Telecom Sector Skill Council

Facilitator Guide



Sector
Telecom

Sub-Sector
Passive Infrastructure

Occupation
Operations and Maintenance - Passive Infrastructure

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NSQF Level **4**

Telecom Rigger – 5G and Legacy Networks

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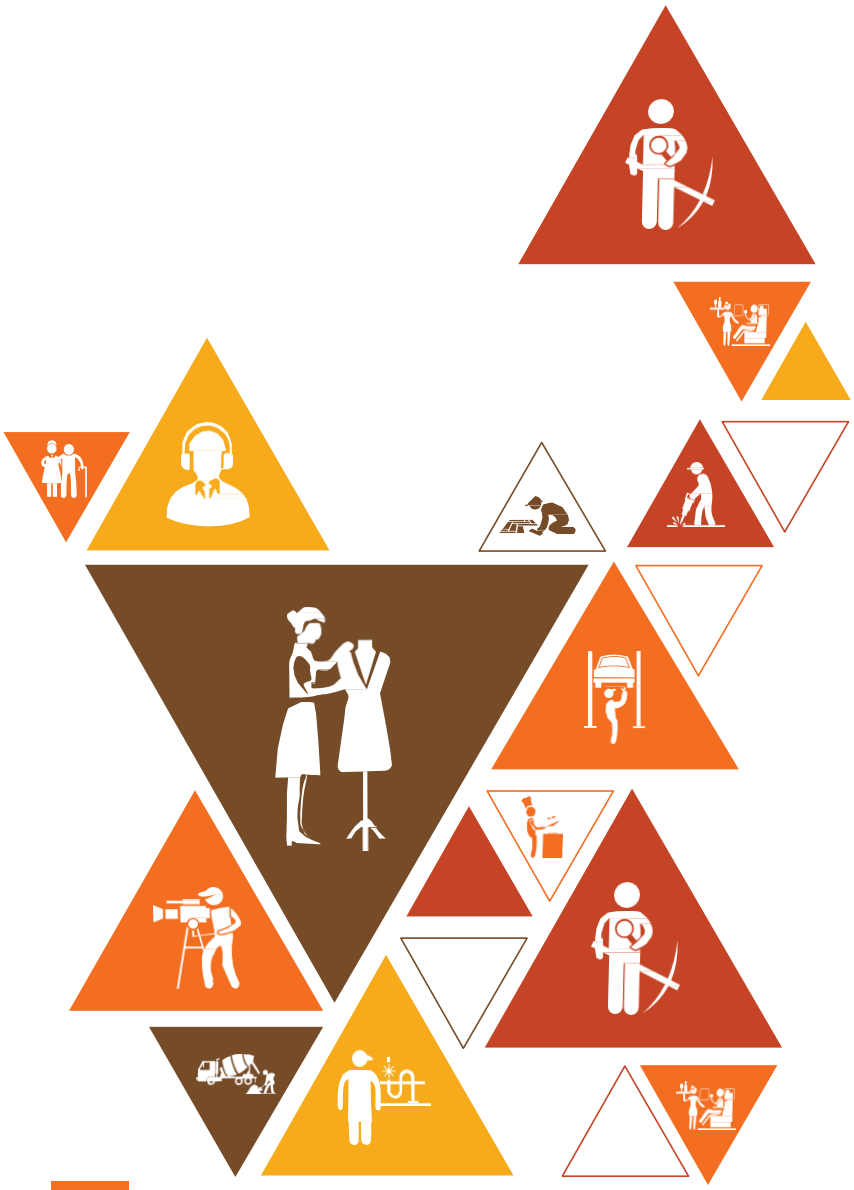
"Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission."

Shri Narendra Modi
Prime Minister of India



Acknowledgements

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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 Telecom Rigger – 5G and Legacy Networks is primarily designed to facilitate skill development and training of people, who want to become professional Telecom Rigger – 5G and Legacy Networkss 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/N6310: Assist in the Installation of Telecom Equipment
2. TEL/N6323: Assist in the Maintenance, Upgrade and Decommissioning of Telecom Equipment and Sites
3. TEL/N6246: Follow the Occupational Health and Safety Instructions during Tower Climbing
4. TEL/N9105: Follow sustainable practices in telecom infrastructure installation
5. DGT/VSQ/N0101: Employability Skills (30 Hours)

Post this training, the participants will be able to perform tasks as professional Assistant Technician (Wireless). 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

Ask


Explain


Elaborate


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Objectives


Do


Demonstrate


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Practical


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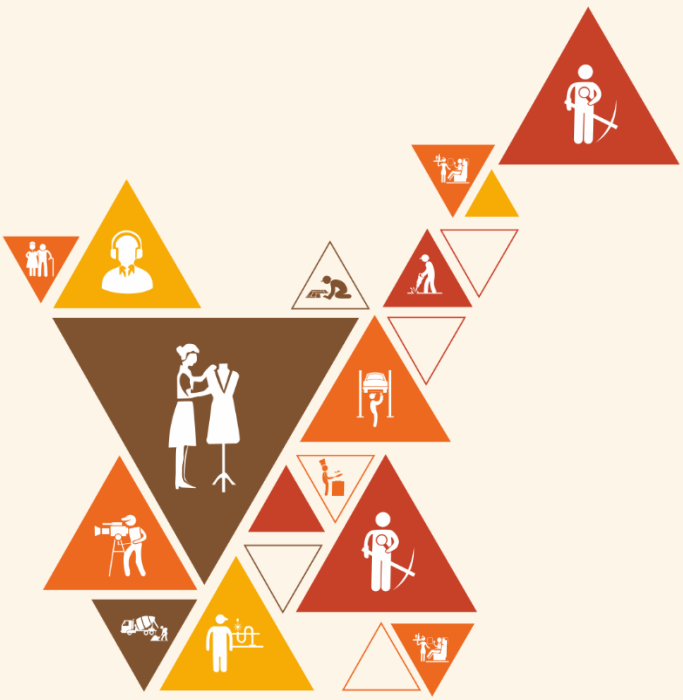
It is recommended that all trainings include the appropriate Employability skills Module. Content for the same is available here: **https://www.skillindiadigital.gov.in/content/list**

1. Introduction to the Sector and the Job Role of a Telecom Rigger - 5G and Legacy Networks

Unit 1.1 - Introduction to Telecom Sector and Role of a Telecom Rigger - 5G and Legacy Networks

Unit 1.2 - Understanding 5G Network Components, Installation, and Safety Protocols



TEL/N6104

Key Learning Outcomes 

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

1. Explain the importance of Telecom Sector.
2. Discuss the roles and responsibilities of a Telecom Rigger - 5G and Legacy Networks.

UNIT 1.1: Introduction to Telecom Sector and Role of a Telecom Rigger - 5G and Legacy Networks

Unit Objectives

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

1. Explain the significance of the telecom sector in modern communication and economic development.
2. Elucidate the key skills and technical expertise required for a Telecom Rigger - 5G Legacy Networks.
3. Describe the challenges faced in the installation, maintenance, upgrading, and dismantling of telecom equipment on towers and other structures.
4. Explain the rigging techniques and installation skills in brief.
5. Discuss the roles and responsibilities of a Telecom Rigger – 5G Legacy Networks.

Resources to be Used

Presentation slides or visual aids, Flipchart or whiteboard with markers, Handouts or worksheets for basic skills practice, Timer or stopwatch, Index cards or sticky notes, Pens or pencils

Say

- Welcome, everyone, to the training session.
- Today, we will understand the basic Skills and ground rules to be followed during the training.
- Our objective is to provide you with a clear understanding of what this program entails, the essential skills you will acquire, and the guidelines we will follow throughout. So, let's begin!

Do

- Provide an overview of the program:
  - Present the program's purpose, goals, and target audience.
  - Highlight the key benefits and outcomes participants can expect.
  - Share any relevant logistical information, such as program duration and schedule.
- Cover basic skills:
  - Identify and explain the fundamental skills participants will learn during the program.
  - Give examples of how these skills can be applied in real-life situations.
  - Use interactive activities or demonstrations to reinforce the importance of these skills.
- Discuss ground rules:
  - Establish a collaborative and respectful learning environment.
  - Introduce the ground rules that will govern the program.
  - Encourage participants to share any additional rules they believe are necessary.

Ask

What interests you the most about this program?

Activity

- Activity: Ice Breaker - Two Truths and a Lie
- Objective of the activity: Encourage participants to get to know each other and create a positive atmosphere for learning.
- Resources: Index cards or sticky notes (one per participant), Pens or pencils
- Time Duration: 15 minutes
- Instructions:
  - Distribute an index card or sticky note to each participant.
  - Instruct participants to write down two true statements about themselves and one false statement on their card or sticky note.
  - Encourage them to be creative and avoid obvious statements.
  - Collect the cards or sticky notes and shuffle them.
  - Randomly distribute the cards or sticky notes to participants, ensuring they receive someone else's card.
  - Instruct participants to take turns reading the statements on the card they received and guess which statement is the lie.
  - After each participant has made their guess, allow the person who wrote the card to reveal the correct answer.
  - Encourage brief discussions about the statements, allowing participants to get to know each other better.
  - Repeat the process with a few more participants, ensuring everyone gets a chance to share.
- Outcome: This activity will foster a relaxed and inclusive environment, encouraging participants to interact with one another while practising active listening and observation skills.

Notes for Facilitation

- Ensure a welcoming and supportive atmosphere throughout the session.
- Encourage active participation and create opportunities for group discussions.
- Monitor the time and pace the session accordingly to cover all topics effectively.
- Use visual aids or examples to enhance understanding and engagement.
- Adapt the content and delivery to meet the specific needs and learning styles of the participants.

UNIT 1.2: Understanding 5G Network Components, Installation, and Safety Protocols

Unit Objectives

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

1. Elucidate the key components and architecture of 5G networks, including small cells, fiber backhaul, and Massive MIMO.
2. Describe the processes of installing, testing, and troubleshooting 5G network hardware, such as antennas, base stations, and fiber optic connections.
3. Identify the challenges in network densification, signal interference, and maintaining low-latency communication in 5G technology.
4. Discuss safety protocols, electromagnetic field (EMF) exposure limits, and best practices for working with high-frequency 5G equipment.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Handouts or worksheets for note-taking, Whiteboard or flipchart with markers, Internet access for real-time examples and research, Examples of telecom equipment and devices (optional)

Say

- Welcome, everyone, to the session on Introduction to the Telecom Sector and the Role of Telecom Rigger.
- Today, we will explore various aspects of the telecom industry, including its history, growth, current scenario, sub-sectors, and the exciting field of 5G.
- We will also dive into the roles and responsibilities of a Telecom Rigger in both 5G and legacy networks. Let's begin by setting the agenda for today's session."

Ask

- How often do you use telecommunication services in your daily life?
- What do you think are the advantages of 5G over previous generations of mobile networks?
- Can you name any telecom infrastructure components you encounter in your surroundings?

Do

- Provide an overview of the telecom sector in India:
  - Present key statistics and facts about the size and importance of the telecom industry.
  - Discuss its contribution to the economy and its role in connectivity and communication.
  - Highlight the significance of the telecom sector in driving digital transformation.

- Cover the history, growth, and current scenario of the telecom sector in India:
  - Trace the evolution of the telecom sector from its early days to the present.
  - Explore the major milestones and regulatory changes that have shaped the industry.
  - Discuss the current landscape, market players, and challenges the telecom sector faces.
- Introduce the various sub-sectors of the telecom industry:
  - Explain the telecom infrastructure, telecom equipment, and telecom services segments.
  - Highlight the importance and interdependence of these sub-sectors.
  - Provide examples of key components and technologies associated with each sub-sector.
- Introduce 5G and its key features and benefits:
  - Define 5G technology and its potential impact on communication and connectivity.
  - Discuss the key features, such as high data rates, low latency, and massive device connectivity.
  - Explore the benefits of 5G, including enhanced mobile broadband, IoT applications, and industry transformation.

Elaborate

- Legacy Network:
  - Provide an overview of the existing telecom network architecture and technologies.
  - Discuss the challenges and limitations of legacy networks in meeting the demands of modern communication.
- Roles and Responsibilities of a Telecom Rigger - 5G Legacy Networks:
  - Explain the role of a Telecom Rigger in deploying and maintaining telecom infrastructure.
  - Discuss the importance of rigging in ensuring network reliability and performance.
  - Highlight the safety protocols and technical skills required for the role.
- Scope of Work for a Telecom Rigger - 5G and Legacy Networks:
  - Describe the tasks and responsibilities involved in rigging for both 5G and legacy networks.
  - Explore the differences in equipment, procedures, and safety considerations between the two.
- Employment Opportunities:
  - Discuss the potential career paths and job opportunities in the telecom industry.
  - Highlight the growing demand for skilled Telecom Riggers in the context of 5G deployment.
- Process Workflow in an Organization and the role of a Telecom Rigger - 5G Legacy Networks:
  - Provide an overview of a telecom company's typical workflow and organizational structure.
  - Explain how a Telecom Rigger fits into the larger process and collaborates with other stakeholders.
- Daily, Weekly, and Monthly Operations/Activities under Telecom Rigger:
  - Outline the routine tasks and activities that a Telecom Rigger performs in its role.
  - Discuss the importance of regular maintenance, troubleshooting, and documentation.

Activity

- Name of the activity: Case Study Analysis - "5G Implementation Challenges"
- Objective of the activity: Engage participants in analyzing real-world challenges and stimulate critical thinking about the deployment of 5G networks.
- Resources: Case study handouts or access to online case studies, Flipchart or whiteboard with markers, Pens or pencils, Time Duration: 30 minutes
- Instructions:
  - Divide participants into small groups (3-4 members per group).
  - Provide each group with a case study related to the challenges faced during 5G implementation.
  - Instruct groups to read and analyze the case study, identifying the key issues and obstacles encountered.
  - Encourage groups to discuss possible solutions or strategies to overcome the challenges described.
  - Allocate a specific time for group discussion and note-taking.
  - Ask each group to present their findings and recommendations to the larger group.
  - Facilitate a brief discussion after each presentation, allowing participants to share their insights and perspectives.
  - Summarize the key takeaways from the case studies and encourage participants to reflect on the complexities of 5G deployment.
- **Outcome:** This activity will promote active learning, critical thinking, and collaboration among participants, enhancing their understanding of the challenges and considerations involved in 5G implementation.

Notes for Facilitation

- Ensure a balanced pace of the session, allowing enough time for discussion and participant engagement.
- Use real-life examples and current industry trends to make the content more relatable and meaningful.
- Encourage participants to ask questions and seek clarification throughout the session.
- Facilitate discussions to foster an inclusive and respectful learning environment.
- Relate the topics covered to potential career opportunities, emphasizing the practical relevance of the content.

Exercise

Answers to exercises for PHB

A. Short Answer Questions

1. The telecom sector contributes to modern communication by enabling fast, reliable voice and data connectivity, supporting services like mobile internet, cloud applications, and IoT. It drives economic growth by improving business efficiency, creating jobs, enabling digital services, and supporting industries such as banking, education, transport, and e-commerce.
2. Essential technical skills for a Telecom Rigger include knowledge of tower climbing and safety, antenna installation and alignment, RF cable handling, use of rigging tools (ropes, pulleys, slings), understanding of 4G/5G equipment, and basic troubleshooting of network components.
3. Two common challenges during installation or maintenance are: i. Working at heights with safety risks and harsh weather conditions. ii. Handling heavy equipment and ensuring proper alignment or structural stability
4. Basic rigging techniques include safely lifting, hoisting, and positioning equipment using ropes, pulleys, slings, knots, and winches; securing loads properly; and using controlled movements to place antennas, mounts, and cables on towers.
5. A Telecom Rigger installs, aligns, and maintains antennas, feeders, and mounts; performs tower climbing tasks; ensures safe lifting and rigging operations; follows safety protocols; and supports the overall functionality of the network by ensuring proper equipment installation.

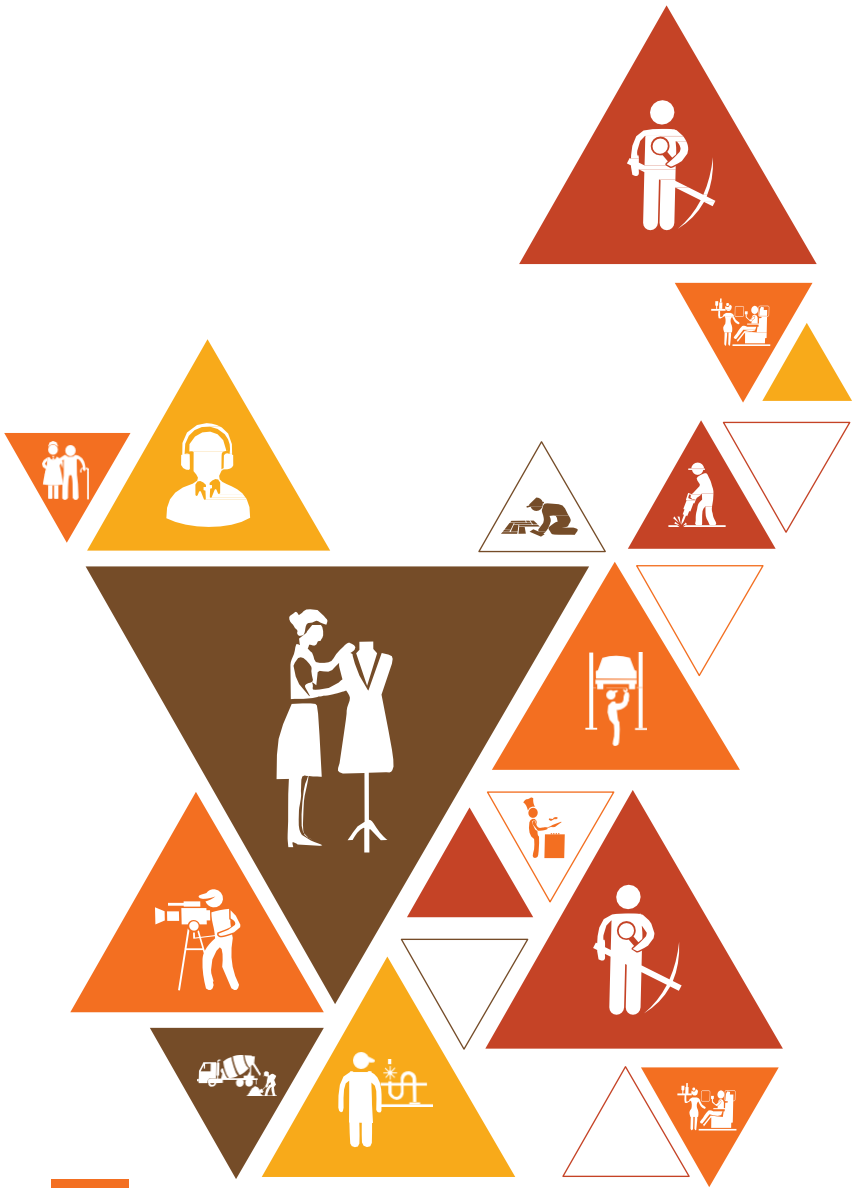
B. Multiple Choice Questions (MCQs):

1. b) Enhancing communication and digital connectivity
2. a) Helmet and harness
3. b) Harsh weather conditions and height safety
4. b) Lifting, positioning, and securing telecom equipment
5. a) Installing, aligning, and maintaining antennas and cables

C. Fill in the Blanks

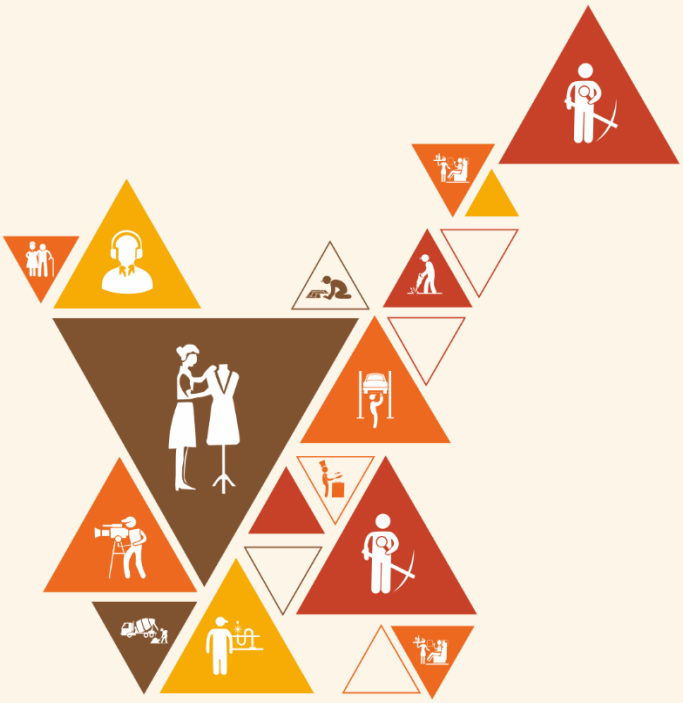
1. digital communication
2. rigging techniques
3. height safety
4. ropes, pulleys, and slings
5. safety / standard safety procedures

Notes



2. Assist in the Installation of Telecom Equipment

Unit 2.1 - Preparing for Telecom Equipment Installation
Unit 2.2 - Assisting in the Installation of Telecom Equipment and Site Testing
Unit 2.3 - Post Installation Activities



TEL/N6310

Key Learning Outcomes 

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

1. Explain how to prepare for the installation of racks and equipment for 5G networks.
2. Describe the process to install and secure racks and equipment for 5G networks.

UNIT 2.1: Preparing for Telecom Equipment Installation

Unit Objectives

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

1. Explain the scope of work for telecom equipment installation based on blueprints and site plans.
2. Describe the different types of telecom equipment, components, and their installation requirements.
3. Elucidate the importance of conducting a site audit before installation to assess potential hazards.
4. Enlist the tools, materials, and PPE necessary for telecom installation and maintenance.
5. Discuss the safety guidelines and regulatory standards applicable to telecom installations.
6. Explain the procedures for handling and disposing of hazardous materials in telecom installation.
7. Describe best practices for optimizing telecom infrastructure placement to ensure energy efficiency and sustainability.
8. Demonstrate how to read and interpret blueprints and site plans for telecom installations.
9. Show how to inspect and prepare telecom installation tools, ensuring they are in proper working condition.
10. Demonstrate the correct use of PPE and adherence to safety protocols at the installation site.
11. Show how to handle and organize telecom materials, including RF connectors, cables, and other components.
12. Demonstrate proper procedures for assembling RF connectors, jumpers, and telecom components for installation.
13. Show how to follow approved procedures for handling and disposing of hazardous materials during installation.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Blueprints, schematics, as-built site plans, Samples of installation material, tools, and equipment, Personal Protective Equipment (PPE) examples, Tower models or visual representations (optional)

Say

- Welcome to the session on Prepare for the Installation of Telecom Equipment.
- Today, we will focus on the essential steps and considerations involved in preparing for the installation of telecom equipment.
- We will cover topics such as the scope of work, analyzing blueprints and site plans, ensuring proper tools and equipment, safety guidelines, working at high elevations and tower types, identifying common defects, and the importance of job hazard assessments and following checklists. Let's begin by setting the agenda for today's session."

Ask

- Why is it important to analyze blueprints and site plans before installation work?
- What are some essential personal protective equipment (PPE) items for telecom rigging?
- Name one safety guideline you should follow while working at high elevations.

Do

- Discuss the scope of installation work:
  - Explain the various tasks and responsibilities involved in the installation process.
  - Discuss the importance of clear communication and coordination with team members and stakeholders.
  - Emphasize the significance of following project specifications and timelines.
- Analyze the relevant blueprints, schematics, and as-built site plans:
  - Explain the importance of reviewing and understanding the technical documentation.
  - Demonstrate how to interpret blueprints, schematics, and site plans for accurate installation.
  - Highlight the key elements to look for, such as equipment placement, cable routing, and power requirements.
- Emphasize the importance of checking installation material, tools, equipment, and PPE:
  - Discuss the significance of inspecting and verifying the quality and suitability of materials.
  - Explain the importance of having the correct tools and equipment for the installation.
  - Highlight the need for wearing appropriate personal protective equipment (PPE) to ensure safety.
- Provide safety guidelines during rigging operations:
  - Explain the potential hazards and risks involved in rigging operations.
  - Discuss safety measures, such as fall protection, proper lifting techniques, and electrical safety.
  - Stress the importance of adherence to safety protocols and procedures.

Elaborate

- Importance and process of working safely at high elevations:
  - Explain the risks associated with working at heights and the importance of fall protection.
  - Discuss the use of proper climbing techniques and safety equipment.
  - Provide an overview of best practices for working safely at high elevations.
- Climbing and working on different types of towers - Guyed towers, Lattice towers, Monopole towers, Stealth towers:
  - Describe the characteristics and structures of different types of towers.
  - Explain the specific considerations and techniques for climbing and working on each type.
  - Highlight safety precautions and best practices for tower work.
- Common defects found in telecom equipment:
  - Identify common issues and defects that may be encountered during equipment installation.
  - Discuss the impact of defects on the functionality and performance of the telecom network.
  - Explain the importance of quality control and reporting defects.
- Identifying and documenting Job Hazard Assessment (JHA) requirements:
  - Define Job Hazard Assessment (JHA) and its role in identifying and mitigating workplace hazards.
  - Discuss the process of conducting JHA and documenting the findings.
  - Emphasize the importance of involving the entire team in hazard identification and mitigation.
- Benefits of following checklists and Standard Operating Procedures (SOPs):
  - Explain the role of checklists and SOPs in ensuring consistency and efficiency during installation.

- Highlight the benefits of using standardized procedures, such as reducing errors and improving quality.
- Discuss the importance of updating and maintaining accurate checklists and SOPs.

Demonstrate

- Demonstrate the proper use of specific tools and equipment used in telecom equipment installation, such as cable connectors, power tools, and testing devices.
- Highlight the correct techniques and safety precautions.

Activity

- **Activity:** Equipment Inspection Checklist
- **Objective of the activity:** Familiarize participants with the process of inspecting installation material, tools, and equipment for quality and suitability.
- **Resources:** Sample installation material, tools, and equipment (or visual representations), Equipment inspection checklist handouts, Pens or pencils
- **Time Duration:** 20 minutes
- **Instructions:**
  - Distribute the equipment inspection checklist handouts to participants.
  - Introduce the sample installation material, tools, and equipment or display visual representations.
  - Instruct participants to, individually or in pairs, inspect the provided items based on the checklist criteria.
  - Encourage participants to note any deficiencies or issues they identify during the inspection.
  - Allocate sufficient time for participants to complete the checklist.
  - Facilitate a group discussion to review the checklist and share participants' observations and findings.
  - Emphasize the importance of thorough inspection and the potential impact of inadequate equipment on installation quality and safety.
- **Outcome:** This activity will enable participants to apply their knowledge of inspecting installation material, tools, and equipment, reinforcing their understanding of quality assurance and the importance of proper equipment.

Notes for Facilitation

- Ensure a positive and inclusive learning environment by encouraging active participation and respecting diverse perspectives.
- Use real-life examples and case studies to illustrate the topics and make them more relatable.
- Incorporate interactive elements like group discussions and participant sharing to promote engagement and active learning.

- Reinforce key safety guidelines and precautions throughout the session, emphasizing their importance in telecom rigging.
- Encourage participants to ask questions and seek clarification, fostering a collaborative and supportive learning atmosphere.

UNIT 2.2: Assisting in the Installation of Telecom Equipment and Site Testing

Unit Objectives

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

1. Explain the steps involved in assembling and installing antennas, feeders, and transmission equipment.
2. Describe the procedures for installing, grounding, and securing telecom cables on towers and rooftop sites.
3. Elucidate the principles of RF systems, microwave transmission, and their role in telecom networks.
4. Discuss the importance of alignment, sweep testing, and signal verification in maintaining network quality.
5. Enlist the tools and equipment required for signal testing, including spectrum analyzers and sweep testers.
6. Describe the factors that contribute to signal loss and interference in telecom installations.
7. Explain the purpose and process of conducting Line-of-Sight (LOS) checks for microwave and RF transmission.
8. Discuss best practices for shelter room installations, including power backup and climate control considerations.
9. Describe the documentation process for recording installation details and preparing client handover reports.
10. Demonstrate the process of assembling and mounting antennas, feeders, and transmission equipment.
11. Show how to install, route, and secure telecom cables on towers and rooftop sites, ensuring compliance with safety standards.
12. Demonstrate the grounding techniques for telecom equipment to prevent electrical hazards.
13. Show how to perform alignment and sweep testing using appropriate tools and techniques.
14. Demonstrate signal verification procedures to ensure optimal network performance.
15. Show how to identify and troubleshoot potential signal loss issues in a telecom installation.
16. Demonstrate the process of conducting a Line-of-Sight (LOS) check for microwave and RF links.
17. Show how to assist in shelter room installations, including equipment setup and climate control measures.
18. Demonstrate the process of maintaining installation records and preparing documentation for client handover.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Samples or visuals of tower equipment and components, Tools and equipment used in tower equipment installation, Handouts or reference materials on installation processes and procedures

Say

- Welcome, everyone, to the session on Assisting in the Installation of Tower Equipment.
- Today, we will cover a range of topics related to the installation process of tower equipment in a cellular carrier network.
- We will explore processes such as network expansion and upgrading, microwave transmission installation, antenna assembly, feeder system installation, RF connector preparation, tower erection and securing, installation of telecom equipment and transmission components, cable installation, and various antenna types. Let's begin by setting the agenda for today's session."

Do

- Discuss the process of expanding and upgrading a cellular carrier network:
  - Explain the reasons and requirements for network expansion and upgrades.
  - Discuss the key steps involved in the expansion and upgrade process.
  - Highlight the importance of following protocols and procedures during network expansion.
- Explain the process of microwave transmission installation:
  - Discuss the role of microwave transmission in a cellular network.
  - Explain the installation process of microwave antennas and related equipment.
  - Discuss the considerations and best practices for alignment and configuration.
- Demonstrate antenna assembly, waveguide, and coax connector assembly:
  - Show participants how to assemble antennas, including attaching waveguides and coax connectors.
  - Explain the importance of proper assembly techniques for optimal performance.
  - Highlight the significance of following manufacturer guidelines and specifications.
- Explain the installation and testing of copper and hybrid feeder systems:
  - Discuss the purpose and components of copper and hybrid feeder systems.
  - Explain the installation process, including cable routing and connection methods.
  - Discuss the testing procedures to ensure signal integrity and performance.

Ask

- What is the purpose of network expansion and upgrading in a cellular carrier network?
- Name one component used in microwave transmission installation.
- What are some key considerations for proper antenna assembly?

Elaborate

- Preparing radio frequency (RF) connector and jumper:
  - Explain the process of preparing RF connectors and jumpers for installation.
  - Discuss the different connector types and their respective applications.
  - Highlight the importance of proper cable stripping, connector attachment, and testing.
- Erecting and securing telecom structures:
  - Explain the steps involved in erecting and securing telecom structures, such as towers or poles.
  - Discuss safety considerations, including proper rigging techniques and the use of fall protection.
  - Highlight the importance of following engineering and safety guidelines.
- Installing telecom equipment on the towers:
  - Discuss the installation process for various types of telecom equipment on towers.
  - Explain the considerations for equipment placement, mounting, and alignment.
  - Highlight the importance of cable management and labelling.
- Installation of cables on different types of towers:

- Explain the cable installation process for guyed towers, lattice towers, monopole towers, and stealth towers.
- Discuss the cable routing and attachment methods specific to each tower type.
- Highlight the importance of proper cable tensioning and weatherproofing.

- Installing radio frequency (RF) antenna system and external RF hardware:
  - Explain the installation process for RF antenna systems and related external hardware.
  - Discuss the considerations for antenna positioning, grounding, and weatherproofing.
  - Highlight the importance of proper cable connections and testing.
- Installation of various types of microwave antennae:
  - Describe the installation process for different types of microwave antennas.
  - Explain the considerations for antenna alignment, mounting, and weatherproofing.
  - Highlight the importance of following manufacturer specifications and alignment procedures.

Demonstrate

- Demonstrate the proper assembly of an antenna and the installation of a cable on a sample tower structure.
- Emphasize safety precautions, correct techniques, and best practices.

Activity

- **Name of the activity:** Labeling and Grounding Exercise
- **Objective of the activity:** Reinforce participants' understanding of labelling and grounding procedures in tower equipment installation.
- **Resources:** Sample tower equipment components, Labelling materials (e.g., labels, markers), Grounding equipment (e.g., grounding wire, clamps)
- **Time Duration:** 20 minutes
- **Instructions:**
  - Divide participants into small groups.
  - Provide each group with a set of sample tower equipment components.
  - Instruct each group to label the components according to industry standards and guidelines.
  - Discuss the importance of accurate labeling for maintenance and troubleshooting purposes.
  - Next, instruct the groups to demonstrate proper grounding techniques for the equipment.
  - Emphasize the significance of grounding in preventing electrical hazards and maintaining system integrity.
  - Facilitate a group discussion to review the labeling and grounding exercises.
  - Address any questions or clarifications raised by the participants.
- **Outcome:** This activity will enable participants to apply their knowledge of labeling and grounding procedures, emphasizing their importance in tower equipment installation.

Notes for Facilitation

- Ensure a safe learning environment by emphasizing the importance of following safety protocols throughout the session.
- Encourage participants to actively engage in discussions and ask questions related to the installation processes.
- Use visuals, diagrams, and real-life examples to enhance participants' understanding of complex concepts.
- If possible, arrange for hands-on experiences or demonstrations to reinforce practical skills.
- Provide participants with relevant handouts or reference materials for further self-study and review.

UNIT 2.3: Post Installation Activities

Unit Objectives

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

1. Explain the use of a cable and antenna analyzer for VHF, broadcasting, cellular, PCS/GSM, 3G/4G/5G, ISM, WLAN and WLL applications.
2. Explain the benefits and process of upgrading legacy cable plants from coaxial cable to fibre
3. Explain the importance and process of measuring the alignment, azimuth, tilt, roll, and height of
4. antennas using the antenna alignment tool.
5. Demonstrate the process of carrying out bird-proofing and water-proofing of connectors
6. Show how to use the compass, Global Positioning System (GPS) receiver, Range Finder and other relevant equipment as per the requirement
7. Demonstrate the process of performing a Line of Sight (LOS) check to ensure signal drop or termination is not experienced
8. Show how to measure the alignment in azimuth, tilt, roll, and height of antennas using the antenna
9. alignment tool and change the settings
10. Demonstrate the process of installing and testing Outdoor Unit (ODUs), splitters, and Customer Premises Equipment (CPE)
11. State the recommended safety practices to be followed while working at heights on a range of telecom structures, including poles, towers and masts.
12. Prepare sample survey reports and documentation for client handover.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Samples or visuals of post-installation activities and equipment, Cable and antenna analyzer, Tools and equipment used for measuring, terminating, grounding, and testing cables, Handouts or reference materials on post-installation processes and procedures

Say

- Welcome, everyone, to the session on Post Installation Activities.
- Today, we will explore a range of topics related to activities that occur after the installation of telecom equipment and systems.
- We will cover topics such as cable and antenna analysis, upgrading legacy cable plants, antenna alignment, bird-proofing and water-proofing, cable installation and testing, use of compass and GPS, line of sight checks, safety practices, site audits, and more. Let's begin by setting the agenda for today's session."

Ask

Why is proper antenna alignment important for signal performance?

Do

- Discuss the importance and process of cable and antenna analysis:
  - Explain the role of a cable and antenna analyzer in post-installation activities.
  - Discuss how to use the analyzer to measure and analyze cable and antenna performance.
  - Explain the significance of identifying and resolving issues detected during analysis.
- Explain the process of upgrading legacy cable plants from coaxial cable to fiber:
  - Discuss the reasons for upgrading legacy cable plants.
  - Explain the steps involved in the transition from coaxial cable to fiber.
  - Highlight the importance of proper planning, termination, and testing.
- Demonstrate measuring and adjusting antenna alignment:
  - Show participants how to use tools and techniques to measure antenna alignment.
  - Explain the process of adjusting antenna alignment for optimal performance.
  - Discuss the impact of misaligned antennas on signal quality and coverage.
- Discuss the process of carrying out bird-proofing and water-proofing of connectors:
  - Explain the importance of protecting connectors from bird damage and water ingress.
  - Discuss the methods and materials used for bird-proofing and water-proofing.
  - Highlight the significance of regular maintenance and inspection.

Elaborate

- Installing, terminating, earthing, labelling, and testing different types of cables:
  - Explain the procedures for installing and terminating different types of cables.
  - Discuss the importance of proper grounding, labelling, and testing for cable integrity.
  - Highlight industry standards and best practices for cable installation.
- Use of compass, GPS receiver, and range finder:
  - Explain the role of the compass, GPS receiver, and range finder in post-installation activities.
  - Discuss how these tools are used for site surveys, alignment, and location identification.
  - Highlight the importance of accurate measurements and data collection.
- Performing a line of sight (LOS) check:
  - Explain the concept of line of sight and its relevance in telecom installations.
  - Discuss the process of performing a line-of-sight check using appropriate tools.
  - Highlight the impact of obstacles on signal propagation and network performance.
- Reasons for drop/attenuation/loss of signal:
  - Discuss common causes of telecom systems' signal drop, attenuation, or loss.
  - Explain the impact of environmental factors, cable quality, and equipment configuration.
  - Highlight troubleshooting techniques to identify and resolve signal issues.

Activity

- **Activity:** Post-Installation Audit
- **Objective of the activity:** Reinforce participants' understanding of post-installation processes and the importance of site audits.
- **Resources:** Sample post-installation site or equipment checklist, Pen and paper for participants
- **Time Duration:** 30 minutes
- **Instructions:**
  - Distribute a sample post-installation site or equipment checklist to each participant.
  - Instruct participants to review the checklist and identify any missing or incorrect items.
  - Ask participants to work individually or in pairs to conduct a mock post-installation audit using the checklist.
  - Encourage participants to document their findings, including observations, recommendations, and areas for improvement.
  - Facilitate a group discussion to review the audit findings and encourage participants to share their insights.
  - Discuss the importance of post-installation audits in ensuring quality, compliance, and customer satisfaction.
  - Address any questions or clarifications raised by the participants.
- **Outcome:** This activity will allow participants to apply their knowledge of post-installation activities and reinforce the importance of conducting audits for quality assurance.

Notes for Facilitation

- Encourage active participation and engagement throughout the session.
- Relate the topics to real-life examples and experiences to enhance understanding.
- Provide opportunities for hands-on practice or demonstrations whenever possible.
- Use visuals, diagrams, and multimedia to support explanations and demonstrations.
- Remind participants of the significance of safety practices and adherence to regulations during post-installation activities.

Exercise

Answers to exercises for PHB

A. Short Answer Questions

1. Conducting a site audit is important because it helps assess site readiness, verifies structural stability, identifies potential hazards, checks equipment requirements, and ensures that installation follows design specifications. It prevents delays, safety risks, and installation errors.
2. The procedure for assembling and installing antennas and feeders includes:
    - Preparing equipment as per the site plan
    - Hoisting antennas and mounting brackets using rigging tools
    - Securing antennas firmly on the tower
    - Routing feeder cables properly, ensuring no sharp bends
    - Connecting feeders to RRUs/BBUs with correct torque
    - Weatherproofing connectors and labeling all cables for identification
3. Safety guidelines include following fall-protection protocols, maintaining proper tool handling, avoiding tower climbing during adverse weather, performing lockout–tagout procedures, and maintaining safe distance from energized RF equipment. PPE includes helmet, full-body harness, gloves, safety shoes, reflective jacket, and eye protection.
4. Alignment ensures antennas are oriented correctly to achieve maximum coverage and link quality. Sweep testing checks cable integrity, connector quality, and frequency response. Together, they ensure low losses, stable connections, and optimal network performance.
5. Line-of-Sight (LOS) checks are conducted by visually inspecting the clear path between two microwave sites and using tools like binoculars, GPS, and mapping software. They are critical because microwave signals require an unobstructed path; obstacles like buildings or trees can cause signal loss, interference, and link failure.

B. Multiple Choice Questions (MCQs)

1. b) Blueprint and site plan
2. c) Spectrum analyzer
3. b) Prevent electrical hazards and equipment damage
4. b) Cable bending and improper termination
5. c) Following approved hazardous material disposal procedures

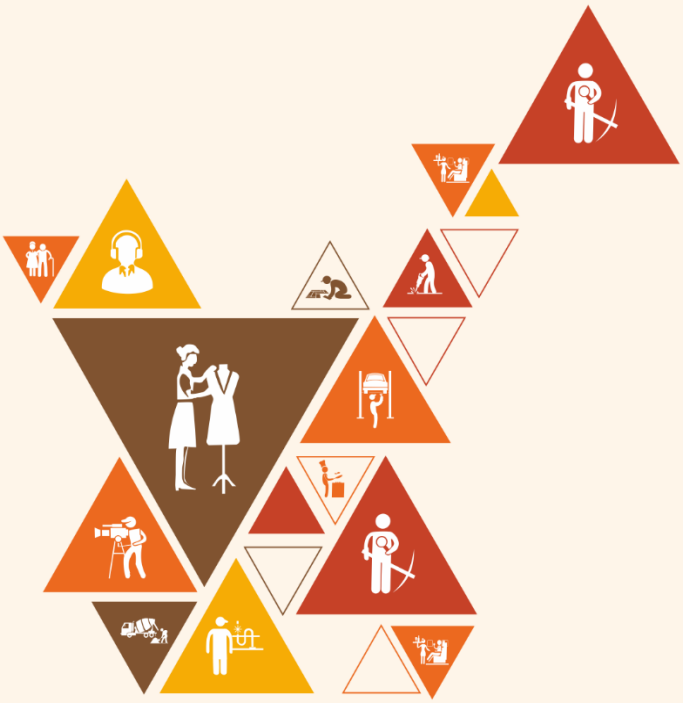
C. Fill in the Blanks

1. site audit
2. spectrum analyzer and alignment tools
3. routing / handling
4. Personal Protective Equipment (PPE)
5. Line-of-Sight (LOS) check

Notes

3. Assist in the Maintenance, Upgrade and Decommissioning of Telecom Equipment and Sites

Unit 3.1 - Preventive and Corrective Maintenance of Telecom Equipment
Unit 3.2 - Decommissioning and Recovery of Telecom Equipment



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Key Learning Outcomes 

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

1. Describe the process of configuring wireless network equipment.
2. Explain the steps involved in establishing and verifying wireless network connectivity.
3. Determine the methods for recording configuration settings and test results for wireless network deployments.

UNIT 3.1: Carryout Maintenance Activities

Unit Objectives

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

1. Explain the industry standards and best practices for preventive and corrective maintenance of telecom equipment.
2. Describe the common structural issues such as corrosion, fatigue, and wind-induced vibrations affecting telecom towers.
3. Elucidate the importance of securing bolts, brackets, and mounts for structural stability.
4. Discuss the alignment requirements for antennas, microwave dishes, and feeder cables.
5. Enlist the preventive maintenance checklists and their role in ensuring network reliability.
6. Explain the safety protocols for working at heights, including the use of PPE, harnesses, and fall protection systems.
7. Describe the methods for testing and troubleshooting signal transmission faults using DTF analyzers and other testing tools.
8. Discuss the procedures for handling, installing, and replacing fiber-optic and hybriflex cables.
9. Explain the steps involved in network upgrades, including the installation of 3G/4G/5G equipment.
10. Describe the importance of documenting maintenance activities and updates in logs or digital systems. Demonstrate the process of inspecting telecom towers, antennas, and associated structures for damage, misalignment, and wear.
11. Show how to secure bolts, brackets, and mounts to ensure the structural integrity of telecom installations.
12. Demonstrate the identification of defects in equipment casings and the replacement of worn-out components.
13. Show how to follow a preventive maintenance checklist to ensure telecom equipment compliance with industry standards.
14. Demonstrate the process of conducting audits of rigging installations and support structures.
15. Show how to check and report the operational status of telecom transmission lines, RRUs, power units, and backup systems.
16. Demonstrate the correct usage of safety gear such as harnesses, ladders, and boom lifts for accessing telecom structures.
17. Show how to detect fiber-optic cable damage and measure signal loss using appropriate testing tools.
18. Demonstrate the installation or upgrading of telecom network components, including 3G/4G/5G equipment.
19. Show how to organize and handle cables, jumpers, and accessories for structured installations.
20. Demonstrate the process of documenting maintenance activities and updating records in logs or digital systems.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Samples or visuals of maintenance activities and equipment, Troubleshooting tools and equipment (multimeter, cable repair tools, etc.), Maintenance checklists or forms, Handouts or reference materials on maintenance procedures

Say

- Welcome, everyone, to the session on Carryout Maintenance Activities.
- Today, we will explore various topics related to the maintenance of telecom equipment and structures.
- We will cover site audits, common maintenance needs, preventive maintenance, troubleshooting, misalignment identification, distance to fault measurements, cable repairing, electrical measurements, and more. Let's begin by setting the agenda for today's session."

Ask

- Why is it important to conduct site audits and audits of rigging installations and civil areas?
- Name one common maintenance need of antennas.
- What is the purpose of preventive maintenance for telecom structures?

Do

- Discuss the importance of conducting site audits and auditing rigging installations and civil areas:
  - Explain the purpose of site audits in identifying maintenance needs and ensuring compliance.
  - Discuss the process of auditing rigging installations and civil areas for safety and functionality.
  - Highlight the significance of proper documentation and reporting.
- Explain the common maintenance needs of antennas, microwave dishes, feeder cables, and ancillary equipment:
  - Discuss the typical issues and maintenance requirements for these components.
  - Explain the importance of regular inspections, cleaning, and performance checks.
  - Highlight best practices for maintaining and troubleshooting these components.
- Discuss preventive maintenance of telecom structures:
  - Explain the importance of proactive maintenance to prevent structural issues.
  - Discuss inspection techniques, corrosion prevention, and structural integrity checks.
  - Highlight the role of regular maintenance in ensuring safe and reliable operations.
- Discuss maintenance of telecom structures, lifting and personal safety equipment:
  - Explain the procedures for maintaining telecom structures and equipment.
  - Discuss the importance of proper maintenance of lifting and personal safety equipment.
  - Highlight the significance of adherence to safety regulations and equipment certifications.

Elaborate

- Tower ladders, boom lifts, cross lifts, and other safety mechanisms to climb cell towers:
  - Explain the different types of equipment used for climbing cell towers safely.
  - Discuss the proper usage, inspection, and maintenance of these safety mechanisms.

  Carrying out appropriate troubleshooting for mechanical or electrical connections:
  - Explain the steps involved in troubleshooting mechanical and electrical connections.
  - Discuss common issues and techniques for identifying and resolving connection problems.

  Identification and rectification of misalignment of telecom antennas:
  - Discuss the impact of misalignment on signal performance and coverage.
  - Highlight the methods and tools used to rectify misalignment.

Demonstrate

- Demonstrate the use of a multimeter to measure electrical parameters and earthing values.
- Show participants how to interpret the readings and troubleshoot any issues identified.

Activity

- Name of the activity: Maintenance Checklist Exercise
- Objective of the activity: Reinforce participants' understanding of maintenance procedures and the importance of following checklists.
- Resources: Sample maintenance checklists or forms, Pen and paper for participants
- Time Duration: 30 minutes
- Instructions
  - Distribute a sample maintenance checklist or form to each participant.
  - Instruct participants to review the checklist and familiarize themselves with the maintenance tasks listed.
  - Ask participants to work individually or in pairs to complete the checklist based on their understanding of the maintenance activities discussed in the session.
  - Encourage participants to discuss and compare their responses, ensuring they understand the importance of each task.
  - Facilitate a group discussion to review the checklist and address any questions or clarifications.
  - Emphasize the significance of following maintenance checklists to ensure thorough and consistent maintenance practices.
- Outcome: This activity will reinforce participants' knowledge of maintenance activities and the importance of following checklists for effective maintenance.

Notes for Facilitation

- Encourage active participation and engagement throughout the session.
- Relate the topics to real-life examples and experiences to enhance understanding.
- Use visuals, diagrams, and multimedia to support explanations and demonstrations.
- Provide opportunities for hands-on practice or demonstrations whenever possible.
- Emphasize the importance of safety practices and adherence to regulations during maintenance activities.

Say

- Welcome, everyone, to the session on upgrading telecom equipment.
- Today, we will explore the process of upgrading telecom structures, wireless telecom sites, and equipment.
- We will also discuss the importance of preparing relevant records as per the organizational policy. Let's begin by setting the agenda for today's session."

Ask

- Why is it important to upgrade telecom structures?
- Why is it necessary to maintain relevant records during the upgrade process?

Elaborate

- Upgrading Telecom Structures:
  - Discuss the reasons for upgrading, such as capacity expansion or technological advancements.
  - Explain the importance of proper planning, assessment, and coordination during the upgrade process.
  - Highlight the role of safety protocols and stakeholder engagement.
- Upgrading Wireless Telecom Sites and Equipment:
  - Explain the need for upgrading wireless sites to support new technologies or improve network performance.
  - Discuss the steps involved in equipment replacement, site preparation, installation, and integration.
  - Highlight the significance of testing and commissioning to ensure proper functionality.
- Prepare Relevant Records as per the Organizational Policy:
- Explain the importance of maintaining accurate and up-to-date records during the upgrade process.
- Discuss the types of records to be prepared, such as equipment inventory, configuration details, and change management documentation.
- Highlight the role of these records in ensuring accountability, traceability, and compliance.

Activity

- **Activity:** Record-Keeping Exercise
- **Objective of the activity:** Reinforce participants' understanding of the importance of maintaining relevant records during the upgrade process.
- **Resources:** Sample organizational policy documents, Pen and paper for participants
- **Time Duration:** 30 minutes
- **Instructions:**
  - Distribute a sample organizational policy document to each participant.
  - Instruct participants to review the document and identify the types of records that need to be prepared during the upgrade process.
  - Ask participants to work individually or in pairs to create a checklist of these records.
  - Facilitate a group discussion to compare and consolidate the checklists, ensuring all essential records are included.
  - Discuss the importance of each record type and the potential impact of inadequate record-keeping practices.
- **Outcome:** This activity will reinforce participants' knowledge of the record-keeping requirements during telecom equipment upgrades and highlight the significance of maintaining accurate and comprehensive records.

Notes for Facilitation

- Encourage active participation and address any questions or concerns raised by participants.
- Relate the topics to real-life examples and experiences to enhance understanding.
- Use visuals, diagrams, and multimedia to support explanations and demonstrations.
- Emphasize the importance of following organizational policies and procedures during telecom equipment upgrades.
- Encourage participants to actively engage in the activity and reflect on their own record-keeping practices.

UNIT 3.2: Decommissioning and Recovery of Telecom Equipment

Unit Objectives

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

1. Explain the standard processes for telecom site decommissioning and equipment removal.
2. Describe the step-by-step procedure for dismantling antennas, mounts, feeder cables, and telecom components.
3. Discuss the importance of following safety precautions while removing telecom structures and materials.
4. Elucidate the best practices for recovering, organizing, and storing decommissioned telecom equipment and cabling.
5. Describe the impact of decommissioning activities on existing network operations and methods to minimize disruptions.
6. Explain the site decommissioning plans and their role in ensuring compliance with industry standards.
7. Enlist the documentation and reporting requirements for equipment recovery.
8. Discuss the environmental and waste management guidelines for handling and disposing of telecom materials.
9. Demonstrate the process of dismantling antennas, mounts, feeder cables, and telecom components safely.
10. Show how to recover and organize decommissioned telecom equipment and cabling for reuse or disposal.
11. Demonstrate the correct use of safety gear and tools while removing redundant telecom structures.
12. Show how to follow a site decommissioning plan to ensure compliance with industry standards.
13. Demonstrate the techniques to minimize network disruption during the decommissioning process.
14. Show how to document and report the recovered equipment and materials for inventory tracking.
15. Demonstrate the correct methods for handling, storing, and disposing of telecom materials following environmental regulations.

Resources to be Used

Participant handbook, Presentation slides or visual aids, Samples or visuals of decommissioned telecom sites and structures, Handouts or reference materials on swapping and decommissioning procedures, Tools or equipment used in the calibration procedure.

Say

- Welcome, everyone, to the session on Decommissioning of Telecom Site and Equipment.
- Today, we will explore the process of swapping and decommissioning mobile telecom sites and structures.
- We will also discuss the recovery of network equipment, the role of telecom riggers in dismantling decommissioned equipment, and the calibration procedure. Let's begin by setting the agenda for today's session."

Do

- Start the session by providing an overview of each topic, highlighting their significance in decommissioning telecom sites and equipment.
- Engage the participants through interactive discussions, encouraging them to share their experiences and insights related to decommissioning activities they have been involved in or witnessed.
- Use real-life examples or case studies to illustrate the concepts and facilitate group discussions on best practices and challenges faced during decommissioning.
- Conduct practical demonstrations or hands-on activities, such as equipment dismantling practice, to allow participants to apply their knowledge and skills in a simulated environment. Provide guidance and feedback as they perform the activities.

Ask

- Why is it necessary to decommission mobile telecom sites and structures?
- What are the considerations for recovering network equipment during decommissioning?
- What is the role of telecom riggers in the dismantling process?

Elaborate

- Swapping and Decommissioning of Mobile Telecom Sites and Structures:
  - Discuss the reasons for swapping or decommissioning sites and the planning involved.
  - Explain the steps of dismantling and removing equipment, ensuring safety and compliance.

4Recovering Network Equipment:

  - Identify the different types of network equipment and their significance.
  - Discuss the importance of recovering network equipment during decommissioning.
  - Explain the procedures for identifying, documenting, and managing recovered equipment.
  - Highlight considerations for refurbishment, recycling, or disposal.
- Role of Telecom Rigger in Dismantling Decommissioned Telecom Equipment:
  - Explain the responsibilities and skills required of telecom riggers in the decommissioning process.
  - Discuss the importance of following safety protocols and using appropriate tools and equipment.
  - Highlight the need for proper documentation and reporting during dismantling activities.
- Calibration Procedure of Telecom Equipment:
  - Discuss the importance of calibrating telecom equipment for accurate measurements and functionality.
  - Explain the calibration process, including setup, reference usage, and verification steps.
  - Highlight the documentation and record-keeping requirements associated with calibration.

Demonstrate

- Demonstrate the dismantling process of decommissioned telecom equipment using visual aids or samples.
- Show participants the proper techniques, tools, and safety precautions involved.

Activity

- Name of the activity: Equipment Calibration Exercise
- Objective of the activity: Provide participants with hands-on experience in calibrating telecom equipment.
- Resources: Telecom equipment requiring calibration (e.g., multimeter), Calibration standards or reference equipment, Calibration procedure documentation
- Time Duration: 45 minutes
- Instructions:
    - Divide participants into small groups.
    - Provide each group with the required telecom equipment and calibration standards.
    - Instruct participants to follow the provided calibration procedure to calibrate the equipment.
    - Monitor and assist the groups as needed.
    - After the calibration exercise, encourage participants to discuss their findings and challenges.
    - Facilitate a group discussion on the importance of calibration and the impact of accurate measurements on telecom operations.
- Outcome: Participants will gain practical experience in calibrating telecom equipment, understand the importance of calibration, and be able to discuss the impact of accurate measurements on telecom operations.

Notes for Facilitation

- Encourage active participation and address any questions or concerns raised by participants.
- Emphasize the importance of safety protocols and compliance with regulations during decommissioning activities.
- Use visuals, diagrams, and practical demonstrations to enhance understanding.
- Provide real-life examples and case studies related to the topics to make the content more relatable.
- Highlight the importance of documentation, record-keeping, and adherence to organizational procedures throughout the decommissioning process.

Exercise

Answers to exercises for PHB

A. Short Answer Questions

1. Preventive maintenance involves routine inspections, cleaning, testing, and servicing to avoid failures before they occur. Corrective maintenance is performed after a fault or failure happens and focuses on repairing or replacing the malfunctioning components.
2. Common structural issues include corrosion, loose bolts, cracked welds, bent members, and foundation damage. These can be detected through visual inspection, rust assessment, structural alignment checks, vibration monitoring, and periodic tower audits.
3. Securing bolts, brackets, and mounts is essential because loose or improperly tightened components can lead to misalignment, structural instability, excessive vibrations, equipment damage, and safety risks. Proper torque ensures long-term durability and tower safety.
4. Telecom site decommissioning involves disconnecting power and transmission lines, labeling and safely removing cables, dismantling antennas and mounts, lowering equipment using rigging tools, removing active electronics, and ensuring the site is cleared and restored according to guidelines.
5. Environmental and waste management guidelines involve segregating recyclable and non-recyclable materials, disposing of batteries, cables, and hazardous items through authorized facilities, preventing soil or water contamination, and maintaining documentation to ensure compliance with environmental standards.

B. Multiple Choice Questions (MCQs)

1. c) DTF analyzer
2. b) Ensure regular inspection and performance reliability
3. b) Environmental exposure and poor maintenance
4. a) Disconnect all power and transmission lines
5. b) Track activities, equipment condition, and compliance

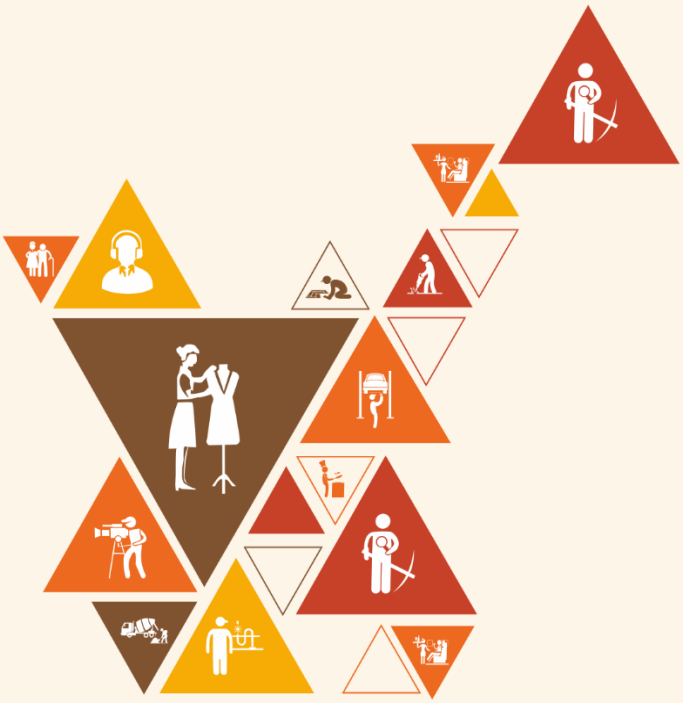
C. Fill in the Blanks

1. Preventive
2. loosening
3. Gloves
4. Decommissioning
5. waste-disposal guidelines

Notes

4. Follow the Occupational Health and Safety Instructions during Tower Climbing

Unit 4.1 - Pre-climbing Tower Inspection
Unit 4.2 - Process of Checking the Safety Equipment and Work Site Conditions
Unit 4.3 - Demonstrate the Process of Carrying out Tower Operations Following Safety Instructions



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Key Learning Outcomes 

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

1. Explain the procedures for conducting pre-climb safety inspections and identifying potential hazards at telecom worksites.
2. Describe the importance of PPE, environmental assessments, and compliance with safety regulations before climbing towers.
3. Explain the procedures for safe tower climbing, fall prevention, and the correct use of safety equipment.
4. Describe emergency preparedness strategies, including first aid, incident reporting, and hazard mitigation.

UNIT 4.1: Pre-climbing Tower Inspection

Unit Objectives

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

1. Explain industry best practices for safe tower climbing and fall protection.
2. Describe the importance of well-maintained and certified safety equipment.
3. Elucidate the essential PPE requirements for tower climbing.
4. Discuss the procedures for conducting a visual inspection of the tower to detect loose hardware, rust, or structural damage.
5. Explain how to identify and mitigate climbing hazards such as bird nests, insect infestations, or external attachments.
6. Describe the process of inspecting turnbuckles and verifying proper tensioning of guy wires in guyed towers.
7. Enlist the steps to examine anchor points and supporting components for corrosion or mechanical damage.
8. Discuss the significance of verifying the vertical alignment of the tower using a plumb line or inclinometer.
9. Explain the importance of reporting identified defects and ensuring necessary repairs before climbing.
10. Describe the methods for conducting a Job Hazard Analysis (JHA) and developing an Emergency Action Plan (EAP).
11. Discuss electrical hazard mitigation strategies and safety regulations, including proximity to power lines.
12. Explain weather assessment techniques and decision-making for halting tower operations in extreme conditions.
13. Describe the procedures for reading and interpreting safety manuals and SOPs.
14. Elucidate the record-keeping process for safety inspections and maintenance logs. Demonstrate a visual inspection of the tower to detect structural defects before climbing.
15. Show how to identify and mitigate climbing hazards such as bird nests, insect infestations, or loose attachments.
16. Demonstrate the inspection of turnbuckles and verification of guy wire tensioning in guyed towers.
17. Show how to examine anchor points and supporting components for corrosion or mechanical damage.
18. Demonstrate the process of verifying vertical tower alignment using a plumb line or inclinometer.
19. Show how to inspect ladders, hoisting, and rigging equipment for operational readiness.
20. Demonstrate the proper pre-use inspection of PPE, including harnesses, lanyards, helmets, gloves, and boots.
21. Show how to measure RF exposure levels to ensure compliance with safety standards.
22. Demonstrate how to identify electrical hazards and implement mitigation strategies.
23. Show how to conduct a Job Hazard Analysis (JHA) and develop an Emergency Action Plan (EAP).
24. Demonstrate how to measure wind velocity and assess weather conditions for safe tower climbing.
25. Show how to position vehicles and equipment safely at the worksite.
26. Demonstrate the correct procedure for documenting safety inspections and maintenance logs.

Resources to be Used

Participant handbook, Presentation slides on the topics covered in the unit, Handouts or worksheets for note-taking, Binoculars for demonstration and practice, Two-way radios for demonstration and practice, Safety gear (e.g., harness, helmet, safety glasses), Visual aids (e.g., images or videos of tower inspections)

Say

- Welcome, everyone, to the session on Perform Pre-Climb Tower Inspection.
- Today, we will focus on the importance of getting adequate training and practice in tower climbing and inspecting the tower before climbing, using binoculars to check for loose or missing hardware.
- We will also understand the importance of using two-way radio for telecom riggers.

Ask

- Why is it important to receive proper training and practice in tower climbing?
- What potential risks or hazards can be identified during a tower inspection?

Elaborate

- Importance of Getting Adequate Training and Practice in Tower Climbing:
  - Discuss the potential risks and hazards associated with tower climbing.
  - Explain the need for proper training, certification, and ongoing practice to ensure safety.
  - Highlight the importance of following industry standards and best practices in tower climbing.
- Inspecting Tower before Climbing:
  - Learn about the key elements and components to inspect during a pre-climb tower inspection.
  - Understand the importance of visual inspections, identifying structural issues, and checking for potential hazards.
- Using Binoculars to Check for Loose or Missing Hardware:
  - Explain the role of binoculars in conducting a detailed visual inspection of the tower.
  - Demonstrate how to use binoculars effectively to identify loose or missing hardware, damaged components, or signs of deterioration.
- Importance of Using Two-Way Radio for Telecom Riggers:
  - Discuss the role of effective communication in tower climbing operations.
  - Highlight the benefits of using two-way radios for coordination, safety updates, and emergency situations.

Practical

- Perform a practical demonstration of a tower inspection using binoculars.
- Show the trainees how to scan the tower systematically, focusing on different areas and hardware connections.
- Emphasize the importance of attention to detail and thoroughness in the inspection process.

Activity

- **Name of the activity:** Tower Inspection Practice
- **Objective:** To provide hands-on experience in conducting a pre-climb tower inspection.
- **Resources:** Safety gear, binoculars, visual aids
- **Time Duration:** 45 minutes
- **Instructions:**
  - Divide the trainees into small groups.
  - Provide each group with safety gear, binoculars, and visual aids representing different tower components.
  - Instruct the groups to conduct a simulated tower inspection, following the step-by-step process discussed in the session.
  - Encourage the groups to discuss their findings, share observations, and address any safety concerns they identify.
  - Rotate the groups and provide feedback and guidance as they perform the activity.
  - Conclude the activity by discussing the key findings, common challenges, and lessons learned from the inspection exercise.
- **Outcome:** The trainees will have gained practical experience in conducting pre-climb tower inspections, improving their ability to identify potential hazards, and ensuring the safety of tower climbing operations.

Notes for Facilitation

- Emphasize the importance of safety throughout the session and during the activity. Reinforce the use of safety gear and adherence to safety protocols.
- Encourage active participation and engagement from all trainees during discussions and activities.
- Provide real-life examples and case studies related to tower inspection failures and their consequences to highlight the significance of thorough inspections.
- Ensure that trainees understand the importance of documenting and reporting any identified issues or safety concerns during tower inspections.
- Highlight the need for continuous learning and staying updated with industry standards and best practices in tower climbing and inspection procedures.

UNIT 4.2: Process of Checking the Safety Equipment and Work Site Conditions

Unit Objectives

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

1. Explain industry safety protocols for tower climbing and fall protection.
2. Describe the process of registering at the worksite and adhering to safety protocols before climbing.
3. Elucidate the importance of securing a full-body harness and maintaining 100% tie-off at all times.
4. Discuss the correct use of a safety cable climb system or double lanyards while moving on the tower.
5. Explain how to properly use PPE following manufacturer guidelines.
6. Describe standard climbing procedures to prevent falls or slips.
7. Discuss the importance of maintaining continuous communication with the ground crew via a two-way radio.
8. Explain how to identify and report health issues that may impact climbing performance.
9. Elaborate on maintaining a safe distance from live power lines and coordinating de-energization.
10. Describe the procedures for placing warning signs near live electrical zones to prevent accidents.
11. Explain the key industry safety regulations (e.g., OSHA and local standards) relevant to telecom tower climbing.
12. Discuss the procedures for administering basic first aid in case of injuries or medical emergencies.
13. Describe the process of preparing incident reports for workplace hazards or accidents.
14. Explain decision-making strategies for emergencies, including extreme weather and equipment failure.
15. Discuss team collaboration techniques for maintaining a risk-free work environment.

Resources to be Used

Participant handbook, Presentation slides on the topics covered in the unit, Handouts or worksheets for note-taking, Safety equipment samples (e.g., harness, helmet, safety glasses, gloves), Tools, hoisting and rigging equipment samples, First aid kit and first aid training materials, RF safety regulations documentation, Electrical health and safety standards documentation, Visual aids (e.g., images or videos) related to safety equipment and work site conditions

Say

- Welcome, everyone, to the session on Safety Equipment and Work Site Conditions. Today, we will cover a range of topics focused on ensuring the safety of tower climbing and rigging work.
- We will discuss the importance of safety equipment, the dangers of performing rigging work without using personal protective equipment (PPE), inspections of tools and equipment, RF safety regulations, first aid and first aid kits, government regulations for telecom sites, electrical health and safety standards, and conducting comprehensive safety planning for job sites.

Ask

- Why is it important to use personal protective equipment (PPE) when performing rigging work?
- What are some potential hazards or risks associated with RF exposure in telecom sites?

Elaborate

- Safety Equipment for Tower Climbing:
  - Identify the essential safety equipment required for tower climbing (e.g., harness, helmet, safety glasses, gloves).
  - Explain the purpose and proper usage of each safety equipment item.
- Dangers of Performing Rigging Work without Using PPE:
  - Discuss the potential risks and hazards of not using personal protective equipment (PPE) during rigging work.
  - Highlight the importance of PPE in mitigating injuries and maintaining a safe work environment.
- Conducting Inspections of Tools, Hoisting and Rigging Equipment, and Other Machinery:
  - Learn about the importance of regular inspections to ensure the safety and proper functioning of tools, hoisting and rigging equipment, and other machinery used in telecom operations.
  - Explain the key elements and steps involved in conducting thorough inspections.
- RF Safety Regulations:
  - Provide an overview of RF (radio frequency) safety regulations and their significance in the telecom industry.
  - Discuss the potential health risks associated with RF exposure and the measures to mitigate them.
- First Aid and First Aid Box:
  - Explain the importance of first aid in emergency situations.
  - Discuss the contents and proper maintenance of a first aid box.
- First Aid for Different Types of Medical Emergencies:
  - Provide an overview of basic first aid procedures for common medical emergencies (e.g., bleeding, fractures, burns, cardiac arrest).
  - Discuss the importance of emergency preparedness and how to respond to medical situations.
- Government Regulations for Telecom Sites:
  - Explain the role of government regulations in ensuring safety and compliance at telecom sites.
  - Discuss key regulations and standards relevant to telecom operations.
- Electrical Health and Safety Standards:
  - Highlight the importance of electrical health and safety standards in telecom operations.
  - Discuss key safety measures and precautions related to electrical work.
- Conducting Comprehensive Safety Planning for Every Job Site:
  - Explain the process of conducting comprehensive safety planning for job sites, including hazard identification, risk assessment, and implementation of safety measures.

Demonstrate

- Perform practical demonstrations of safety equipment usage, tool and equipment inspections, and first aid procedures.
- Show the trainees how to properly wear safety equipment, conduct inspections, and administer basic first aid techniques. Emphasize the importance of following proper procedures and guidelines.

Activity

- **Name of the activity:** Safety Equipment Inspection and Demonstration
- **Objective:** To reinforce understanding of safety equipment usage and conducting inspections.
- **Resources:** Safety equipment samples, tools and equipment samples, visual aids
- **Time Duration:** 60 minutes
- **Instructions:**
  - Divide the trainees into small groups.
  - Provide each group with safety equipment samples and tools and equipment samples.
  - Instruct the groups to conduct inspections of the safety equipment and tools, following the guidelines discussed in the session.
  - Encourage the groups to discuss their findings, share observations, and address any safety concerns they identify.
  - Rotate the groups and provide feedback and guidance as they perform the activity.
  - Conclude the activity by discussing the key findings, common challenges, and best practices related to safety equipment inspections.
- **Outcome:** The trainees will have gained practical experience in inspecting safety equipment and tools, reinforcing their understanding of safety requirements in telecom operations.

Notes for Facilitation

- Emphasize the importance of safety throughout the session and during the activity. Reinforce the use of safety equipment and adherence to safety protocols.
- Encourage active participation and engagement from all trainees during discussions and activities.
- Provide real-life examples and case studies related to safety incidents in tower climbing and rigging work to highlight the consequences of neglecting safety measures.
- Facilitate group discussions to encourage knowledge sharing and the exchange of best practices among trainees.
- Highlight the significance of ongoing training and staying updated with industry standards and regulations related to safety equipment and work site conditions.

UNIT 4.3: Demonstrate the Process of Carrying out Tower Operations Following Safety Instructions

Unit Objectives

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

1. Demonstrate the registration process and adherence to safety protocols before climbing.
2. Show how to properly secure a full-body harness and maintain 100% tie-off at all times.
3. Demonstrate the correct use of a safety cable climb system or double lanyards while moving on the tower.
4. Show how to inspect, wear, and adjust PPE according to manufacturer guidelines.
5. Demonstrate standard climbing techniques to prevent falls or slips.
6. Show how to use a two-way radio to maintain continuous communication with the ground crew.
7. Demonstrate how to report health issues that may impact climbing performance.
8. Show how to identify and maintain a safe distance from live power lines or coordinate de-energization.
9. Demonstrate the proper placement of warning signs near live electrical zones.
10. Show how to administer basic first aid for common tower climbing injuries.
11. Demonstrate the process of documenting and reporting unsafe conditions and workplace hazards.
12. Show how to prepare an incident report following an accident or emergency.

Resources to be Used

Participant handbook, Presentation slides on the topics covered in the unit, Handouts or worksheets for note-taking, Safety instructions and guidelines documents, Incident report templates, Visual aids (e.g., images or videos) related to tower operations and safety practices

Say

- Welcome, everyone, to the session on Carrying out Tower Operations Following Safety Instructions. Today, we will focus on the essential safety measures and practices required during tower operations.
- We will cover topics such as identifying unsafe conditions, checking weather conditions, the importance of physical health, enhancing safety skills through regular training, appropriate climbing and working practices, and preparing and reviewing incident reports. Let's begin by setting our agenda for today."

Do

- Introduce the importance of safety instructions and their role in tower operations.
- Discuss the topics of identifying unsafe conditions, checking weather conditions, and the importance of physical health.
- Explain the significance of continual enhancement of safety skills and awareness through regular training.

Ask

- Why is it important to check weather conditions before working at heights?
- Why is it crucial to avoid working at heights when experiencing impaired physical health?

Elaborate

- Identifying Unsafe Conditions at the Work Site:
  - Explain how to identify and address potential hazards and unsafe conditions at a work site, such as structural damage, loose hardware, or electrical hazards.
  - Discuss the importance of reporting and resolving unsafe conditions promptly.
- Checking Weather Conditions before Working at Height:
  - Highlight the significance of assessing weather conditions before engaging in tower operations.
  - Explain how adverse weather conditions, such as strong winds or thunderstorms, can pose risks and affect the safety of workers.
- Importance of Not Working at Heights in Case of Impaired Physical Health:
  - Discuss the potential risks associated with working at heights while experiencing impaired physical health, such as dizziness, loss of balance, or decreased coordination.
  - Emphasize the importance of recognizing and prioritizing personal well-being and seeking medical attention when necessary.
- Importance of Continually Enhancing Safety Skills and Awareness through Regular Training:
  - Stress the significance of ongoing training to stay updated with safety practices, industry standards, and regulatory requirements.
  - Discuss the benefits of continuous learning in maintaining a safe work environment and minimizing risks.
- Appropriate Climbing and Working Practices for Different Telecom Structures:
  - Explain the specific climbing and working practices applicable to various types of telecom structures (e.g., monopoles, lattice towers, rooftops).
  - Discuss techniques for safely ascending and descending towers, proper use of safety equipment, and secure attachment methods.
- Preparing and Reviewing Incident Reports:
  - Discuss the importance of documenting incidents and near-misses to improve safety procedures and prevent future occurrences.
  - Explain the process of preparing and reviewing incident reports, including capturing accurate information and identifying corrective actions.

Practical

- Conduct practical demonstrations related to tower operations and safety practices, such as demonstrating proper climbing techniques, using safety equipment, and assessing work site conditions.
- Emphasize the correct procedures and highlight potential hazards to enhance trainees' understanding of safe practices.

Activity

- Name of the activity: Tower Safety Scenario Analysis
- Objective: To analyze tower safety scenarios and apply knowledge of safety instructions.
- Resources: Safety instructions and guidelines, incident report templates, visual aids
- Time Duration: 45 minutes
- Instructions:
  - Divide the trainees into small groups.
  - Provide each group with a safety scenario related to tower operations.
  - Instruct the groups to analyze the scenario, identify potential hazards, and discuss appropriate safety measures to mitigate risks.
  - Ask each group to prepare an incident report based on the scenario, documenting the incident details, recommended corrective actions, and lessons learned.
  - Allocate time for group presentations, allowing each group to share their findings and recommendations.
  - Facilitate a group discussion to compare and evaluate different approaches, highlighting the importance of effective safety practices.
- Outcome: The trainees will have improved their ability to analyze tower safety scenarios, identify potential hazards, and propose appropriate safety measures to ensure safe tower operations.

Notes for Facilitation

- Emphasize the importance of active participation, engagement, and collaboration among trainees during discussions and activities.
- Encourage trainees to share their personal experiences, insights, and challenges related to tower operations and safety practices.
- Incorporate real-life case studies or examples to illustrate the consequences of disregarding safety instructions.
- Remind trainees of the significance of continuous improvement and staying updated with evolving safety guidelines and regulations in the telecom industry.
- Provide additional resources or references for further exploration of the topics covered in the unit, allowing trainees to deepen their knowledge and understanding of tower operations safety.

Field Visit

Conduct a field visit to an actual tower site to provide trainees with practical exposure to tower operations and safety conditions. Ensure proper safety measures are followed during the visit, and facilitate discussions and observations related to the topics covered in the unit.

Exercise

Answers to exercises for PHB

Multiple Choice Question

1. a. It minimizes the chances of accidents and injuries during tower climbing.
2. b. To ensure that the tower is safe for climbing.
3. c. To reduce the risk of accidents and injuries.
4. a. To maintain communication with the ground crew.
5. a. To reduce the risk of accidents and injuries.

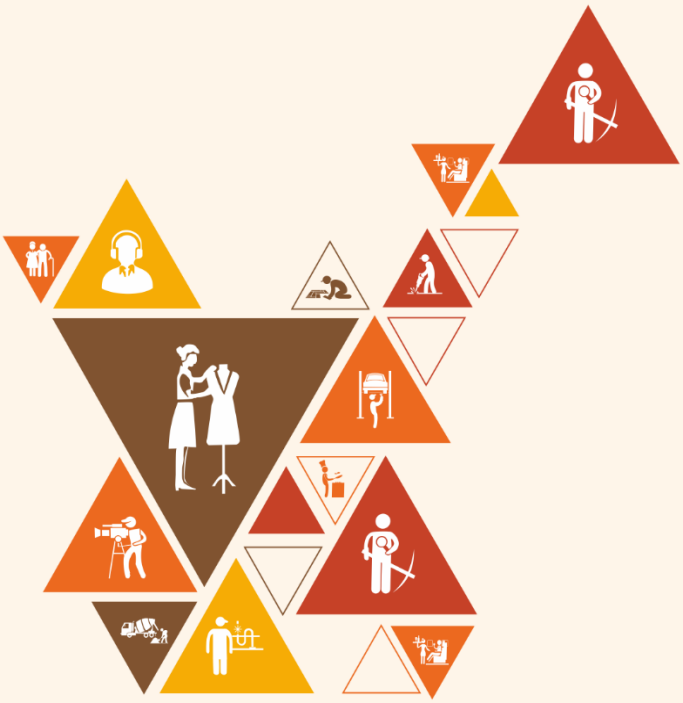
Descriptive Questions:

6. Refer: UNIT 4.1: Perform Pre-Climb Tower Inspection
   Topic - 4.1.2 Inspecting Tower before Climbing
7. Refer: UNIT 4.2: Safety Equipment and Work Site Conditions
   Topic - 4.2.3 RF Safety Regulations
8. Refer: UNIT 4.2: Safety Equipment and Work Site Conditions
   Topic - 4.2.2 Conducting Inspections of Tools, Hoisting and Rigging Equipment, and Other Machinery
9. Refer: UNIT 4.2: Safety Equipment and Work Site Conditions
   Topic - 4.2.6 Electrical Health and Safety Standards
10. Refer: UNIT 4.2: Safety Equipment and Work Site Conditions
    Topic - 4.2.4 First Aid

Notes

5. Follow Sustainable Practices in Telecom Infrastructure Installation

Unit 5.1 - Environmental Sustainability and Waste Management in the Telecommunications Industry



TEL/N9105

Key Learning Outcomes

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

1. Determine the methods used to diagnose and rectify wiring faults in wireless networks.
2. Explain the process of troubleshooting and repairing Wi-Fi backhaul equipment operating at 5 GHz.
3. Describe the procedures for troubleshooting and restoring Wi-Fi access points operating at 2.4 GHz.
4. Discuss the steps involved in carrying out documentation and restoring the worksite after wireless network fault rectification.

UNIT 5.1: Environmental Sustainability and Waste Management in the Telecommunications Industry

Unit Objectives

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

1. Explain national and international environmental laws and regulations governing telecom infrastructure installation.
2. Describe e-waste management and recycling policies applicable to telecom sites.
3. Identify occupational safety and health standards related to environmental practices.
4. List recyclable and refurbishable telecom components and their proper handling techniques.
5. Define methods for reducing electronic waste through responsible procurement and reuse.
6. Explain advancements in eco-friendly telecom infrastructure and the use of renewable energy sources.
7. Elucidate techniques for optimizing energy consumption in telecom operations.
8. Describe proper disposal methods for hazardous and non-hazardous waste.
9. Explain procedures for collaborating with authorized agencies for waste collection and disposal.
10. Identify best practices for reducing the carbon footprint of telecom installations.
11. Show how to identify telecom components suitable for recycling or refurbishment.
12. Demonstrate the process of sorting electronic and non-electronic waste according to disposal protocols.
13. Show the correct labeling and storage of recyclable and refurbishable components.
14. Demonstrate the safe handling and disposal of hazardous and non-hazardous waste.
15. Show the proper coordination process with authorized e-waste recycling units or disposal agencies.
16. Demonstrate the use of energy-efficient tools and equipment during telecom installations.
17. Show how to optimize infrastructure placement to minimize energy consumption.
18. Demonstrate the maintenance of records for waste disposal and sustainability measures.
19. Show how to guide team members on sustainable practices and encourage environmentally responsible habits.

Resources to be Used

Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, sample e-waste bins, labels, PPE (gloves, masks), and demonstration components.

Notes For Facilitation

In this unit, we will discuss environmental sustainability practices and waste management procedures followed in the telecom sector.

Say

Good Morning everyone, and welcome back!
In this session, we will explore how the telecom industry is adopting sustainable practices and managing waste responsibly. As future broadband technicians, your role in keeping our environment clean and safe is extremely important.

Ask

Ask the participants the following questions:

- Why do you think sustainability is important in the telecom sector?
- Have you ever seen or handled e-waste before?

What challenges did you notice?
Write down the trainees' answers on the whiteboard or flipchart.
Use their responses as a starting point to explain today's lesson.

Elaborate

In this session, we will discuss the following points:

- Environmental Sustainability in Telecom Industry
- Environmental Laws and Regulations in Telecommunications.
- E-Waste in the Telecom Industry
- E-Waste Management Process in the Telecom Industry
- Occupational Safety in Environmental Practices for Telecom E-Waste Management
- Energy Optimization in Telecom Operations
- Reducing the Carbon Footprint in Telecom
- Documentation and Compliance Tracking in Telecom Environmental Management

Say

Let us now participate in an activity to explore these topics more deeply.

Activity

Duration: 30 minutes

Resources: Sample components (cables, adapters, packaging materials), e-waste bins, labels, gloves, markers, projector, laptop, whiteboard.

Steps:

1. Divide the class into small groups.
2. Give each group a mix of telecom-related items (e.g., cable scraps, old router parts, batteries, plastic packaging).
3. Ask them to sort the items into:
    - Recyclable
    - Refurbishable
    - Hazardous waste
    - General waste
4. Display a checklist on the projector for guidance.
5. After all groups finish, reveal the correct sorting categories and explain the reasoning behind each decision.

Do

- Ask a student to maintain scores or observations on the whiteboard.
- Write down important points shared by trainees.
- Add your own insights based on industry best practices.
- Encourage every student to engage in discussions and participate in sorting activities.
- Ask one participant to summarize the key learnings of the session.
- Maintain positive energy and show enthusiasm for sustainability practices.

Activity

Duration: 25 minutes

Resources: Laptop, projector, sample telecom equipment (router/ONT), power meter (if available), pictures/videos of solar-powered telecom sites, whiteboard, markers.

Steps:

1. Divide the class into small groups.
2. Play a short video or show images demonstrating energy-efficient telecom practices such as:
3. Use of solar panels
    - Smart cooling techniques
    - Low-power CPE devices
    - Optimized equipment placement to reduce heat load

Provide each group with a scenario—for example:“A broadband installation site has high energy consumption due to poor equipment placement. Suggest three improvements.”

4. Ask the groups to discuss and write down their solutions.
5. Invite one member from each group to present their recommendations.
6. Summarize the key practical techniques used in the industry to save energy.

Do

- Ask a trainee to note down the key energy-saving suggestions shared by each group on the whiteboard.
- Highlight the practical feasibility of each idea and relate them to real telecom installation scenarios.
- Add your own insights—especially where small changes (like repositioning equipment or using smart adapters) can lead to big energy savings.
- Encourage quieter students to share their thoughts or add to the discussion.
- Ask one participant to briefly recap the energy-efficiency techniques discussed in the activity.
- Reinforce the importance of using energy-efficient tools and practicing mindful consumption during field installations.

Notes for Facilitation

- Ask trainees if they have any questions or doubts regarding waste handling or environmental laws.
- Encourage peer learning by inviting other trainees to answer queries.
- Remind participants to read the related section in their participant manual.
- Reinforce the importance of safe handling, labeling, and correct segregation while working on telecom sites.

Exercise

Answers to exercises for PHB

A. Multiple-Choice Questions (MCQs)

1. b) To avoid damage to the cable corec) Duct laying method
2. b) Cable winch machine
3. b) To avoid excessive friction and damage
4. b) Using approved cable ties or clamps

B. Descriptive Questions

1. Step-by-step procedure for direct burial cable laying

- Conduct a site survey and mark the cable route.
- Excavate the trench to the required depth.
- Lay a layer of sand or soft soil at the base.
- Place the cable carefully without exceeding bend radius.
- Cover the cable with sand and protective tiles/warning tape.
- Backfill the trench and compact the soil.
- Test cable continuity and performance after installation.

2. Safety precautions during underground cable laying

- Ensure all underground utilities (water, gas, electricity) are identified before digging.
- Use PPE: gloves, safety shoes, helmets, eye protection.
- Maintain safe distance from live electrical cables.
- Use proper tools for excavation and lifting.
- Avoid working in wet or unstable soil conditions.
- Ensure trench shoring to prevent collapse.

3. Difference between aerial and underground cable laying

- Cost: Aerial is cheaper; underground is more expensive due to excavation and protection. materials.
- Durability: Underground cables are safer from weather and vandalism; aerial cables are more exposed.
- Maintenance: Aerial cables are easy to access and repair; underground maintenance is difficult, costly, and time-consuming

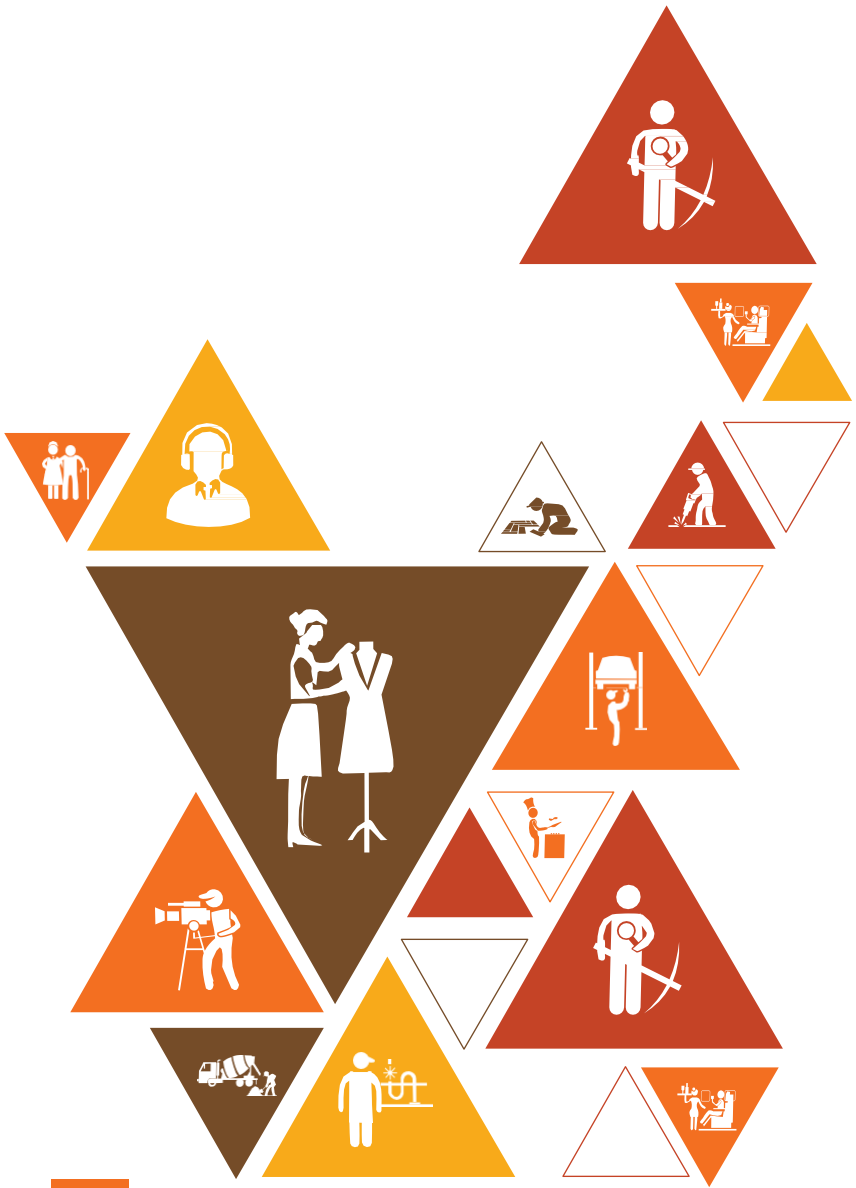
4. Role and importance of cable jointing and termination

- Ensures continuity and reliable signal/power transfer.
- Provides mechanical and environmental protection at connection points.
- Reduces losses, electrical faults, and downtime.
- Maintains safety by insulating and securing conductors properly.

5. Common challenges in urban cable laying & solutions

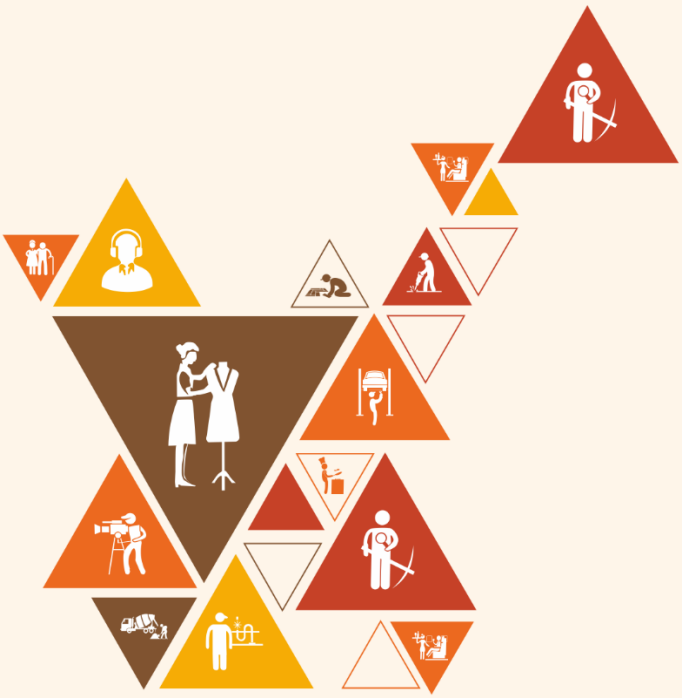
- Limited space: Use micro-trenching and duct methods.
- Traffic congestion: Work during off-peak hours and use proper barricading.
- Utility congestion: Conduct detailed utility mapping and use cable locators.
- Permission and coordination issues: Work closely with local authorities and utility providers.
- Obstructions like buildings, pipelines: Use directional drilling or rerouting techniques.

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



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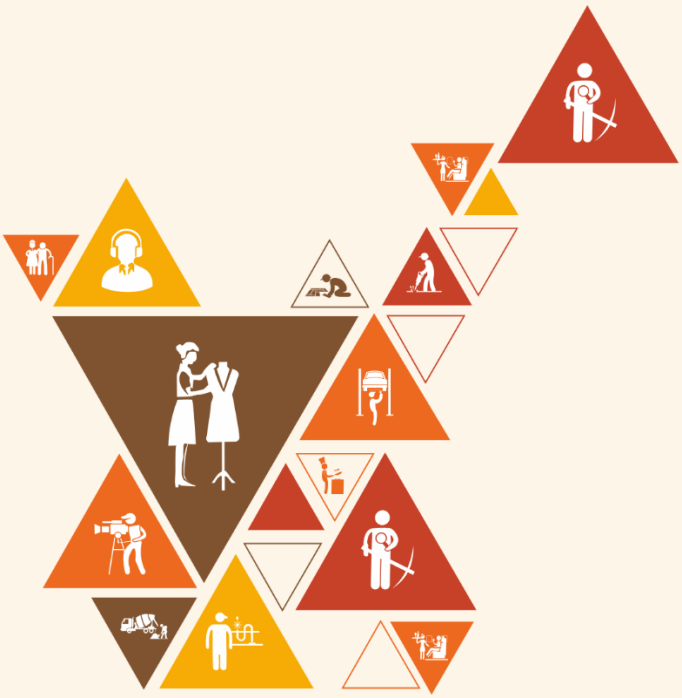
7. Annexure

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:	Telecom Rigger – 5G and Legacy Networks		
Qualification Pack Name & Ref. ID	TEL/Q6212		
Version No.	3.0	**Version Update Date**	08-05-2025
Pre-requisites to Training (if any)	Not Applicable		
Training Outcomes	After the completion of this unit, the participant will be able to: • Explain the process of installing telecom equipment, including rigging, cabling, alignment, and testing procedures on various tower structures. • Describe the steps involved in maintaining, upgrading, and decommissioning telecom infrastructure for 5G and legacy networks. • Discuss the occupational health and safety protocols required for tower climbing, including pre-climb inspections and use of safety equipment. • Explain sustainable practices in telecom infrastructure installation, including waste management, energy efficiency, and compliance with environmental regulations. • Discuss the Employability and Entrepreneurship Skills.		

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
1	Introduction to the Sector and the job role of Telecom Rigger – 5G Legacy Networks (Theory: 05:00 Practical: 00:00)	Understanding the Telecom Industry	• 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	T- 01:00 P- 00:00
		Responsibilities and Policies of a Telecom Rigger	• Discuss the role and responsibilities of a Telecom Rigger – 5G Legacy Networks. • Identify various employment opportunities for a Telecom Rigger – 5G Legacy Networks. • Discuss the organizational policies on workplace ethics, managing sites, quality standards, personnel management, and public relations (PR).				T- 02:00 P- 00:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Workflow and Daily Operations	• Describe the process workflow in the organization and the role of a Telecom Rigger – 5G Legacy Networks in the process. • List the various daily, weekly, monthly operations/activities that take place at the site under a Telecom Rigger – 5G Legacy Networks.				T- 01:00 P- 00:00
		Practical Skills and Application	• Role play based on case studies, outlining the scope, responsibilities, and challenges of a Telecom Rigger – 5G and Legacy Networks. • Analyze the requirements for the course and prepare for the pre-requisites of the course. • Testing of antenna systems for the purposes of fault finding and subsequent rectification. • Demonstrate how to conduct visual inspections of antenna mounts, aerials, co-axial cables, fixings, feeder cables, and anchor points.				T- 01:00 P- 00:00
2	Process of assisting in the in-stallation of telecom equipment	Installation Scope and Require-ments	• Define the scope of installation work by coordinating with supervisors and commissioning engineers. • Analyze blueprints, schematics, and site plans to determine installation requirements.	TEL/N6310 PC1, PC2, KU7, KU11	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discus-sion	Training Kit (Trainer Guide, Pre-sentations). White-board, Marker, Projector, Laptop, Radio Fre-quency (RF) Connector,	T- 02:00 P- 06:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Explain the significance of understanding client requirements and adhering to approved drawings.			Tower Mounted Amplifiers, Remote Radio Unit, Coaxial Cable, Coaxial Connector, Hand and Power Tools like - Cable Cutters, Crimping Pliers, Wire & Cable Strippers, Screw-drivers, Scissors & Knives, Modular & Coaxial Test Equipment, Laser Measuring & Impact Tools	T- 02:00 P- 06:00
		Material Preparation and Inspection	• Assist supervisors by providing relevant inputs and feedback to achieve the scope of work. • Check availability and inspect installation material, tools, equipment, and PPE. • Explain the importance of verifying the quality and condition of installation materials.	TEL/N6310 PC3, PC4, PC5, KU12			T- 02:00 P- 06:00
		Equipment Assembly and Antenna Installation	• Assist in preparing and assembling relevant telecom equipment for installation.	TEL/N6310 PC6, PC7, PC8, PC9, PC10, PC11, KU14, KU15			T- 02:00 P- 05:00
			• Perform antenna assembly, waveguide, and coaxial connector assembly as per instructions. • Assist in erecting telecom structures and installing antennas, feeders, and ancillary equipment.	TEL/N6310 PC6, PC7, PC8, PC9, PC10, PC11, KU14, KU15			T- 02:00 P- 06:00
		Transmission Equipment Installation and Alignment	• Install necessary transmission equipment components and ensure correct alignment. • Explain the process of installing and aligning transmission equipment for optimal performance.	TEL/N6310 PC10, PC11, KU15, KU16, KU17, KU18			T- 02:00 P- 06:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Feeder Cable Installation and Testing	• Assist in the installation of RF antenna systems, RF hardware, and microwave antennas. • Perform installation of feeder cables, high jumpers, and relevant equipment. • Explain the importance of accurate installation and testing of feeder cables.	TEL/N6310 PC12, PC13, PC14, PC15, KU19, KU20			T- 02:00 P- 06:00
		Quality Checks and Trouble-shooting	• Use appropriate tools for quality checks and signal alignment. • Perform Line of Sight (LOS) checks and troubleshoot signal issues. • Explain the importance of LOS checks and troubleshooting for optimal network performance.	TEL/N6310 PC16, PC17, PC18, PC19, PC20, PC21, KU21, KU22			T- 02:00 P- 06:00
		Shelter Room Installation and Testing	• Perform shelter room installations and test equipment within the shelter room. • Explain the process of shelter room installation and testing.	TEL/N6310 PC29, PC30, KU27			T- 02:00 P- 06:00
		Documen-tation and Reporting	• Assist in completing relevant survey reports, documentation, and records. • Explain the importance of accurate documentation and reporting for project handover.	TEL/N6310 PC31, PC32, PC33, KU32, KU33			T- 02:00 P- 06:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Safety and Risk Management	• Follow applicable safety guidelines during rigging operations. • Apply safety practices when working at heights and using appropriate safety equipment. • Explain the significance of safety protocols and risk management in telecom rigging.	TEL/N6310 KU1, KU2, KU3, KU4, KU5			T- 02:00 P- 06:00
		Rigger's Role and Ethical Practices	• Describe the role of a Telecom Rigger and the ethical practices in the industry. • Explain the importance of conducting site audits, upgrading legacy systems, and adhering to workplace ethics.	TEL/N6310 KU6, KU8, KU9, KU10			T- 03:00 P- 05:00
3	Process of assisting in the maintenance, upgradation and decommissioning of telecom equipment and sites	Importance of Site Audits and Safety Measures	• Explain the significance of conducting site audits and ensuring adherence to installation standards. • Describe the importance of checking maintenance requirements, lifting equipment, and safety measures for telecom structures.	TEL/N6323 PC6, KU1, KU2, KU3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, Remote Radio Unit - RRU Frequency band, Optical Fibre Cable, Hand and Power Tool like - Diagonal Pliers, Linesman Pliers. Mini Hacksaw, Adjustable Wrench, Wire Stripper,	T- 02:30 P- 05:00
		Climb and Inspection Techniques	• Use tower ladders, lifts, and safety mechanisms to climb and inspect cell towers and structures. • Identify common maintenance needs of antennas, microwave dishes, and ancillary equipment on telecom structures.	TEL/N6323 PC7, PC8, PC9, KU4			T- 02:30 P- 05:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Maintenance Procedures and Tools	• Assist in estimating Distance to Fault (DTF) measurements for antenna and transmission line maintenance.	TEL/N6323 PC10, PC11, PC12, KU5, KU6, KU7		Spinner Handle, Soldering Iron, Solder, Digital Tester	T- 02:30 P- 05:00
			• Describe the process of maintaining and upgrading 3G/4G/5G network equipment. • Explain how to maintain telecom equipment following safety, efficiency, and calibration procedures.	TEL/N6323 PC10, PC11, PC12, KU5, KU6, KU7			T- 02:30 P- 05:00
		Regular Maintenance and Equipment Recovery	• Perform regular maintenance of telecom equipment and structures using appropriate tools. • Assist in maintaining and upgrading telecom structures and sites as per supervisor's instructions.	TEL/N6323 PC13, PC14, KU8, KU9			T- 02:30 P- 05:00
		Maintenance Records and Data Collection	• Assist in collecting relevant data and maintaining maintenance records as per organizational policy.	TEL/N6323 PC15, PC16, KU10, KU11			T- 02:30 P- 05:00
			• Describe the process of swapping, decommissioning, and recovering mobile telecom sites and structures.	TEL/N6323 PC15, PC16, KU10, KU11			T- 02:30 P- 05:00
		Decommissioning and Dismantling	• Assist in decommissioning and dismantling telecom cabling and equipment as per requirements. • Assist in recovering panel antennas, cables, earthing, and equipment from decommissioned sites.	TEL/N6323 PC17, PC18, PC19, KU12			T- 02:30 P- 05:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Comprehensive Maintenance Overview	• Assist in recovering various equipment and components from decommissioned sites.	TEL/N6323 PC20, KU13			T- 02:30 P- 05:00
		Climbing Techniques and Safety Measures	• Explain the importance of safety measures and equipment when climbing telecom structures.	TEL/N6323 KU2, KU3, KU4			T- 02:30 P- 05:00
		Regular Maintenance Procedures	• Carry out preventive maintenance of telecom structures and equipment to prevent downtime. • Demonstrate the process to replace the faulty equipment and protective casing, as required	TEL/N6323 PC1, PC2, PC3, KU5, KU6, KU7			T- 02:30 P- 05:00
		Technical Maintenance and Upgrades	• Assist in maintaining and upgrading network equipment, structures, and cabling.	TEL/N6323 PC11, PC12, PC13, KU8, KU9, KU10			T- 02:30 P- 05:00
4	Process of following the occupational health and safety instructions during tower climbing	Preparing for Safe Tower Climbing	• Explain the importance of training and practice in tower climbing to ensure safety. • Describe the process of performing a visual observation of the tower and addressing issues before climbing. • Identify climbing obstructions and hazards and take appropriate measures to mitigate them.	TEL/N6246 PC1, PC2, PC3, KU1, KU2, KU3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop, PPE Kit, Safety Kit, Carabiners Connectors, Harnesses, RF Safety, Two Way Radios, Tower Climbing Kits, Helmet, RF Monitor	T- 02:00 P- 06:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Equipment and Safety Check	• Inspect and maintain guy wires, turnbuckles, guy preforms, and thimbles on towers. • Check tower verticality and address leaning or eccentricity issues. • Ensure the availability of appropriate safety equipment, PPE, and tools for tower climbing. • Inspect and maintain PPE to ensure it's safe for use. • Explain the importance of conducting comprehensive safety planning and Job Hazard Analysis (JHA).	TEL/N6246 PC4, PC5, PC6, PC7, PC8, KU4, KU5, KU6, KU7, KU8, KU9			T- 03:00 P- 04:00
		Worksite Safety Measures	• Ensure the availability of a fully equipped first aid kit and understand its usage. • Measure radio wave strength and identify potential electrical hazards. • Coordinate safety planning and emergency action plans. • Identify unsafe conditions and report them promptly. • Check weather conditions and wind velocity to ensure safe tower climbing.	TEL/N6246 PC9, PC10, PC11, PC12, PC13, KU9, KU10, KU11, KU12			T- 03:00 P- 04:00
		Safe Climbing Techniques	• Maintain a safe distance from potential dangers and ensure compliance with safety standards. • Follow appropriate tower climbing practices and maintain tie-off using safety equipment.	TEL/N6246 PC16, PC17, PC18, KU13, KU14, KU15			T- 03:00 P- 04:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Use two-way radio for continuous communication during tower climbing. • Coordinate with authorities in case of physical health impairment or drowsiness-inducing medication. • Ensure compliance with safety practices while working near electricity wires.				
		Ensuring Compli-ance and First Aid	• Ensure compliance with health and safety standards and regulations. • Administer first aid for different medical emergencies. • Assist in preparing incident reports for tower climbing incidents.	TEL/N6246 PC26, PC27, PC28, KU16, KU17, KU18			T- 03:00 P- 04:00
		Effective Tower Climbing Practices	• Explain the importance of safety skills, training, and awareness in tower climbing. • Describe the process of conducting inspections and ensuring equipment availability. • Emphasize the significance of compliance with safety planning and standards.	TEL/N6246 KU1, KU7, KU9, KU10, KU12			T- 03:00 P- 04:00
		Ensuring Safety and Reporting	• Highlight the importance of equipment availability, safe practices, and communication during tower climbing.	TEL/N6246 KU11, KU14, KU15, KU17, KU18			T- 03:00 P- 04:00

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Explain the significance of reporting unsafe conditions and incidents to authorities.				
5	Follow sustainable practices in telecom infrastructure installation	Segregate recyclable and refurbishable components	• identify telecom components suitable for recycling or refurbishment • .Explain how to sort electronic and non-electronic waste based on disposal protocols • .Show how to label and store recyclable and refurbishable components separately	TEL/N9105 PC1, PC2, PC3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Types of cables (OFC, UTP, STP, Twisted Pair etc.) and connectors (RJ-45, RJ-11 etc.), crimping tools, soldering tools and splicing tools, signal level meters /OTDR, voltmeter, digital multimeter, digital clamp meter, signal tester, electrical drill, ladder, spanner, screwdriver set, nut driver set, bolt remover, cutter, angle finder, Wiring layout, Instruction manual, Service Manual/ User Manuals, Customer Registration, Program Authentication Form, CustomerFeed back form	T: 02:30 P: 05:00
		Dispose of waste & Use Energy-Efficient Methods	•Explain how to follow approved procedures for the safe disposal of hazardous and non-hazardous waste • Discuss how to coordinate with authorized e-waste recycling units or certified disposal agencies •Show how to select and use energy-efficient tools and equipment during telecom installations	TEL/N9105 PC4, PC5, PC7			T: 02:30 P: 05:00
		Follow environmental standards and compliance guidelines	• .Discuss how to adhere to national and international environmental regulations for telecom infrastructure installation • Explain how to maintain records of waste disposal, recycling, and sustainability measures	TEL/N9105 PC10, PC11, PC12, PC13			T: 02:30 P: 05:00
		Guide team members	• Explain how to guide team members on sustainable telecom installation guidelines and practices • .Discuss how to encourage environmentally responsible work habits	TEL/N9105 PC14, PC15			T: 02:30 P: 05:00

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Telecom Rigger – 5G and Legacy Networks	
Job Role	Telecom Rigger – 5G and Legacy Networks
Qualification Pack	TEL/Q6212 V2.0
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 50% of aggregate marks.
6	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification File.

National Occupational Standards	NOS Code & Version	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
Assist in the Installation of Telecom Equipment	TEL/N6310, v3.0	30	50	-	20	100	25
Assist in the Maintenance, Upgrade and Decommissioning of Telecom Equipment and Sites	TEL/N6323, v2.0	30	50	-	20	100	25
Follow the Occupational Health and Safety Instructions during Tower Climbing	TEL/N6246, v2.0	30	50	-	20	100	20
Follow Sustainable Practices in Telecom Infrastructure Installation	TEL/N9105, v1.0	30	50	-	20	100	20
Employability Skills (30 Hours)	DGT/VSQ/N0101, v1.0	20	30	-	-	50	10
Total		**140**	**230**	**-**	**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 a Telecom Rigger – 5G and Legacy Networks	Unit 1.2: Introduction to Telecom Sector and the Role of Telecom Rigger	1.2.1 Overview of the Telecom Sector in India	https://www.youtube.com/watch?v=PirV-lZn9yI	
Module 2. Process of Assisting in the Installation of Telecom Equipment	Unit 2.1: Prepare for the Installation of Telecom Equipment	2.1.4 Safety Guidelines during Rigging Operations	https://www.youtube.com/watch?v=cXDDTuu-II0	
	Unit 2.2: Assist in Installation of Tower Equipment	2.2.3 Antenna Assembly, Waveguide, and Coax Connector Assembly	https://www.youtube.com/watch?v=cg83nOQS6mY	
	Unit 2.3: Post Installation Activities	2.3.5 Installing, Terminating, Earthing, Labelling, and Testing Different Types of Cables	https://www.youtube.com/watch?v=eMR1rT8p-oA	
3. Process of Assisting in the Maintenance, Upgradation and Decommissioning of Telecom Equipment and Sites	Unit 3.1: Carryout Maintenance Activities	3.1.3 Preventive Maintenance of Telecom Structures	https://www.youtube.com/watch?v=-WyyrKbUruA	

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
	Unit 3.3: De-commission-ing of Tele-com Site and Equipment	3.3.1 Swapping and Decom-missioning of Mobile Telecom Sites and Struc-tures	https://www.youtube.com/watch?v=xFoy1QPz5xo	
Module 4. Process of Following the Occu-pational Health and safety instructions during Tow-er Climbing	Unit 4.1: Perform Pre-Climb Tower Inspection	4.1.2 Inspecting Tower before Climbing	https://www.youtube.com/watch?v=Ha8zHXUFdHc	
	Unit 4.2: Safety Equip-ment and Work Site Conditions	4.2.3 RF Safety Regulations	https://www.youtube.com/watch?v=Fy72EOEBG4U	
	Unit 4.3: Car-ryout Tower Operations Following Safety In-structions	4.3.5 Appropri-ate Climbing and Working Practices for Different Tele-com Structures	https://www.youtube.com/watch?v=RRoCm-G6d8o	

NCVET
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Skill India
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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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