation processes.

Notes for Facilitation

- Encourage active participation and hands-on learning.
- Foster a collaborative learning environment.
- Emphasize the practical application of knowledge.
- Stress the importance of following manufacturer instructions for proper installation.
- Highlight the significance of testing in ensuring equipment functionality.
- Discuss the role of compatibility in cabling for efficient and effective installation.

UNIT 3.5: Advanced Equipment Installation and Power Connection

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Show how to identify and prepare a suitable location for the DG set, ensuring ventilation and airflow.
2. Identify the conditions necessary for proper Diesel Generator (DG) set placement, including ventilation and dust control.
3. Demonstrate the installation of the DG set with air cleaners and anti-condensation heaters as required.
4. Describe the installation process for air cleaners and anti-condensation heaters based on environmental conditions.
5. Elucidate the role of Climate Control Units in maintaining optimal temperature and humidity for telecom equipment.
6. Show the process of installing Climate Control Units to regulate environmental conditions.
7. Demonstrate the installation of protective shelters and telecom ducts to safeguard infrastructure equipment.
8. Demonstrate the process of establishing a site-wide power distribution system for 5G telecom infrastructure.
9. Show the proper use of PPE while handling electrical installations for safety compliance.
10. Demonstrate final testing procedures for all installed equipment and troubleshooting techniques for identified issues.
11. Show how to coordinate with equipment manufacturers for defect resolution and servicing needs.

Resources to be Used

DG set model for demonstration, Air cleaners and anti-condensation heaters for illustration, Climate Control Units (CCUs) for showcasing, Power supply unit for gNodeB/eNodeB, Heat sink for demonstration, Cables and connectors, Shelters and telecom ducts for installation demon-stration, Visual aids or presentation slides.

Say

- Welcome to our session on Advanced Equipment Installation and Power Connection. Today, we'll delve into the intricacies of setting up advanced telecom infrastructure. Get ready for some exciting hands-on learning!
- Our goal is to master the advanced techniques involved in installing critical telecom equipment and establishing power connections. This knowledge is crucial for ensuring the efficiency and reliability of our telecom networks.

- Understanding advanced equipment installation and power connection is like having the keys to a high-performance engine. It ensures our networks operate smoothly, efficiently, and with the reliability demanded by modern communication.

Ask

- Can anyone share an experience where equipment malfunctioned due to improper installation?
- Why is it essential to consider environmental factors like dust and humidity when installing tel-ecom equipment?
- How can the proper installation of shelters and ducts contribute to the protection of passive in-frastructure equipment?

Do

- Briefly discuss the significance of advanced equipment installation and its impact on network performance.
- Highlight the importance of adhering to manufacturer instructions.

Elaborate

- Proper installation of the DG set in accordance with the manufacturer's in-structions.
- Installation process of air cleaners for dusty environments and anti-condensation heaters for humid/ coastal atmospheres.
- Installation of Climate Control Units to maintain optimal temperatures at the tel-ecom base station and shelter for efficient equipment functioning.
- Installation process of the power supply unit for gNodeB/eNodeB, ensuring compatibility with the equipment.
- Install a heat sink to regulate temperatures in the gNodeB/eNodeB by facilitating heat flow away from the equipment.
- Connection process between gNodeB/eNodeB, power supply unit, and heat sink using appropriate cables, ensuring a secure and effective connection.
- Setup of a power connection between the 5G base station and the power source, ensuring recommended power supply adherence.
- Installation of shelters and telecom ducts to protect passive infrastructure equipment and cabling.

Demonstrate

- Demonstration 1-2: DG Set and Environmental Controls Installation
- Proper installation of the DG set following manufacturer instructions.
- Installation of air cleaners and anti-condensation heaters for varying environments.

Activity

1. **Activity name - Installation Challenge**
2. **Objective:** Reinforce understanding of advanced installation techniques.
3. **Type of Activity:** Group
4. **Resources:** Equipment samples, tools, shelters, and ducts.
5. **Time Duration:** 30 minutes
6. **Instructions:**
    - In groups, participants simulate the installation of advanced telecom equipment, emphasiz-ing correct procedures and considerations.
7. **Outcome:** Increased confidence in executing advanced installation processes.

Notes for Facilitation

- Encourage active participation and hands-on learning.
- Foster collaboration among participants during group activities.
- Emphasize the practical application of knowledge.
- Stress the importance of environmental considerations in equipment installation.
- Highlight the role of advanced equipment installation in ensuring network efficiency.
- Discuss the significance of proper power connections for equipment reliability.

Exercise

Answers to exercises for PHB

Multiple Choice Questions:

1. b. To provide uninterrupted power
2. b. To ensure regulated output voltage
3. b. Wide fluctuations and surges in mains supply
4. c. To provide backup power during outages
5. b. To identify and rectify potential issues

Descriptive Questions:

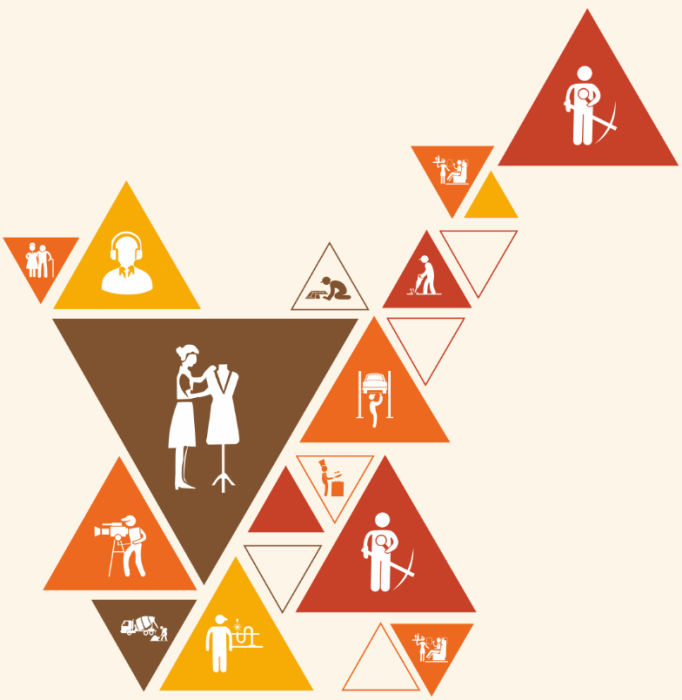
1. Refer to UNIT 3.4: Passive Infrastructure Equipment Testing and Installation
   Topic 3.4.7 Equipment Testing and Validation
2. Refer to UNIT 3.4: Passive Infrastructure Equipment Testing and Installation
   Topic 3.4.2 Battery Bank Installation and Management
3. Refer to UNIT 3.5: Advanced Equipment Installation and Power Connection
   Topic 3.5.4 5G Power Connection Setup
4. Refer to UNIT 3.5: Advanced Equipment Installation and Power Connection
   Topic 3.5.1 DG Set Installation
5. Refer to UNIT 3.4: Passive Infrastructure Equipment Testing and Installation
   Topic 3.4.6 Power Connection Setup and Safety Assurance

Notes

4. Process of Maintaining the Passive Infrastructure Equipment

Unit 4.1 - Foundations of Passive Infrastructure Management and Troubleshooting

Unit 4.2 - Effective Maintenance Practices and New Equipment Integration



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Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the importance of regular maintenance and its impact on network uptime and efficiency.
2. Describe preventive maintenance methodologies for passive infrastructure and their role in reducing failures. Show the process of carrying out preventive maintenance of passive infrastructure equipment as per schedule.
3. Explain the proper setup, positioning, wiring, and performance testing of battery banks.
4. Describe best practices for battery testing and troubleshooting charge retention issues.
5. Demonstrate verification of the positioning, connections, and charge-holding capacity of battery banks.
6. Demonstrate battery diagnostic tests and corrective measures for performance improvement.
7. Identify the impact of damaged or improperly connected cables on equipment performance and describe replacement techniques.
8. Show the inspection, testing, and replacement of damaged or worn-out equipment cables.
9. Explain SMPS functionality, troubleshooting techniques, and energy efficiency considerations.
10. Show corrective maintenance for SMPS, including troubleshooting overheating, overvoltage, and power inconsistencies.
11. Describe PIU testing procedures, including voltage regulation and power fluctuation handling.
12. Demonstrate the testing and troubleshooting of PIU for handling power fluctuations and surges.
13. Show how to identify and resolve PIU malfunctions to prevent downtime.
14. Identify common DG set faults (e.g., fuel system failures, lubrication issues, electrical malfunctions) and describe troubleshooting methods.
15. Demonstrate routine checks on DG sets for oil pressure, water temperature, overload, start failures, and electrical issues.
16. Show how to execute manufacturer-recommended troubleshooting for DG set faults.
17. Explain HVAC and climate control technologies used for maintaining optimal conditions in telecom facilities.
18. Demonstrate assessment of climate control units (HVAC systems) for optimal temperature and humidity management.
19. List the importance of using manufacturer-recommended spare parts and diagnostic tools.
20. Show the process of selecting and using manufacturer-approved spare parts for maintenance.
21. Demonstrate the replacement of irreparable passive infrastructure components while ensuring system integration.
22. Describe data-driven decision-making for predictive maintenance based on maintenance records.
23. Demonstrate the accurate documentation of maintenance activities, including inspections, repairs, and replacements.
24. Show the review and analysis of maintenance logs to identify recurring issues and implement preventive strategies.
25. Demonstrate the accurate documentation of maintenance activities, including inspections, repairs, and replacements.

UNIT 4.1: Foundations of Passive Infrastructure Management and Troubleshooting

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the importance of regular maintenance and its impact on network uptime and efficiency.
2. Describe preventive maintenance methodologies for passive infrastructure and their role in reducing failures.
3. Show the process of carrying out preventive maintenance of passive infrastructure equipment as per schedule.
4. Explain the proper setup, positioning, wiring, and performance testing of battery banks.
5. Describe best practices for battery testing and troubleshooting charge retention issues.
6. Demonstrate verification of the positioning, connections, and charge-holding capacity of battery banks.
7. Demonstrate battery diagnostic tests and corrective measures for performance improvement.
8. Identify the impact of damaged or improperly connected cables on equipment performance and describe replacement techniques.
9. Show the inspection, testing, and replacement of damaged or worn-out equipment cables.
10. Explain SMPS functionality, troubleshooting techniques, and energy efficiency considerations.
11. Show corrective maintenance for SMPS, including troubleshooting overheating, overvoltage, and power inconsistencies.
12. Describe PIU testing procedures, including voltage regulation and power fluctuation handling.
13. Demonstrate the testing and troubleshooting of PIU for handling power fluctuations and surges.
14. Show how to identify and resolve PIU malfunctions to prevent downtime.
15. Identify common DG set faults (e.g., fuel system failures, lubrication issues, electrical malfunctions) and describe troubleshooting methods.
16. Demonstrate routine checks on DG sets for oil pressure, water temperature, overload, start failures, and electrical issues.
17. Show how to execute manufacturer-recommended troubleshooting for DG set faults.
18. Explain HVAC and climate control technologies used for maintaining optimal conditions in telecom facilities.
19. Demonstrate assessment of climate control units (HVAC systems) for optimal temperature and humidity management.

Resources to be Used

Visual aids or presentation slides, Sample batteries, cables, SMPS units, PIU, DG set, and cli-mate control units, Troubleshooting guides provided by manufacturers, Testing equipment for batteries, cables, SMPS, PIU, and climate control units.

Say

- Welcome to our session on Foundations of Passive Infrastructure Management and Trouble-shooting. Today, we'll dive into the critical aspects of maintaining and troubleshooting passive infrastructure. Let's gear up for an insightful session!
- Our goal today is to understand the significance of preventive maintenance and troubleshooting for passive infrastructure. This knowledge is key to ensuring the smooth functioning of our tele-com networks.
- Knowing how to proactively maintain and troubleshoot passive infrastructure is like having a toolkit for ensuring the reliability and longevity of our equipment. It's a skill set that every tele-com professional should master.

Ask

- Can anyone share an experience where preventive maintenance or timely troubleshooting could have prevented a telecom equipment failure?
- How do you think battery issues impact the performance of passive infrastructure equipment?
- In what ways can fluctuations in the main supply affect the operation of telecom equipment?

Do

- Discuss the importance of preventive maintenance in passive infrastructure management.
- Emphasize the critical role of troubleshooting in identifying and resolving issues promptly.

Elaborate

Preventive Maintenance

- Describe the process and schedule for preventive maintenance, covering batteries, equip-ment cables, and SMPS units.

Testing and Troubleshooting PIU

- List relevant tests for PIU.
- Explain common issues and troubleshooting methods.

DG Set, Climate Control, and Troubleshooting

- Discuss common issues with DG sets.
- Describe checks for climate control units.
- Provide troubleshooting steps for both.

Demonstrate

- Demonstrate how to check batteries, ensure they hold a charge, and troubleshoot common battery-related issues.

Activity

1. **Activity name:** Troubleshooting Challenge
2. **Objective:** Apply troubleshooting skills to real-life scenarios.
3. **Type of Activity:** Group
4. **Resources:** Troubleshooting scenarios, sample equipment, testing tools.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - Groups work on provided troubleshooting scenarios, applying the knowledge gained during the session.
7. **Outcome:** Enhanced ability to apply troubleshooting techniques.

Notes for Facilitation

- Encourage active participation and practical application.
- Foster a collaborative learning environment.
- Emphasize the real-world importance of preventive maintenance and troubleshooting.
- Stress the need for adherence to recommended preventive maintenance schedules.
- Discuss the financial and operational benefits of proactive maintenance.
- Highlight the role of troubleshooting in minimizing downtime and ensuring network reliability.

UNIT 4.2: Effective Maintenance Practices and New Equipment Integration

Unit Objectives

After the completion of this unit, the participant will be able to:

1. List the importance of using manufacturer-recommended spare parts and diagnostic tools.
2. Show the process of selecting and using manufacturer-approved spare parts for maintenance.
3. Demonstrate the replacement of irreparable passive infrastructure components while ensuring system integration.
4. Describe data-driven decision-making for predictive maintenance based on maintenance records.
5. Demonstrate the accurate documentation of maintenance activities, including inspections, repairs, and replacements.
6. Show the review and analysis of maintenance logs to identify recurring issues and implement preventive strategies.
7. Demonstrate the accurate documentation of maintenance activities, including inspections, repairs, and replacements.

Resources to be Used

Presentation slides or visual aids, Samples of manufacturer-recommended spare parts and maintenance tools, Illustrative charts or diagrams for new equipment integration, Sample maintenance records.

Say

- Welcome to our session on Effective Maintenance Practices and New Equipment Integration. Today, we'll explore crucial aspects of equipment maintenance and the integration of new in-frastructure. Let's make this session insightful and practical!
- Our goal today is to understand the significance of effective maintenance practices, the proper integration of new equipment, and the importance of using manufacturer-recommended tools and spare parts. This knowledge is vital for ensuring the longevity and optimal performance of our infrastructure.
- Knowing how to effectively maintain our equipment and seamlessly integrate new components is like ensuring the heartbeat of our telecom network remains strong. It's about sustainability, efficiency, and reliability.

Ask

- Can anyone share an experience where using manufacturer-recommended spare parts made a significant difference in equipment performance?
- How do you currently handle the installation of new equipment in your telecom infrastructure?
- Why is it crucial to keep meticulous maintenance records for passive infrastructure equipment?

Do

- Discuss the importance of using manufacturer-recommended spare parts and tools during equipment maintenance.
- Highlight the significance of installing new passive infrastructure equipment correctly.

Elaborate

Importance of Manufacturer-Recommended Parts and New Equipment Installation

- Explain the importance and process of using recommended spare parts.
- Stress the importance of installing new equipment correctly.

Maintenance Records

- Discuss the significance of maintaining and reviewing maintenance records.
- Provide a sample record of maintenance activities for reference.

Demonstrate

Demonstrate the process of installing new passive infrastructure equipment, emphasizing pre-cision and adherence to manufacturer guidelines.

Activity

1. **Activity name:** Maintenance Review and Integration Challenge
2. **Objective:** Apply knowledge of maintenance practices and new equipment integration.
3. **Type of Activity:** Group
4. **Resources:** Sample maintenance records, scenarios for equipment integration.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - Groups review a maintenance record, identify potential issues, and discuss strategies for in-tegrating new equipment in provided scenarios.
7. **Outcome:** Enhanced understanding and application of effective maintenance and integra-tion practices.

Notes for Facilitation

- Encourage open discussions and questions.
- Emphasize the practical application of knowledge in real-world scenarios.
- Highlight the cost-effectiveness and long-term benefits of using manufacturer-recommended spare parts.
- Discuss the role of proper installation in preventing future issues and maintaining equipment longevity.
- Emphasize the role of accurate maintenance records in identifying recurring issues and opti-mizing maintenance schedules.

Exercise

Answers to exercises for PHB

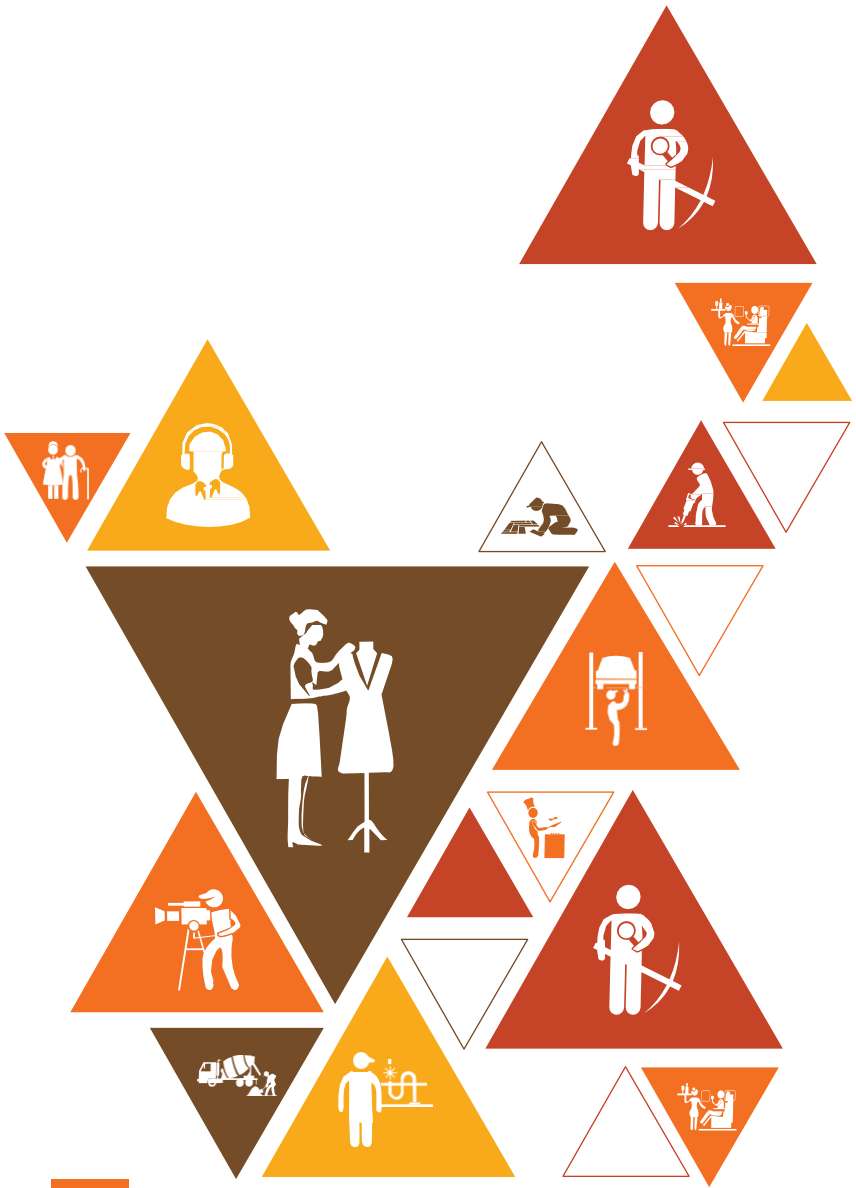
Multiple Choice Question

1. b. To optimize performance and prevent potential problems
2. b. It ensures compatibility and optimal performance
3. c. Cable Integrity Check
4. b. Fuel-related problems, mechanical issues, and electrical faults
5. b. It helps in predicting failures and optimizing maintenance strategies

Descriptive Questions:

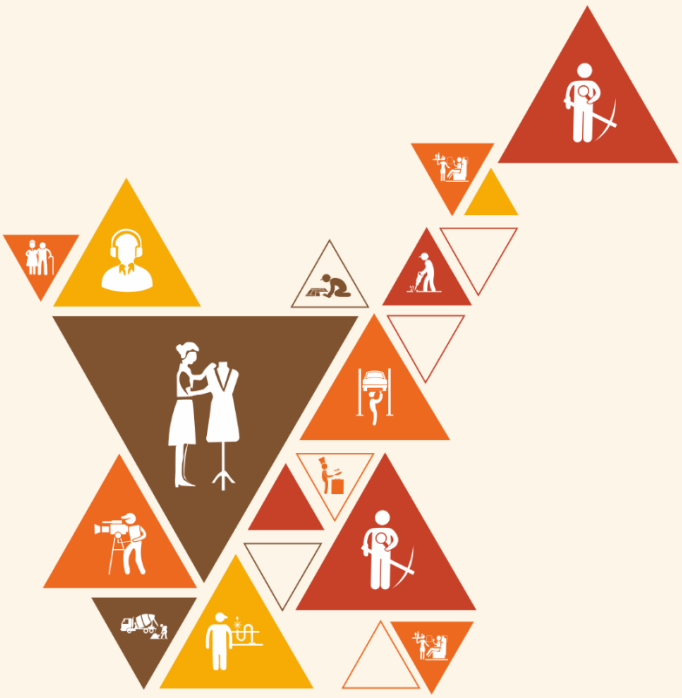
1. Refer to UNIT 4.1: Foundations of Passive Infrastructure Management and Troubleshooting
   Topic 4.1.3 Importance of Correct Battery Positioning in a 5G Cell Site Battery Bank
2. Refer to UNIT 4.1: Foundations of Passive Infrastructure Management and Troubleshooting
   Topic 4.1.7 Troubleshooting Procedures for SMPS Issues
3. Refer to UNIT 4.1: Foundations of Passive Infrastructure Management and Troubleshooting
   Topic 4.1.8 Malfunctioning of Power Interface Unit (PIU)
4. Refer to UNIT 4.1: Foundations of Passive Infrastructure Management and Troubleshooting
   Topic 4.1.9 Common Issues Experienced with a DG Set
5. Refer to UNIT 4.2: Effective Maintenance Practices and New Equipment Integration
   Topic 4.2.3 Maintaining and Reviewing Maintenance Records

Notes



5. Sustainability Practices in Telecom Infrastructure Management

Unit 5.1 - Sustainability Practices in Telecom Infrastructure Management



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Key Learning Outcomes

After the completion of this module, the participant will be able to:

1. Explain the e-waste management rules applicable to the telecom sector.
2. Show how to identify, segregate, and categorize e-waste and hazardous waste at telecom sites.
3. Describe Central Pollution Control Board (CPCB) guidelines for telecom site waste disposal.
4. Demonstrate the process of maintaining logs and records for disposed, recycled, or repurposed telecom waste.
5. Identify safety standards for battery handling and disposal, including lead-acid and lithium-ion batteries.
6. Demonstrate safe handling procedures for hazardous materials, including the use of protective gear.
7. List recyclable telecom components and methods for minimizing telecom waste.
8. Demonstrate the reduction of packaging waste through the reuse of telecom materials and accessories.
9. Elucidate techniques for energy optimization, such as smart cooling, LED lighting, and hybrid power systems.
10. Demonstrate energy-efficient practices, such as optimizing power usage and using smart cooling systems.
11. Explain the role of renewable energy sources, like solar energy, in reducing telecom carbon footprint.
12. Show how to assist in adopting solar-powered telecom towers and integrating hybrid energy systems.
13. Describe best practices for managing telecom tower site waste and reducing fuel consumption in Diesel Generators (DG) sets.
14. Demonstrate guiding co-workers on eco-friendly practices and waste management policies.
15. Define water conservation principles and sustainable telecom site design.
16. Explain the importance of training telecom employees on environmental awareness and compliance.
17. Show how to conduct periodic environmental audits to ensure sustainability compliance.

UNIT 5.1: Sustainability Practices in Telecom Infrastructure Management

Unit Objectives

After the completion of this unit, the participant will be able to:

1. Explain the e-waste management rules applicable to the telecom sector.
2. Show how to identify, segregate, and categorize e-waste and hazardous waste at telecom sites.
3. Describe Central Pollution Control Board (CPCB) guidelines for telecom site waste disposal.
4. Demonstrate the process of maintaining logs and records for disposed, recycled, or repurposed telecom waste.
5. Identify safety standards for battery handling and disposal, including lead-acid and lithium-ion batteries.
6. Demonstrate safe handling procedures for hazardous materials, including the use of protective gear.
7. List recyclable telecom components and methods for minimizing telecom waste.
8. Demonstrate the reduction of packaging waste through the reuse of telecom materials and accessories.
9. Elucidate techniques for energy optimization, such as smart cooling, LED lighting, and hybrid power systems.
10. Demonstrate energy-efficient practices, such as optimizing power usage and using smart cooling systems.
11. Explain the role of renewable energy sources, like solar energy, in reducing telecom carbon footprint.
12. Show how to assist in adopting solar-powered telecom towers and integrating hybrid energy systems.
13. Describe best practices for managing telecom tower site waste and reducing fuel consumption in Diesel Generators (DG) sets.
14. Demonstrate guiding co-workers on eco-friendly practices and waste management policies.
15. Define water conservation principles and sustainable telecom site design.
16. Explain the importance of training telecom employees on environmental awareness and compliance.
17. Show how to conduct periodic environmental audits to ensure sustainability compliance.

Resources to be Used

Visual aids or slides on e-waste, Samples of e-waste products, Information on local waste man-agement facilities, Recycling bins or containers.

Say

- Today, we're diving into a crucial topic – 'Waste Management.' It's not just about cleaning up; it's about understanding what we discard and how it impacts the environment.
- Our objective today is to explore the world of waste management, with a special focus on e-waste. By the end, you'll understand what e-waste is, the concept of waste management, and the recycling process, contributing to a cleaner, greener planet.
- The way we manage waste, especially electronic waste, has a direct impact on our environ-ment. Understanding this process empowers us to make informed choices and actively partici-pate in creating a sustainable future.

Ask

- Can you name some electronic devices you've discarded recently, and what did you do with them?
- Have you ever thought about what happens to your old gadgets once you throw them away?
- Do you currently practice any recycling habits at home or in your workplace?

Do

- Introduce the concept of waste management and its importance.
- Outline the session's objectives.

Elaborate

Understanding E-Waste

- Define e-waste and discuss common electronic products contributing to it.

Concept of Waste Management

- Explain the overall concept of waste management, including the 3 R's (Reduce, Reuse, Re-cycle).

Recycling Process of E-Waste

- Detail the process of recycling e-waste and the environmental benefits.

Demonstrate

Demonstrate the disassembly of a simple electronic device to highlight recyclable compo-nents. Discuss the importance of responsible disposal.

Activity

1. **Activity name:** E-Waste Sorting
2. **Objective:** Sort various e-waste items into categories (recyclable, non-recyclable).
3. **Type of Activity:** Group
4. **Resources:** Samples of e-waste, recycling bins.
5. **Time Duration:** 30 minutes
6. **Instructions:**
   - Groups sort provided e-waste items, discussing reasons for their choices.
7. **Outcome:** Improved understanding of e-waste categories and recycling possibilities.

Notes for Facilitation

- Encourage participants to share personal experiences or challenges related to waste manage-ment.
- Emphasize the importance of individual responsibility in waste reduction.
- Provide information on local e-waste recycling facilities or programs.
- Discuss the impact of improper e-waste disposal on the environment.
- Encourage participants to share any sustainable waste management practices they are aware of.

Exercise

Answers to exercises for PHB

1. Which rule governs the safe handling and disposal of telecom-related e-waste in India?
a) Motor Vehicle Rules
b) E-Waste Management Rules
c) Electricity Act
d) Telecom Licensing Rules

2. Which battery type is considered hazardous and needs special disposal procedures?
a) Alkaline battery
b) Lead-acid or lithium-ion battery
c) Dry cell
d) Coin battery

3. What is the main purpose of maintaining logs for disposed telecom waste?
a) To increase paperwork
b) To track waste movement and ensure compliance
c) To report network outages
d) To reduce employee workload

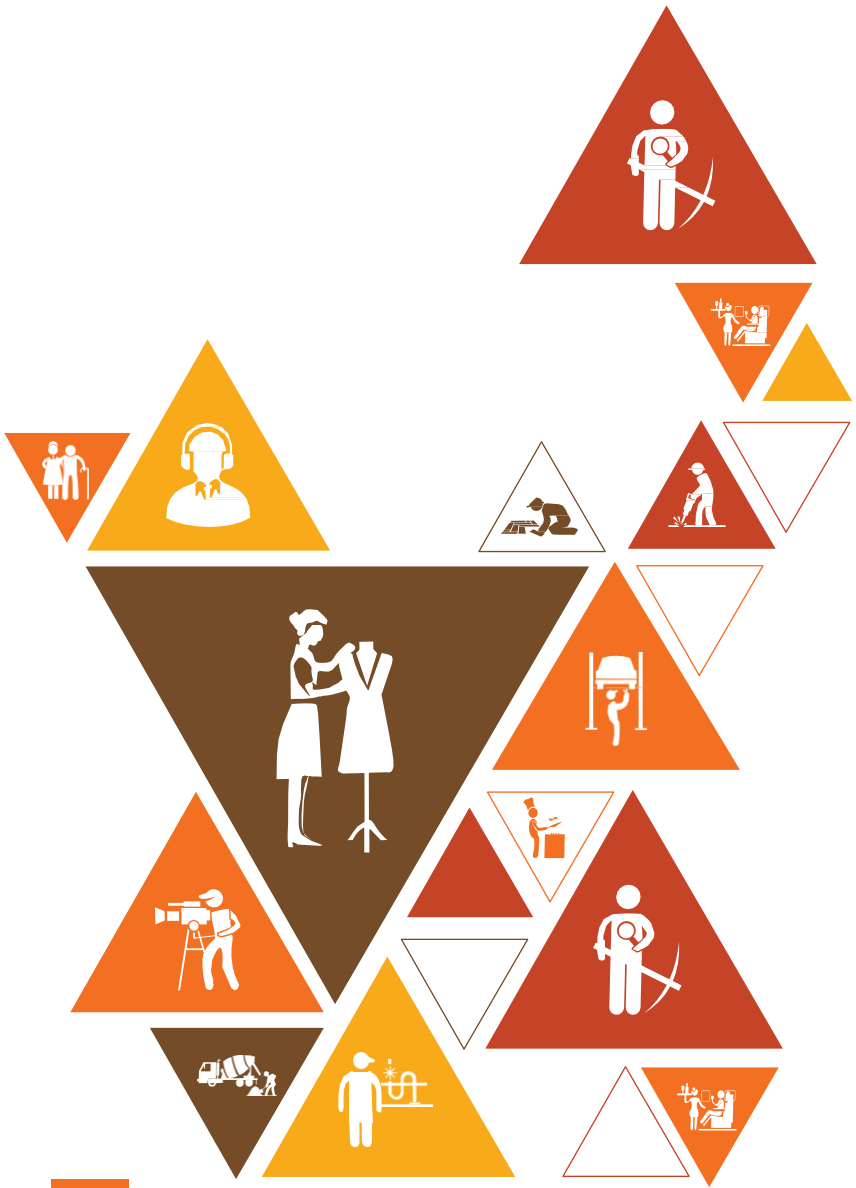
4. Which of the following is a recyclable telecom component?
a) Oil-soaked cloth
b) Plastic bottles
c) Metal frames and cables
d) Damaged batteries

5. Solar panels used at telecom sites help mainly in:
a) Increasing DG fuel use
b) Reducing carbon footprint
c) Increasing tower heat load
d) Causing network drops

B. Fill-in-the-Blanks
1. The CPCB provides guidelines for the safe _____ and disposal of telecom waste. (handling)
2. Using protective gear like gloves and goggles is important for _____ material handling.(hazardous)
3. Smart cooling and LED lighting are examples of _____ optimization techniques. (energy)

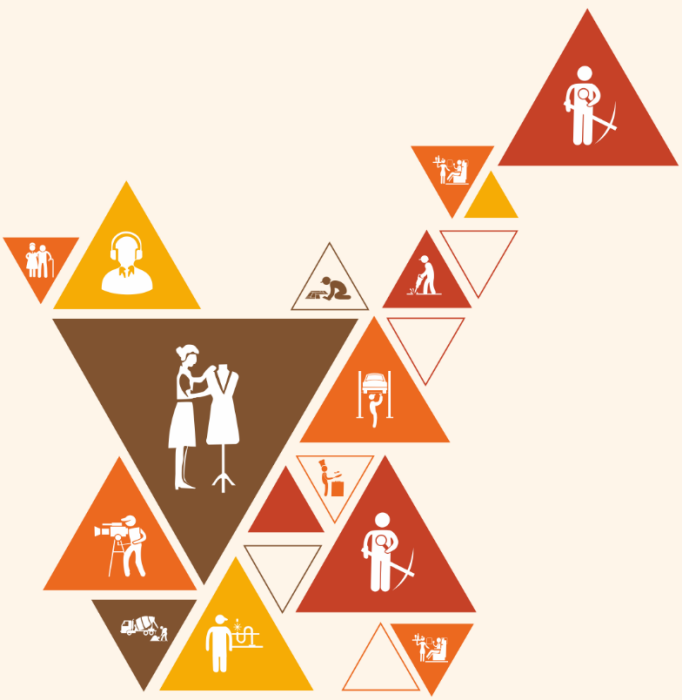
D. Short Answer Questions
1. Why is it important to follow CPCB guidelines for telecom waste disposal?
To ensure safe, compliant, and environmentally responsible disposal that avoids pollution and legal violations.
2. What are two common methods used at telecom sites to reduce energy consumption?
Smart cooling systems, LED lighting, hybrid power systems, or solar energy (any two).
3. Why should telecom technicians maintain records of recycled or disposed waste?
To track waste movement, ensure regulatory compliance, support audits, and promote responsible waste management.

Notes



6. Employability Skills (30 Hours)

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



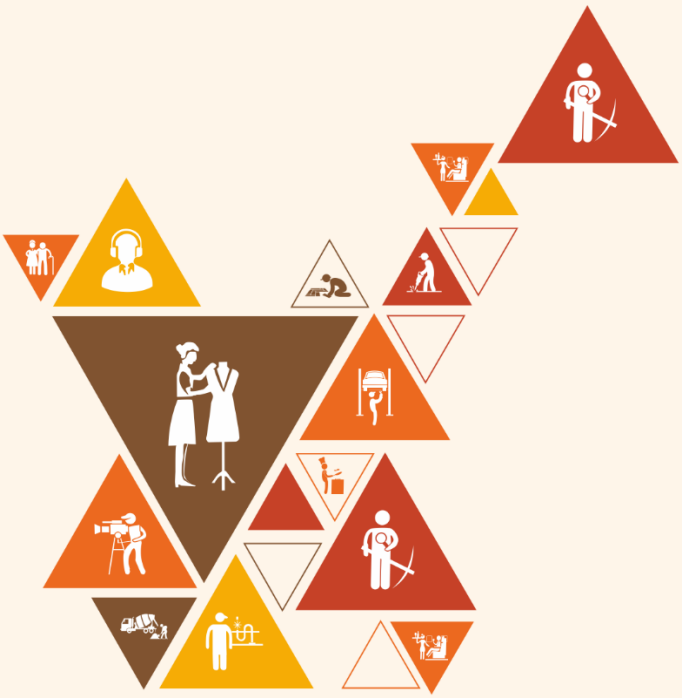
DGT/VSQ/N0101

7. Annexure

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria

Annexure III: List of QR Codes used in PHB



Annexure I
Training Delivery Plan

Training Delivery Plan			
Program Name:	Infrastructure Technician - 5G Networks		
Qualification Pack Name & Ref. ID	Infrastructure Technician - 5G Networks, TEL/Q4201, V3.0		
Version No.	3.0	**Version Update Date**	31/03/2022
Pre-requisites to Training (if any)	Not Applicable		
Training Outcomes	**By the end of this program, the participants will be able to:** 1. Demonstrate the process of installing the relevant 5G network infrastructure. 2. Demonstrate the process of installing and setting up the passive infrastructure equipment with the 5G equipment. 3. Demonstrate the process of maintaining the passive infrastructure equipment. 4. Explain the importance of implementing effective communication and coordination at work. 5. Explain the importance of managing work and resources and ensuring health and safety at work. 6. Demonstrate the process of maintaining the 5G network infrastructure.		

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
1	Introduction to the role of an Infrastructure Technician – 5G Networks	Introduction to Telecom Sector	• Describe the size and scope of the Telecom industry and its sub-sectors.	Bridge Module	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training Kit - Trainer Guide, Presentations, White-board, Marker, Projector, Laptop, Video Films	5 Theory (5:00) Practical (0:00))
		Introduction to the role of Infrastructure Technician	• Discuss the role and responsibilities of an Infrastructure Technician – 5G Networks. • Role play based on case studies, outlining the scope, responsibilities, and challenges of an Infrastructure Technician – 5G Networks.				

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Pre- req-uisites of course and employ-ment opportuni-ties	• Analyse the requirements for the course and prepare for the pre- requisites of the course. • Identify various employment opportunities for an Infrastructure Technician – 5G Networks.				8 Theory (5:00) Practical (3:00)
		Process workflow of a Infra-structure Technician	• Describe the process workflow in the organization and the role of Infrastructure Technician – 5G Networks in the process. • List the various daily, weekly, monthly operations/activities that take place at the site under an Infrastructure Technician – 5G Networks.				8 Theory (5:00) Practical (3:00)
2	Conduct Site Surveys and Pre-Installatio n Activities for 5G (Theory: 45 Hours, Practical: 70 Hours)	Site Scope Awareness	• Identify the factors involved in determining the scope of work for the installation of 5G network infrastructure.	TEL/N4202 PC1, KU1	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discus-sion	Training Kit (Trainer Guide, Pre-sentations). White-board, Marker, Projector, Laptop, Anten-na test Systems & Over-The-Air (OTA) Chambers, Broadband Amplifiers	8 Theory (4:00) Practical (4:00)
		Site Survey Coordina-tion Skills	• Demonstrate the ability to coordinate and execute a site survey to assess the suitability of selected sites for 5G network infrastructure installation.	TEL/N4202 PC2, KU2			8 Theory (4:00) Practical (4:00)
		Evaluation of Safety Protocols	• Elaborate the safety considerations when checking sites for access, identifying obstructions, and assessing potential dangers during 5G network infrastructure installation.	TEL/N4202 PC3			8 Theory (4:00) Practical (4:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Modification Planning	• Analyze the surveyed sites and coordinate with relevant personnel to plan modifications needed for 5G network infrastructure installation.	TEL/N4202 PC4			8 Theory (4:00) Practical (4:00)
		Authorization Process Awareness	• Recall the necessary steps to ensure required authorizations are obtained and paperwork is completed before the installation of 5G network infrastructure.	TEL/N4202 PC5, KU5			8 Theory (4:00) Practical (4:00)
		Equipment Preparation	• Apply knowledge to arrange and check the condition of equipment, accessories, tools, and gear required for the 5G network infrastructure installation.	TEL/N4202 PC6, PC7			8 Theory (4:00) Practical (4:00)
		Assembly and Configuration Skills	• Demonstrate the ability to assemble equipment and configure networking gear for 5G infrastructure installation.	TEL/N4202 PC8, KU4			8 Theory (4:00) Practical (4:00)
		Tower Erection Coordination	• Analyze the requirements and coordinate with personnel for the erection of 5G cell towers as per specifications	TEL/N4202 PC9			8 Theory (4:00) Practical (4:00)
		Document Preparation Proficiency	• Create comprehensive documents related to network infrastructure preparation activities	TEL/N4202 PC10, KU8			7 Theory (3:00) Practical (4:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Equipment Condition Awareness	• Understand the importance of checking the condition of equipment, accessories, tools, and gear to ensure they are in working order.	TEL/N4202 KU3			7 Theory (3:00) Practical (4:00)
		Tool Proficiency	• Apply knowledge of the appropriate tools and equipment required for the installation of telecom infrastructure.	TEL/N4202 KU6			8 Theory (3:00) Practical (5:00)
		Installation Techniques Application	• Apply recommended methods and techniques for installing, positioning, and securing telecom equipment.	TEL/N4202 KU7			8 Theory (3:00) Practical (5:00)
		Safety and Quality Compliance	• Evaluate the importance of safety and quality standards in the installation of 5G network infrastructure.	TEL/N4202 PC3			8 Theory (3:00) Practical (5:00)
		Process Workflow Understanding	• Illustrate the process workflow in the organization and the specific role of a System Architect in 5G Cloud RAN installation.	TEL/N4202 PC4			8 Theory (3:00) Practical (5:00)
3	Install passive infrastructure equipment (Theory: 15 Hours, Practical: 30 Hours)	Passive Infrastructure Equipment Knowledge	• Identify and list various passive infrastructure equipment used in 5G network infrastructure installations	TEL/N4203 KU1	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Power Interface Unit (PIU),	8 Theory (4:00) Practical (4:00)
		Pre-installation Test Importance	• Understand the significance of performing pre-installation tests on passive infrastructure equipment.	TEL/N4203 PC2, KU2			8 Theory (4:00) Practical (4:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Battery Installation Proficiency	• Apply knowledge to install the battery bank, battery charger, and battery stand following manufacturer instructions.	TEL/N4203 PC3, KU3, KU4		Switched-mode Power Supply (SMPS), Battery Bank, Battery Charger	8 Theory (4:00) Practical (4:00)
		Battery Charging Competence	• Demonstrate the ability to carry out the charging of batteries, ensuring they function without issues.	TEL/N4203 PC4, KU5			8 Theory (4:00) Practical (4:00)
		SMPS Unit Handling Skills	• Apply knowledge to install the SMPS unit and perform relevant tests to ensure regulated output voltage.	TEL/N4203 PC5, PC6			8 Theory (4:00) Practical (4:00)
		PIU Installation Proficiency	• Apply knowledge to install the PIU and understand its purpose in protecting against fluctuations and surges.	TEL/N4203 PC7, KU7			8 Theory (4:00) Practical (4:00)
		DG Set Setup Analysis	• Analyze the factors involved in selecting an appropriate location for the DG set and demonstrate the setup process.	TEL/N4203 PC8, PC9, PC10, KU10, KU11, KU12			8 Theory (4:00) Practical (4:00)
		Climate Control Unit Application	• Apply knowledge to install Climate Control Units and understand their role in maintaining suitable temperatures for telecom equipment.	TEL/N4203 PC12, KU13, KU14			8 Theory (4:00) Practical (4:00)
		Cabling and Connection Proficiency	• Apply knowledge to carry out cabling for installed equipment and establish secure connections between telecom equipment and power sources.	TEL/N4203 PC14, PC15, KU15, KU22			7 Theory (3:00) Practical (4:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Equipment Testing and Trouble-shooting Compe-tence	• Evaluate the importance of testing installed equipment and demonstrate troubleshooting skills for common issues.	TEL/N4203 PC16, PC28			7 Theory (3:00) Practical (4:00)
		Power Manage-ment Pro-ficiency	• Apply knowledge to install power supply units, heat sinks, and establish secure connections for gNodeB/eNodeB.	TEL/N4203 PC17, PC18, PC19, KU21, KU23			8 Theory (3:00) Practical (5:00)
		Power Connec-tion Setup Proficiency	• Apply knowledge to set up power connections for 5G base stations, RF transceivers, and RRUs, ensuring adherence to power requirements.	TEL/N4203 PC20, PC21, PC23, PC24, KU24, KU25			8 Theory (3:00) Practical (5:00)
		Shelter and Duct Installa-tion Com-petence	• Apply knowledge to install shelters and telecom ducts for passive infrastructure equipment and cabling protection.	TEL/N4203 PC25, KU29			8 Theory (3:00) Practical (5:00)
		Safety and Equipment Check Pro-ficiency	• Evaluate the importance of using Personal Protection Equipment (PPE) and demonstrate equipment checks for correct functioning.	TEL/N4203 PC26, PC27, PC28, KU30			8 Theory (3:00) Practical (5:00)
4	Maintain Passive Infrastruc-ture Equip-ment (Theory: 30 Hours, Practical: 30 Hours)	Regular Equipment Checks Proficiency	• Demonstrate the ability to check passive infrastructure equipment regularly, ensuring correct functioning.	TEL/N4204 PC1, KU1	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discus-sion	Training Kit - Trainer Guide, Pre-sentations, White-board, Marker, Projector, Laptop,	8 Theory (4:00) Practical (4:00)
		Preventive Mainte-nance Implemen-tation	• Demonstrate the ability to check passive infrastructure equipment regularly, ensuring correct functioning.	TEL/N4204 PC2, KU2			8 Theory (4:00) Practical (4:00)
		Battery Positioning Under-standing	• Understand the importance of correctly positioning batteries in the battery bank.	TEL/N4204 PC3, KU3			8 Theory (4:00) Practical (4:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Cable Inspection and Re-placement Skills	• Understand the importance of correctly positioning batteries in the battery bank.	TEL/N4204 PC4, KU4		Video Films, Switched-mode Pow-er Supply (SMPS), Climate Control Unit, Fiber Distribu-tion Hub, Resistive Load Bank, Artificial Load Tester.	8 Theory (4:00) Practical (4:00)
		Battery Testing and Trouble-shooting Compe-tence	• Understand the importance of correctly positioning batteries in the battery bank.	TEL/N4204 PC5, KU5			8 Theory (4:00) Practical (4:00)
		SMPS Check and Trouble-shooting Proficiency	• Apply knowledge to check SMPS functionality and troubleshoot identified issues.	TEL/N4204 PC6, PC7, KU6			8 Theory (4:00) Practical (4:00)
		PIU Test-ing and Trouble-shooting Compe-tence	• Apply knowledge to check SMPS functionality and troubleshoot identified issues.	TEL/N4204 PC8, PC9, KU7			8 Theory (4:00) Practical (4:00)
		DG Set Checks and Trouble-shooting Proficiency	• Apply knowledge to check SMPS functionality and troubleshoot identified issues.	TEL/N4204 PC10, PC11, KU8, KU9			8 Theory (4:00) Practical (4:00)
		Climate Control Unit Awareness	• Apply knowledge to check SMPS functionality and troubleshoot identified issues.	TEL/N4204 PC12, KU10			8 Theory (4:00) Practical (4:00)
		Mainte-nance Record Manage-ment Pro-ficiency	• Apply knowledge to check SMPS functionality and troubleshoot identified issues.	TEL/N4204 PC15, PC16, KU13			8 Theory (4:00) Practical (4:00)

SL	Module Name	Session Name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
6.	Sustainability in Telecom Infrastructure Management (Theory:10 Practical: 20 hours)	E-Waste and Hazardous Material Management	• Identify, segregate, and categorize e-waste and hazardous waste (PC1) • Dispose of or recycle waste following applicable guidelines (PC2) • Follow safe handling procedures for hazardous materials (PC3) • Maintain logs and records of disposed, recycled, or repurposed waste (PC4) • Know e-waste management rules (2022) applicable to the telecom sector (KU1) • Know CPCB hazardous waste disposal regulations and safety standards for battery handling (KU2, KU3)	TEL/N9109 PC1-PC13, KU1-KU10 TEL/N9109 PC1, PC2, PC3, PC4, KU1, KU2, KU3	Classroom lecture / Hands-on Demonstration (Waste segregation) / Practical Exercise (Log book maintenance) / Safety Procedure Role-Play	Training Kit, Projector, Sample Waste Segregation Bins (Mock setup), Mock Log Sheets/Digital Templates, Reference CPCB/E-waste guidelines, Personal Protective Equipment (PPE) for demonstration.	(Theory: 3:00) (Practical: 7:00)
		Green Energy and Fuel Efficiency	• Optimize power usage through energy-efficient telecom equipment (PC5) • Assist in adopting solar-powered telecom towers and hybrid energy systems (PC6) • Monitor and minimize fuel consumption in Diesel Generators (DG) sets (PC7) • Know techniques for energy optimization (smart cooling, LED lighting, hybrid power systems) (KU5) • Understand the role of solar energy and renewable sources in reducing carbon footprint (KU6) • Know green telecom practices like fuel efficiency in DG sets and power-saving measures (KU7)	TEL/N9109 PC5, PC6, PC7, KU5, KU6, KU7	Classroom lecture / Interactive Case Studies (Solar/Hybrid Systems) / Practical Exercise (DG fuel monitoring and load balancing scenarios) / Group Discussion (Optimization techniques)	Training Kit, Projector, Case Study Materials (Energy Audits), Energy Monitoring Dashboard mock-up, Diagrams of hybrid energy systems.	(Theory: 3:00) (Practical: 7:00)

SL	Module Name	Session Name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		E-Waste and Hazardous Material Management	• Identify, segregate, and categorize e-waste and hazardous waste (PC1) • Dispose of or recycle waste following applicable guidelines (PC2) • Follow safe handling procedures for hazardous materials (PC3) • Maintain logs and records of disposed, recycled, or repurposed waste (PC4) • Know e-waste management rules (2022) applicable to the telecom sector (KU1) • Know CPCB hazardous waste disposal regulations and safety standards for battery handling (KU2, KU3)	TEL/N9109 PC1-PC13, KU1-KU10 TEL/N9109 PC1, PC2, PC3, PC4, KU1, KU2, KU3	Classroom lecture / Hands-on Demonstration (Waste segregation) / Practical Exercise (Log book maintenance) / Safety Procedure Role-Play	Training Kit, Projector, Sample Waste Segregation Bins (Mock setup), Mock Log Sheets/Digital Templates, Reference CPCB/E-waste guidelines, Personal Protective Equipment (PPE) for demonstration.	(Theory: 3:00) (Practical: 7:00)
		Green Energy and Fuel Efficiency	• Optimize power usage through energy-efficient telecom equipment (PC5) • Assist in adopting solar-powered telecom towers and hybrid energy systems (PC6) • Monitor and minimize fuel consumption in Diesel Generators (DG) sets (PC7) • Know techniques for energy optimization (smart cooling, LED lighting, hybrid power systems) (KU5) • Understand the role of solar energy and renewable sources in reducing carbon footprint (KU6) • Know green telecom practices like fuel efficiency in DG sets and power-saving measures (KU7)	TEL/N9109 PC5, PC6, PC7, KU5, KU6, KU7	Classroom lecture / Interactive Case Studies (Solar/Hybrid Systems) / Practical Exercise (DG fuel monitoring and load balancing scenarios) / Group Discussion (Optimization techniques)	Training Kit, Projector, Case Study Materials (Energy Audits), Energy Monitoring Dashboard mock-up, Diagrams of hybrid energy systems.	(Theory: 3:00) (Practical: 7:00)

Annexure II
Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Infrastructure Technician - 5G Networks	
Job Role	Infrastructure Technician - 5G Networks
Qualification Pack	TEL/Q4201, V3.0
Sector Skill Council	Telecom Sector Skill Council

S. No.	Guidelines for Assessment
1	The assessment for the theory part will be based on knowledge bank of questions approved by the SSC.
2	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/ option NOS/ Set of NOS.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
5	To pass the Qualifications File, every trainee should score a minimum of aggregate marks.
6	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification File.

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N4202 – Prepare for the Installation of 5G Network Infrastructure	30	50	0	20	100	25
TEL/N4203 – Install and Set up Passive Infrastructure Equipment with the 5G Equipment	30	50	0	20	100	25
TEL/N4204 – Maintain Passive Infrastructure Equipment	30	50	0	20	100	25
TEL/N9109 – Follow sustainable practices in telecom infrastructure management	30	50	0	20	100	15
DGT/VSQ/N0101 – Employability Skills (30 Hours)	20	30	-	-	50	10
Total	**140**	**230**	**0**	**80**	**450**	**100**

Annexure III

QR Codes –Video Links

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
Module 1: Introduction to the role of an Infrastructure Technician – 5G Networks	Unit 1.1: Navigating the Telecom Industry and Infrastructure Technician Responsibilities	1.1.1 Size and scope of the Telecom industry and its sub-sectors	https://youtu.be/T2SaEuF6i1M?si=_-YT8_wXfwJh3WYo	Evolution of Telecom Industry in India
		1.1.3 Employment opportunities for an Infrastructure Technician – 5G Networks	https://youtu.be/JI4Xuy8kKaA?si=UxZNBr20-L6XCPJNs	Jobs and Career in Telecom
Module 2: Process of preparing for the installation of 5G network infrastructure	Unit 2.1: Advanced Telecommunication Infrastructure Installation and Coordina- tion	2.1.1 Scope and Site Selection in 5G Infrastructure Deployment	https://youtu.be/Q6YxHz_07zk?si=tP-raowM2T6MEanm	5G Network Architecture
		2.1.3 Equipment and Tool Assessment Importance	https://youtu.be/nBAZl8-v2Fs?si=FhkYA64i0XljIdXM	BTS Base Transceiver Station
		2.1.4 Authorization and Paperwork for Telecom Infrastructure Installation	https://youtu.be/-WyyrKbUruA?si=Xwsvz-g2nPTG74kz	Telecom Base Station Materials

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
Module 3: Process of installing and setting up the passive infrastructure equipment with the 5G Equipment	Unit 3.1: Passive Infrastructure Equipment Installation and Testing	3.1.3 Battery Bank Installation and Power Requirement Management	https://youtu.be/kLReFJwBMF8?si=jUXbpb_OeYzWeTJt	Telecom Battery Bank installation Procedure
	Unit 3.2: Diesel Generator (DG) Set Installation and Maintenance	3.2.1 Diesel Generator (DG) Set Installation Process	https://youtu.be/47OoXl9B-5f4?si=hzCZp1iMm-uVC- MiXx	Diesel Generator Installation and commissioning
	Unit 3.3: Power Connection and Equipment Integration	3.3.1 Connectivity and Power Setup Procedures	https://youtu.be/4upJZlY25k-M?si=3eSR_mZBUQ5O7x5H	Power System Installation for Telecommunication
Module 4: Process of maintaining the passive infrastructure equipment	Unit 4.1: Foundations of Passive Infrastructure Management and Troubleshooting	4.1.1 Regular Checks and Preventive Maintenance of Passive Infrastructure Equipment	https://youtu.be/BR_W7IjjlvA?si=w9whASvC-oGeY8yVx	Telecom - Passive Infrastructure
	Unit 4.2: Effective Maintenance Practices and New Equipment Integration	4.2.1 Importance of Using Manufacturer-Recommended Spare Parts and Tools	https://youtu.be/ipMomLuMxZw?si=xBi-cSi17FO7jGLc	The Different Types of Telecommunications Equipment

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
		4.2.2 Installing New Passive Infrastructure Equipment	https://youtu.be/CGaXv0ODDUc?si=0uaiceS4F-VVfYms7	Telecom Passive Infrastructure 2020

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

Telecom Sector Skill Council

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