Telecom Sector Skill Council

Facilitator Guide

Telecom Tower Site Maintenance Technician

Sector
Telecom

Sub-Sector
Passive Infrastructure

Occupation
Operations and Maintenance - Passive Infrastructure

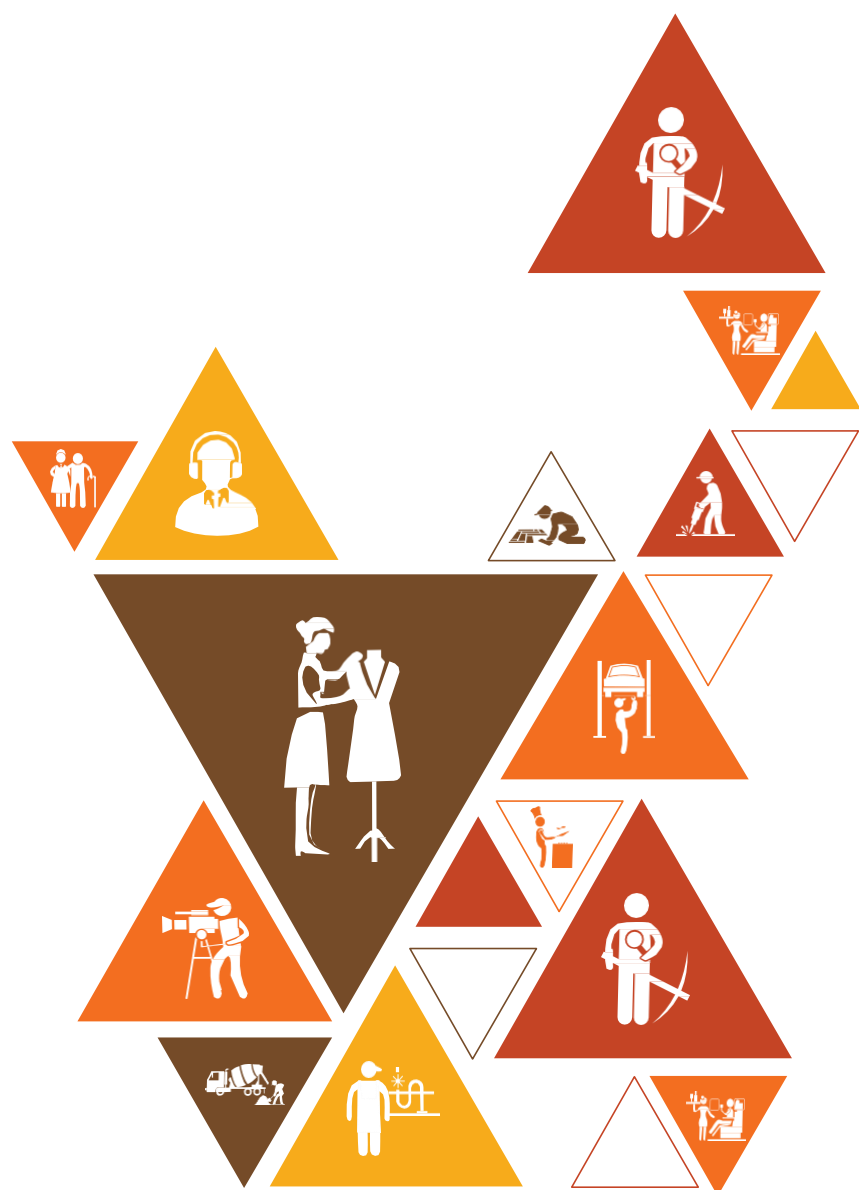Reference ID: **TEL/Q4100,** Version **5.0**
NSQF Level **4**

> **"** 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

About this Guide

India is the second-largest telecom market in the world, with over 1.21 billion (121 crore) subscribers as of June 2025. The sector continues to expand rapidly with the rollout of 5G services, which has already reached nearly 25 crore users. India now has around 979 million (97.9 crore) internet subscribers, showing strong growth in broadband and data usage. As of today, the telecom sector is among the top five employment-generating industries in the country.

This Facilitator Guide is designed to help the trainer to effectively conduct sessions to the trainees.

after completing the course the students can work as a Telecom Tower Site Maintenance Technician. Individuals at this job, maintains the tower site live at all times, repair level-1 faults, carry out corrective/preventive maintenance at the telecom tower site and report issues to the supervisor. Conducts energy management, estate management-level 1 and verify the assets.

Telecom Telecom Tower Site Maintenance Technician Qualification Pack (TEL/Q4100) includes the following National Occupational Standards (NOSs):

1. TEL/N4138 – Maintain Tower Site and Report Periodically
2. TEL/N4139 – Manage Site Operation Safely and Hygienically
3. TEL/N9109 – Follow Sustainable Practices in Telecom Infrastructure Management
4. DGT/VSQ/N0101 Employability Skills (30 Hours)

The Key Learning Outcomes and the skills gained by the participant are defined in their respective units. Post this training, the participant will be able to keep sites live 24x7 through site maintenance.

We hope that this Facilitator Guide will provide a sound learning support to our young friends to build an attractive career in the telecom industry.

Symbols Used

Ask	Explain	Elaborate	Notes	Objectives	Do
Demonstrate	Activity	Team Activity	Facilitation Notes	Practical	Say
Resources	Example	Summary	Role Play	Learning Outcomes	

Table of Contents

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 & the Job Role of a Telecom Tower Site Maintenance Technician

Unit 1.1 - Telecom Sector in India

Unit 1.2 - Roles and Responsibilities of Telecom Tower Site Maintenance Technician
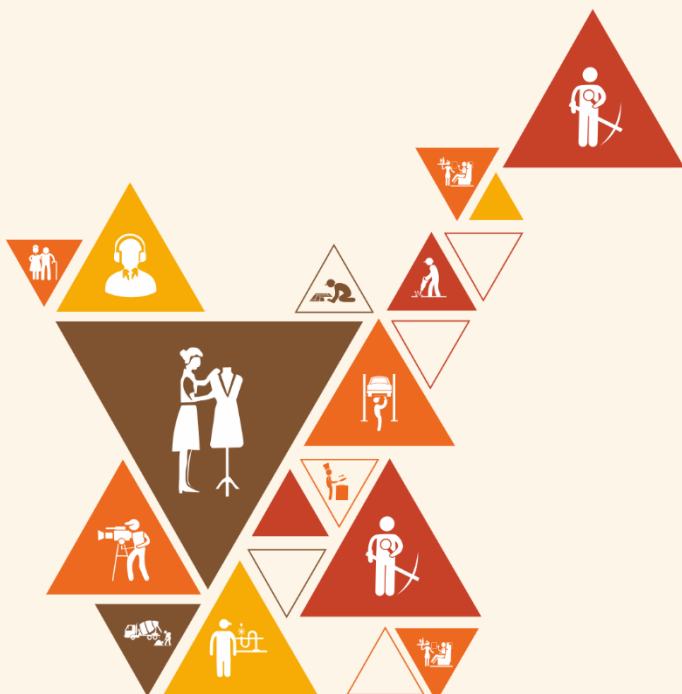
Key Learning Outcomes 💡

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

1. Explain the significance of the telecom sector in daily activities and business operations.

2. Elucidate the key skills and technical expertise required for a Telecom Tower Site Maintenance Technician to diagnose and fix hardware and software issues.

3. Discuss the challenges faced in telecom tower site maintenance activities.

4. Determine the impact of regular tower site maintenance on telecom operations and customer satisfaction.

5. Discuss the roles and responsibilities of a Telecom Tower Site Maintenance Technician in maintaining high service standards and ensuring seamless telecom operations.

Unit 1.1: Telecom Industry and its Sub-sectors

Unit Objectives 🎯

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

1. Illustrate the size and scope of the Telecom industry and its various sub-sectors in India.
2. Outline the growth of the Indian Telecom Sector

Resources to be Used ⚙️

Participant Handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer

Note 📝

In this unit, we will discuss the telecom sector in India and its sub-sectors.

Say 💬

Good morning and welcome back to this training program, "Distributor Sales Representative". Today we shall discuss about the telecom sector in India and its sub-sectors.

Ask 🗨️

Ask the participants the following questions:

• What do you understand by telecom?

Write down the participants' answers on a whiteboard/flipchart. Take appropriate cues from the answers and start teaching the lesson.

Elaborate ⚙️

In this session, we will discuss the following point:

• Introduction to the telecom industry
• Top Mobile handset players in India
• Major subsectors of the Telecom Industry
• Infrastructure
• Equipment
• Mobile Virtual Network Operators (MNVO)
• White Space Spectrum
• 5G
• Telephone service providers and
• Broadband

Say 💬

Let us participate in an activity to explore the unit a little more.

Activity ⚙️

- This is a group activity
- Divide the class into four groups and provide chart paper and other required items to each group
- Now, ask each group to make a chart paper presentation on major sub-sectors of the Telecom Industry
- Ask them to explain each of the types
- They can use hand-drawn diagrams or pasted pictures
- After the groups complete their work, collect all the chart papers and evaluate them

Activity	Duration	Resources used
Chart paper presentation	60 minutes	Participant handbook, pen, notebook, chart paper, sketch pens, pencils, eraser, ruler, laptop, etc.

Do ✓

- Guide the trainees throughout the activity
- Ensure that all trainees participate in the activity

Notes for Facilitation 📝

- Answer all the queries/doubts raised by the trainees in the class
- Encourage other trainees to answer problems and boost peer learning in the class

Unit 1.2: Roles and responsibilities of a Telecom Tower Site Maintenance Technician

Unit Objectives ⊚

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

1. Elucidate the key skills and technical expertise required for a Telecom Tower Site Maintenance Technician to diagnose and fix hardware and software issues.

2. Discuss the challenges faced in telecom tower site maintenance activities.

3. Determine the impact of regular tower site maintenance on telecom operations and customer satisfaction.

4. Discuss the roles and responsibilities of a Telecom Tower Site Maintenance

Resources to be Used ⚙

Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

Note 📋

In this unit, we will discuss the roles and responsibilities of a Telecom Tower Site Maintenance Technician.

Say 💬

Good morning and welcome to this training program on " Distributor Sales Representative". In this session, we will learn about the roles and responsibilities of a Telecom Tower Site Maintenance Technician.

Ask 💬

Ask the participants the following questions:

• What do you understand by telecom tower?

Write down the participants' answers on a whiteboard/flipchart. Take appropriate clues from the answers and start teaching the lesson.

Elaborate ⚙

In this session, we will discuss the following point:

• An overview of Telecom Tower Site Maintenance Technician
• Job description
• Attributes

- Skill Criteria
- Technical skill
- Interpersonal skills
- Operational skills
- Research skills
- Communication skills
- Career opportunities

Say

Let us participate in an activity to explore the unit a little more.

Activity

- Conduct a group discussion on the skills required for a Telecom Tower Site Maintenance Technician
- Ask the participants what they have learnt from this exercise
- Ask if they have any questions related to what they have talked about so far
- Close the discussion by summarising the ways to develop each of the skills

Activity	Duration	Resources used
Group discussion	30 minutes	Participant handbook, pen, notebook, laptop, overhead projector, microphone (if required), etc.

Do

- Ensure that all the trainees participate in the group discussion
- Ensure a friendly atmosphere during the group discussion
- Guide the students in identifying key points

Notes for Facilitation

- Encourage peer learning
- Answer all the doubts raised by the trainees in the class
- Discuss the proper communication technique in group discussion

Exercise

Answers to exercises for PHB

A. **Multiple Choice Questions (MCQs)**
1. b) It enables communication, connectivity, and business operations
2. b) Understanding of power and battery systems
3. b) Weather conditions and remote site access
4. c) Smooth connectivity and reliable service quality
5. b) Maintaining site logs and performing preventive maintenance

B. Short Answer Question
1. Telecom networks enable people to communicate through calls, messages, and the internet. They also support business operations such as online services, remote work, digital payments, and customer support, making everyday communication fast and efficient.
2. Two important technical skills are:Ability to diagnose power systems such as batteries, DG sets, and SMPS units.Knowledge of RF cables, connectors, and basic troubleshooting of telecom hardware.
3. Timely maintenance reduces network faults and downtime, improving service quality. This leads to better customer experience and higher satisfaction because users face fewer disruptions in connectivity.

C. Fill in the Blanks
a) Communication
b) site maintenance / log / maintenance (any one is acceptable)
c) Challenges
d) Failure

D. True or False
a) False
b) True
c) True
d) True

Notes

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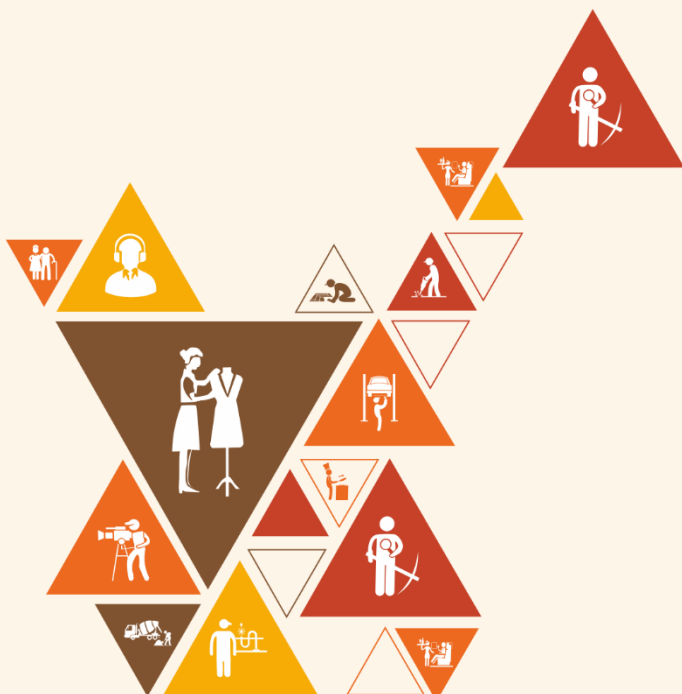
2. Maintaining Telecom Tower Site and Periodic Reporting

Unit 2.1 - Telecom Power Systems and Preventive Maintenance
Unit 2.2 - Fault Diagnosis, Site Infrastructure, and Safety
Unit 2.3 - Documentation, Reporting, and Compliance

TEL/N4138

Key Learning Outcomes 💡

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

1. Explain the components of telecom power systems, including solar, wind, and hybrid energy sources.

2. Demonstrate how to inspect, clean, and maintain solar panels, wind turbines, and hybrid power systems.

3. Elucidate the different battery technologies, such as lead-acid, lithium-ion, and solid-state batteries, along with their maintenance requirements.

4. Show how to test, service, and maintain battery banks, including lead-acid, lithium-ion, and solid-state batteries.

5. Discuss the principles of predictive maintenance and fault analytics for early issue detection in power and cooling systems.

6. Demonstrate the use of remote monitoring tools to track site condition, analyze downtime, and predict failures using data analytics.

7. Describe the use of remote monitoring and management systems for energy tracking, alarm detection, and asset health monitoring.

8. Demonstrate how to track, analyze, and optimize energy consumption, including identifying inefficiencies in battery charging cycles and rectifying power losses.

9. Explain how fault diagnosis using data analytics can improve telecom site maintenance.

10. Show how to identify, troubleshoot, and repair site faults, including power failures, hardware malfunctions, and faulty power components like batteries, rectifiers, and fuses.

11. Discuss the importance of maintaining an inventory of spare parts for power and maintenance activities.

12. Demonstrate how to report issues such as fuel consumption, security breaches, or material theft to the supervisor.

13. Explain the standard safety procedures for electrical and mechanical maintenance at telecom sites.

14. Demonstrate how to inspect and rectify faults in grounding systems to ensure electrical safety.

15. Show how to perform emergency repairs on alternative power sources to maintain site uptime.

16. Discuss telecom site infrastructure, including shelters, tower structures, and power distribution.

17. Show how to conduct preventive maintenance on telecom enclosures, cable connections, and environmental control units.

18. Demonstrate how to monitor, calibrate, and troubleshoot power interface units (PIU), SMPS, Diesel Generators (DG), and air conditioning systems.

19. Show how to perform load balancing and ensure efficient energy distribution at the site.

20. Describe the documentation standards for telecom site maintenance, including digital reporting practices.

21. Show how to document preventive and corrective maintenance tasks in telecom reporting systems and maintain records of site power logs, energy audits, and operational performance.

22. Show how to use digital reporting tools to submit real-time site updates, alarm escalations, and maintenance logs.

23. Demonstrate how to restore connectivity by addressing transmission failures and alarm-triggered events.

24. Show how to ensure regulatory compliance in energy management and site operations.

UNIT 2.1: Telecom Power Systems and Preventive Maintenance

Unit Objectives

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

1. Explain the components of telecom power systems, including solar, wind, and hybrid energy sources.

2. Demonstrate how to inspect, clean, and maintain solar panels, wind turbines, and hybrid power systems.

3. Elucidate the different battery technologies, such as lead-acid, lithium-ion, and solid-state batteries, along with their maintenance requirements.

4. Show how to test, service, and maintain battery banks, including lead-acid, lithium-ion, and solid-state batteries.

5. Discuss the principles of predictive maintenance and fault analytics for early issue detection in power and cooling systems.

6. Demonstrate the use of remote monitoring tools to track site condition, analyze downtime, and predict failures using data analytics.

7. Describe the use of remote monitoring and management systems for energy tracking, alarm detection, and asset health monitoring.

8. Demonstrate how to track, analyze, and optimize energy consumption, including identifying inefficiencies in battery charging cycles and rectifying power losses.

9. Discuss the importance of maintaining an inventory of spare parts for power and maintenance activities.

Resources to be Used

Participant Handbook, Projector, Whiteboard & markers, Sample fault logs, Basic test instruments (multimeter, clamp meter), Sample faulty components (fuses, connectors), Safety gear (helmet, gloves, shoes), Grounding test values/examples

Say

- Preventive maintenance has to be performed on regular basis for the upkeep of the equipment and structures at the site.

Ask

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

Do

- Put up the list of activities to be done on regular basis in front of the participants.
- Divide these activities to be performed on Daily Basis, Weekly basis, Monthly Basis, Quarterly basis, Half yearly and Annual basis.
- There are some activities which needs to be done as and when they are required.

Elaborate

Understanding E-Waste

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

Concept of Waste Management

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

Recycling Process of E-Waste

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

Demonstrate

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

Activity 1

- This is a skill practice activity to demonstrate steps involved in installation of a Battery at a tower site. This activity will provide complete knowledge on how to install a Battery and the precautions need to be taken while installing these batteries
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in the installation of Battery and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of installation of battery.	4 hours	Packed battery and tool kit for installation, Voltmeter, stickers, Markers, Petroleum Jelly, Cloth

Method to do this activity

1. Receive the batteries at site.
2. Check the battery of any damage during transit.
3. If battery is damaged write a note for insurance claim.
4. Explain the precautions which need to be taken while storing these batteries.
5. Demonstrate the process of unpacking the batteries.
6. Show how to do the terminations at the terminals of the batteries.
7. Discuss the precautions to be taken during this process.
8. Explain the post installation process like putting cell numbers, nameplates, date of installation
9. Apply petroleum Jelly on the contractor points
10. Demonstrate this process and explain the utility of applying this Jelly.

Activity

- This is a skill practice activity to demonstrate various Preventive Maintenance activities to be performed for a Battery at a tower site. This activity will provide complete knowledge on how to do preventive Maintenance of a Battery/ Battery Bank and the precautions need to be taken while doing this.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the preventive maintenance of a Battery/ Battery Bank and the precautions which need to be taken while doing this activity at site. After this activity participant should be completely aware of the process of doing preventive maintenance of battery/ Battery Bank.	6 hours	Battery Bank, PIU, SMPS, and tool kit, Ammeter, Voltmeter, stickers, Markers, Petroleum Jelly, Cloth

Method to do this activity

1. Discuss the list of activities to be performed while doing PM of a battery bank.

2. Demonstrate the process of cleaning the battery on regular basis.

3. Show how to check the leakage in any battery cell.

4. Check all the connections and inter cell connections for tightness.

5. Examine if all Batteries are properly seated on the battery bank stand.

6. Check the earthing connection with the battery bank stand.

7. Show how to check the temperature of individual cell for overheating.

8. Explain how we check the voltage of the individual Cell.

9. Demonstrate how to measure the battery bank charging current.

10. Demonstrate how to check the float charging voltage and current of the battery bank. (voltage should be 2.23 V per cell, current should be 10% of the cell rated capacity)

11. Check the environment condition of the Bank like temp, air flow, no direct sunlight, humidity in the room/ Chiller unit/ area where battery bank is installed. (optimum temperature should be 27 degree C. The temperature compensation factor is -3mv/cell degree rise from the ambient temp of 27°C and vice versa).

12. Any other activity needed depending on the area of deployment.

Summarize

In this chapter students have learnt about

- Preventive and corrective maintenance of a tower site.

- Beat plan and the way it has to be executed.

- Timely resolution of the faults incurred at site.

Unit 2.2: Fault Diagnosis, Site Infrastructure, and Safety

Unit Objectives

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

1. Explain how fault diagnosis using data analytics can improve telecom site maintenance.
2. Show how to identify, troubleshoot, and repair site faults, including power failures, hardware malfunctions, and faulty power components like batteries, rectifiers, and fuses.
3. Explain the standard safety procedures for electrical and mechanical maintenance at telecom sites.
4. Demonstrate how to inspect and rectify faults in grounding systems to ensure electrical safety.
5. Show how to perform emergency repairs on alternative power sources to maintain site uptime.
6. Discuss telecom site infrastructure, including shelters, tower structures, and power distribution.
7. Show how to conduct preventive maintenance on telecom enclosures, cable connections, and environmental control units.
8. Demonstrate how to monitor, calibrate, and troubleshoot power interface units (PIU), SMPS, Diesel Generators (DG), and air conditioning systems.
9. Show how to perform load balancing and ensure efficient energy distribution at the site.
10. Demonstrate how to restore connectivity by addressing transmission failures and alarm-triggered events.
11. Demonstrate how to report issues such as fuel consumption, security breaches, or material theft to the supervisor.

Resources to be Used

Participant Handbook, Projector, Whiteboard & markers, Sample fault logs, Basic test instruments (multimeter, clamp meter), Sample faulty components (fuses, connectors), Safety gear (helmet, gloves, shoes), Grounding test values/examples

Say

- Today's session focuses on identifying, diagnosing, and resolving faults at telecom sites while ensuring complete safety during operations.
- You will learn how data analytics supports maintenance, how grounding and power components are inspected, and how emergency repairs help maintain uptime.
- We will also explore telecom site infrastructure and preventive maintenance methods that reduce long-term failures.
- Understanding these skills ensures better service continuity and improves operational efficiency across telecom sites.

Ask

- What are some common site faults you think occur frequently and why?
- Why is grounding essential for both equipment protection and technician safety?
- How can you identify early warning signs of SMPS, DG, or PIU malfunction?
- What risks arise if power faults aren't rectified in time?
- How important is it to report fuel or security-related issues immediately?

Do

- Examine sample fault logs and identify the possible root causes.
- Observe sample faulty components and discuss how they may impact site operation.
- Review sample grounding values and interpret what acceptable vs. faulty readings look like.
- Discuss examples of emergency repairs in situations of sudden power failure.

Elaborate

Use the following key questions to deepen learner understanding:

1. How does data analytics help identify recurring or hidden site faults?
2. What steps ensure safe handling of electrical and mechanical systems during maintenance?
3. How do grounding faults affect overall site performance and equipment reliability?
4. What preventive maintenance tasks help avoid long-term infrastructure degradation?
5. How does proper load distribution support stable and efficient site operation?
6. Provide short explanations related to:
7. Power component health, grounding continuity, environmental system maintenance, and alarm-based troubleshooting.

Demonstrate

- Demonstrate the use of basic instruments (multimeter/clamp meter) for diagnosing site power faults.
- Show how to inspect grounding connections and interpret earthing values.
- Demonstrate troubleshooting steps for faults such as blown fuses, loose connectors, or rectifier overload.
- Show basic calibration of PIU/SMPS and simple DG/AC performance checks.
- Demonstrate reconnecting transmission links and clearing alarms after a fault.
- Show how to fill a simple site fault/incident report for issues like fuel discrepancies or suspected theft.

Activity

- **Activity Name:** Practical Fault Diagnosis & Reporting
- **Objective:** Enable learners to identify faults, find probable causes, and suggest corrective actions.
- **Type:** Group
- **Resources:** Sample logs, faulty components, test readings
- **Duration:** 30 minutes
- **Instructions:**
  - • Groups analyze different simulated faults (power loss, grounding failure, DG not starting, rectifier alarm).
  - • Each group identifies the cause, explains corrective action, and prepares a short incident report.
- **Outcome:** Learners understand structured fault diagnosis, safety compliance, and accurate reporting.

Notes for Facilitation

- Emphasize safe working practices and correct use of basic tools.
- Encourage hands-on interaction with logs, sample components, and test readings.
- Use real-world examples of recurring site issues to make discussions relatable.
- Reinforce the importance of documentation and timely reporting of anomalies.
- Support learners in building a step-by-step habit for diagnosing faults systematically.

Unit 2.3: Documentation, Reporting, and Compliance

Unit Objectives 🎯

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

1. Describe the documentation standards for telecom site maintenance, including digital reporting practices.

2. Show how to document preventive and corrective maintenance tasks in telecom reporting systems and maintain records of site power logs, energy audits, and operational performance.

3. Show how to use digital reporting tools to submit real-time site updates, alarm escalations, and maintenance logs.

4. Show how to ensure regulatory compliance in energy management and site operations.

Resources to be Used ⚙️

Participant Handbook, Projector, Digital reporting tool screenshots, Sample maintenance logs, Mobile/PC with demo reporting interface, Whiteboard & markers

Say 💬

- Today's session focuses on Documentation, Reporting, and Compliance—key responsibilities for maintaining transparent, accurate, and efficient telecom site operations.
- You will learn how to record preventive and corrective activities, maintain logs for power and energy usage, report alarms, and follow regulatory guidelines.
- Proper reporting ensures accountability, improves decision-making, and supports long-term site performance.
- Digital tools now make reporting faster, real-time, and more reliable, helping teams stay aligned with compliance requirements.

Ask

- Why is accurate documentation important for telecom site operations?
- What information should always be included in a maintenance log or power audit?
- How do digital reporting tools improve workflow compared to manual records?
- What risks arise if compliance requirements are not followed?
- Which site activities do you think require mandatory documentation?

Do ☑

- Observe sample site logs and identify mandatory fields included in preventive and corrective maintenance.
- Review screenshots of reporting tools and identify how updates, alarms, and site checks are submitted.
- Discuss examples of regulatory requirements in telecom energy use or site operations.
- Compare a well-documented log vs. a poorly filled one and discuss differences.

Elaborate ⚙

Use the following questions to deepen learner understanding:

1. What are the essential components of a standard telecom maintenance document?
2. How should preventive and corrective tasks be captured for accuracy and traceability?
3. How do power logs and energy audits help detect inefficiencies in site operations?
4. What features in digital reporting tools help technicians submit real-time updates?
5. What are the key compliance areas related to energy consumption and site operations?

Clarify briefly concepts such as documentation formats, audit trails, alarm escalation paths, and compliance checks.

Demonstrate 🖥

- Demonstrate filling out a preventive maintenance report in a sample digital form.
- Show how to document corrective actions including timestamps, component replaced, and issue cause.
- Walk through submitting an alarm escalation and updating site status in a digital reporting platform.
- Demonstrate recording power logs and energy audit values using sample templates.
- Show how compliance checks are verified and marked in reporting tools.

Activity ⚙

- **Activity Name:** Digital Reporting Practice
- **Objective:** Enable learners to practice reporting site updates and maintenance tasks using sample digital tools.
- **Type:** Individual / Group
- **Resources:** Sample reporting interface, log templates, alarm examples
- **Duration:** 30 minutes
- **Instructions:**
    - Learners receive a scenario involving a site maintenance task, power irregularity, or alarm.
    - They must document the event, fill the correct digital form, and submit a mock report.
- **Outcome:** Improved accuracy and confidence in documentation, digital reporting, and compliance awareness.

Notes for Facilitation 📝

- Reinforce the importance of complete and accurate data entry in digital systems.
- Encourage learners to follow a step-by-step approach to documenting maintenance tasks.
- Share examples of how poor reporting leads to repeated faults or compliance violations.
- Help learners understand escalation timelines and how real-time updates assist the NOC.
- Stress the requirement of aligning documentation with organizational and regulatory standards.

Exercise 🖉

Answers to exercises for PHB

A. Multiple Choice Questions (MCQs)
1. a) Solar, wind, and DG/battery systems
2. b) Electrolyte level checks and terminal cleaning
3. b) Providing real-time alarms and performance data
4. c) Detecting early warning signals using analytics
5. c) Energy distribution is optimized and stress is reduced

B. Short Answer Questions
1. Remote monitoring allows for real-time tracking of equipment and alarms, enabling faster fault response, reducing site visits, and supporting predictive maintenance.
2. Electrolyte level checks (topping up with distilled water) and terminal cleaning/torque checks to ensure good electrical contact and prevent corrosion.
3. Proper grounding is vital for safety (preventing shock) and equipment protection by safely dissipating fault currents (e.g., from lightning or surges) into the earth.

C. Fill in the Blanks
1. DG/battery (or diesel generator/battery)
2. data
3. Remote
4. efficiency (or planning/decision-making)

D. True or False
1. True
2. True
3. False
4. True

Notes

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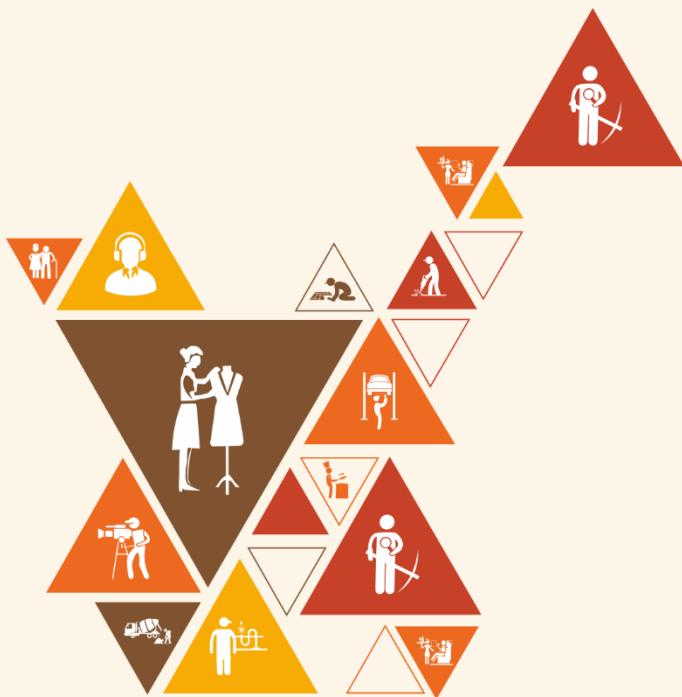_____
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3. Managing Telecom Site Operations Safely and Hygienically

Unit 3.1 - Safety Standards and Site Compliance
Unit 3.2 - Remote Monitoring, Security, and Alarm Management
Unit 3.3 - Energy Efficiency and Record Management

Key Learning Outcomes 💡

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

1. Explain the applicable national and international safety regulations for telecom sites and infrastructure.

2. Demonstrate how to implement and verify adherence to national and international safety standards for telecom sites (e.g., IEC, OSHA, BIS).

3. Describe fire safety measures, fuel storage guidelines, electrical hazard management, and site evacuation procedures.

4. Show how to ensure the proper functioning of civil, mechanical, and electrical infrastructure at the site, including fire safety equipment and grounding systems.

5. Discuss best practices in telecom site hygiene and maintenance.

6. Demonstrate how to identify and clear unwanted materials to maintain a clutter-free and hygienic site, including proper waste segregation.

7. Elucidate site administration processes, including vendor coordination and compliance checks.

8. Show how to verify electricity bill readings, monitor vendor activities for contract adherence, and ensure accurate documentation of site operations.

9. Demonstrate how to maintain records of safety inspections, repairs, regulatory compliance, and Service Level Agreements (SLAs).

10. Elucidate the use of remote monitoring tools for tracking telecom site security, power alarms, and energy efficiency.

11. Show how to track site alarms, sensor data, and security alerts using remote monitoring systems, ensuring timely response to unauthorized access incidents.

12. Determine the classification of alarms, troubleshooting methods, and escalation procedures for critical failures.

13. Demonstrate how to conduct routine checks on power equipment, including solar panels, battery banks, DG sets, PIU, and SMPS, ensuring proper maintenance and hygiene.

14. Describe the functionality of security systems, including access control and surveillance cameras.

15. Demonstrate how to ensure the proper functioning of surveillance cameras, access control systems, and alarms for preventive maintenance.

16. Explain telecom hardware integration with energy-efficient solutions, such as hybrid power systems.

17. Show how to ensure the proper functioning of civil, mechanical, and electrical infrastructure at the site, including fire safety equipment and grounding systems.

18. Discuss energy audit methodologies and strategies to improve energy efficiency in telecom sites.

19. Show how to maintain accurate logs of equipment maintenance, power usage, fuel supply, and vendor activities for compliance and auditing.

UNIT 3.1: Safety Standards and Site Compliance

Unit Objectives ⊚

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

1. Explain the applicable national and international safety regulations for telecom sites and infrastructure.

2. Demonstrate how to implement and verify adherence to national and international safety standards for telecom sites (e.g., IEC, OSHA, BIS).

3. Describe fire safety measures, fuel storage guidelines, electrical hazard management, and site evacuation procedures.

4. Show how to ensure the proper functioning of civil, mechanical, and electrical infrastructure at the site, including fire safety equipment and grounding systems.

5. Discuss best practices in telecom site hygiene and maintenance.

6. Demonstrate how to identify and clear unwanted materials to maintain a clutter-free and hygienic site, including proper waste segregation.

7. Elucidate site administration processes, including vendor coordination and compliance checks.

8. Show how to verify electricity bill readings, monitor vendor activities for contract adherence, and ensure accurate documentation of site operations.

9. Demonstrate how to maintain records of safety inspections, repairs, regulatory compliance, and Service Level Agreements (SLAs).

Resources to be Used ⚙

Participant Handbook, Projector, Safety posters, Sample compliance checklists, PPE samples, Waste segregation chart, Fire safety equipment images, Whiteboard & markers

Say 💬

- Today's session focuses on Safety Standards and Site Compliance, ensuring that telecom sites operate safely, legally, and efficiently.
- We will explore national and international standards, fire safety, grounding, hazard prevention, site hygiene, and vendor compliance.
- You will also learn how to maintain safety records, verify billing and vendor activities, and ensure that all infrastructure meets compliance norms.
- Proper compliance ensures safety for technicians, protects infrastructure, and maintains uninterrupted site operations.

Ask

- What national or international safety standards are you aware of for telecom or industrial sites?
- Why do you think grounding and fire safety systems must be checked regularly?
- What risks arise when clutter or waste is not properly managed at a telecom site?
- How does vendor compliance impact site operations and service reliability?
- Why is documentation important for safety inspections and SLAs?

Do

- Review a sample safety compliance checklist and identify key inspection points.
- Observe PPE samples and discuss when each item should be used.
- Examine a waste segregation chart and categorize common site waste items.
- Look at sample vendor logs or electricity bills and identify what needs verification.

Elaborate

Use the following key questions to deepen learner understanding:

1. What safety regulations apply to telecom sites, and why must they be followed strictly?
2. How can technicians implement and verify safety standards like IEC, OSHA, or BIS during routine visits?
3. What are the critical components of fire safety and electrical hazard management at telecom sites?
4. How does site hygiene directly impact site safety and technician performance?
5. What administrative and documentation practices ensure smooth vendor coordination and compliance tracking?

Clarify concepts related to: fire safety gear, evacuation routes, grounding continuity, civil-mechanical checks, and compliance documentation.

Demonstrate

- Demonstrate how to inspect grounding systems, fire extinguishers, first-aid kits, and electrical panels for safety compliance.
- Show how to identify safety violations such as loose wiring, blocked exits, improper fuel storage, or missing signage.
- Demonstrate proper segregation of waste such as plastics, metals, batteries, and hazardous materials.
- Show how to verify vendor-performance records, electricity consumption readings, and contract adherence.
- Demonstrate how to maintain safety inspection logs, compliance reports, and SLA documentation using sample formats.

Activity

- **Activity Name:** Site Safety & Compliance Walkthrough
- **Objective:** Enable learners to conduct a mock safety inspection and identify compliance gaps.
- **Type:** Group
- **Resources:** Sample checklist, safety posters, waste segregation examples
- **Duration:** 30 minutes
- **Instructions:**
  • Each group performs a simulated site inspection (using classroom setups/materials).
  • They identify hazards, non-compliance points, and hygiene issues.
  • Groups prepare a short "Compliance Report" summarizing observations.
- **Outcome:** Learners gain confidence in spotting safety gaps, ensuring compliance, and documenting findings effectively.

Notes for Facilitation

- Reinforce the importance of following both national and international safety standards during every site visit.

- Use real-world examples of safety failures and their consequences to build practical understanding.

- Encourage learners to practice using compliance checklists and documenting inspection findings accurately.

- Highlight how clean, organized, and well-maintained sites improve technician safety and operational efficiency.

- Stress the role of coordination with vendors and timely documentation in ensuring reliable and compliant site operations.

Unit 3.2: Remote Monitoring, Security, and Alarm Management

Unit Objectives ◎

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

1. Elucidate the use of remote monitoring tools for tracking telecom site security, power alarms, and energy efficiency.

2. Show how to track site alarms, sensor data, and security alerts using remote monitoring systems, ensuring timely response to unauthorized access incidents.

3. Determine the classification of alarms, troubleshooting methods, and escalation procedures for critical failures.

4. Demonstrate how to conduct routine checks on power equipment, including solar panels, battery banks, DG sets, PIU, and SMPS, ensuring proper maintenance and hygiene.

5. Describe the functionality of security systems, including access control and surveillance cameras.

6. Demonstrate how to ensure the proper functioning of surveillance cameras, access control systems, and alarms for preventive maintenance.

Resources to be Used ⚙

Participant Handbook, Projector, Sample remote monitoring dashboard screenshots, Alarm log samples, Security system images, Whiteboard & markers, Sample equipment checklist

Say 💬

- Today's session covers Remote Monitoring, Security, and Alarm Management, essential areas for maintaining telecom site reliability and safety.
- You will learn to use monitoring tools to track alarms, sensor readings, and security alerts, and understand how timely escalation prevents site downtime and security breaches.
- We will also explore how power equipment and security systems are inspected, maintained, and verified for smooth operation.
- Understanding these concepts enables technicians to maintain secure, well-monitored, and operational telecom sites.

Ask

- What types of alarms do you think occur frequently at telecom sites?
- How does remote monitoring help detect unauthorized access or environmental changes?
- What equipment should be routinely checked to maintain stable site operations?
- Why is proper classification and escalation of alarms important?
- How do surveillance and access control systems contribute to site security?

Do

- Review sample alarm logs and identify critical vs. non-critical triggers.
- Observe images of security components like CCTV cameras, access cards, and sensor modules.
- Examine sample maintenance checklists for solar, DG, battery bank, and PIU checks.
- Discuss common remote monitoring dashboards and identify key parameters displayed.

Elaborate

Use the following key questions to deepen learner understanding:

1. How do remote monitoring tools support real-time tracking of power data, alarms, and security events?
2. What are the common alarm categories, and how do they influence troubleshooting and escalation?
3. What routine checks help ensure power equipment and backup systems remain healthy?
4. How do access control systems and surveillance cameras enhance site security and compliance?
5. What role does preventive maintenance play in avoiding unexpected failures?

Clarify related topics such as energy efficiency tracking, intrusion alerts, and maintenance hygiene for power equipment.

Demonstrate

- Demonstrate navigating a remote monitoring dashboard using sample screenshots to interpret alarms and sensor data.
- Show how to classify alarms—critical, major, minor—and outline escalation steps.
- Demonstrate routine inspection steps for battery banks, solar panels, DG sets, PIU, and SMPS.
- Show how to check CCTV camera feed quality, access control functionality, and alarm panel health.
- Demonstrate documenting alarm events and reporting security breaches through a sample escalation flow.

Activity

- **Activity Name:** Alarm Analysis & Response Simulation
- **Objective:** Enable learners to classify alarms, interpret remote monitoring data, and propose escalation steps.
- **Type:** Group
- **Resources:** Sample dashboard images, alarm logs, security alert examples
- **Duration:** 30 minutes
- **Instructions:**
  - Groups receive different alarm and security alert scenarios.
  - They analyze data, classify the severity, decide the correct action, and prepare a short response plan.
- **Outcome:** Enhanced skills in alarm interpretation, remote monitoring, and timely escalation.

Notes for Facilitation

- Reinforce the importance of continuous monitoring for preventing downtime and security risks.

- Encourage learners to relate dashboard information to real-site scenarios.

- Highlight the need to verify security system health during every site visit.

- Stress timely escalation of critical alarms to prevent damage or outages.

- Promote the importance of preventive checks on power equipment and proper documentation.

Unit 3.3: Energy Efficiency and Record Management

Unit Objectives ⊚

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

1. Explain telecom hardware integration with energy-efficient solutions, such as hybrid power systems.

2. Show how to ensure the proper functioning of civil, mechanical, and electrical infrastructure at the site, including fire safety equipment and grounding systems.

3. Discuss energy audit methodologies and strategies to improve energy efficiency in telecom sites.

4. Show how to maintain accurate logs of equipment maintenance, power usage, fuel supply, and vendor activities for compliance and auditing.

Resources to be Used ⚙

Participant Handbook, Projector, Sample energy audit sheets, Maintenance log templates, Hybrid power system diagrams, Whiteboard & markers

Say 💬

- Today's session focuses on Energy Efficiency and Record Management, essential for reducing operational costs and ensuring regulatory compliance at telecom sites.
- You will learn how energy-efficient hardware such as hybrid power systems are integrated into site operations and how infrastructure health impacts energy consumption.
- We will also explore energy audit methods and discuss how proper record management strengthens accountability, transparency, and site performance.
- Maintaining accurate logs helps track trends, prevent failures, and support long-term optimization.

Ask 💬

- What energy-efficient systems have you seen or heard about in telecom sites?
- How does infrastructure condition—civil, mechanical, electrical—affect energy consumption?
- Why do you think energy audits are important for telecom operators?
- What types of logs must always be maintained during site visits?
- How can proper record management help in audits or compliance checks?

Do ☑

- Observe sample energy audit forms and identify what data is typically recorded.
- Review maintenance log templates and note key mandatory entries
- Examine diagrams of hybrid power systems and identify their components.
- Discuss common inefficiencies (e.g., faulty cooling units, improper grounding) and how they impact energy use.

Elaborate

Use the following questions to deepen learner understanding:

1. How do hybrid power systems reduce diesel usage and improve overall energy efficiency?
2. What routine checks ensure civil, mechanical, and electrical infrastructure support efficient power operations?
3. What methodologies are used during energy audits, and what insights do they provide?
4. How do accurate logs help detect energy wastage or operational gaps?
5. What records are essential during compliance checks and vendor performance reviews?

Clarify related points such as grounding quality, DG efficiency, cooling system impact, and audit reporting.

Demonstrate

- Demonstrate reading and interpreting a sample energy audit sheet.
- Show how to inspect fire safety equipment, grounding connections, and electrical panels for proper functioning.
- Demonstrate identifying inefficiencies in cooling systems, PIU, SMPS, or hybrid energy setups.
- Show how to fill maintenance logs for equipment checks, fuel usage, and vendor activities.
- Demonstrate organizing compliance-related records for easy retrieval during audit processes.

Activity

- **Activity Name:** Energy Efficiency Assessment & Log Entry
- **Objective:** Enable learners to analyze energy usage patterns and maintain accurate operational records.
- **Type:** Group
- **Resources:** Sample audit sheets, log templates, hybrid system diagrams
- **Duration:** 30 minutes
- **Instructions:**
    - Groups receive a simulated site scenario with energy readings, maintenance events, and vendor activities.
    - They identify inefficiencies, recommend improvement steps, and complete a log entry based on the scenario.
- **Outcome:** Learners understand how to evaluate energy efficiency, maintain structured records, and ensure compliance.

Notes for Facilitation 📝

- Emphasize the role of energy-efficient systems in reducing costs and supporting sustainability.
- Highlight how neglected infrastructure (cooling, grounding, civil structure) impacts energy performance
- Encourage hands-on practice with log templates and audit sheets for accuracy.
- Reinforce the importance of consistent record management for vendor monitoring and audits.
- Connect energy management practices with overall site reliability and uptime.

Exercise ✎

Answers to exercises for PHB

A. Multiple Choice Questions

1. a) IEC (International Electrotechnical Commission)
2. b) Using approved bunding, clear labeling, and keeping fire extinguishers nearby
3. b) Track alarms, sensor data, and help detect anomalies in real time
4. b) Notify the NOC/operations center, inform the site supervisor, and dispatch technician as per SLA
5. b) Maintaining visit logs, gate passes, and validating invoices against work completed

B. Short Answer Questions

1. **Three fire safety measures:**
   - Install and maintain fire extinguishers (CO_2/DCP).
   - Ensure proper cable management and removal of flammable waste.
   - Maintain functioning fire alarms/smoke detectors.
2. **Alarm classification & escalation:**
   - **Informational:** Non-critical updates (e.g., system logs).
   - **Warning:** Potential issues needing attention (e.g., high temperature).
   - **Critical:** Immediate threat to uptime (e.g., total power failure).
   - **Escalation for critical:** Inform NOC → notify supervisor → dispatch technician as per SLA → log the event.
3. **Steps to verify electricity bill & vendor activity:**
   - Cross-check meter readings with actual site meter.
   - Compare consumption trends with previous months.
   - Validate vendor work using gate passes, visit logs, photos, and contract terms.

C. Fill in the Blanks

1. National and international safety standards commonly referenced for telecom sites include IEC, OSHA, and BIS.
2. The two most common types of fire extinguishers used at power equipment areas are CO_2 and DCP extinguishers.
3. Proper grounding helps to prevent electric shock and protects personnel and equipment from electrical faults.
4. A documented agreement specifying response times, deliverables, and penalties for breaches between the operator and service provider is called an SLA.

D. True or False

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

Notes

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4. Sustainability Practices in Telecom Infrastructure Management

Unit 4.1 - Sustainability Practices in Telecom Infrastructure Management

Key Learning Outcomes

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

Explain the e-waste management rules applicable to the telecom sector.

1. Show how to identify, segregate, and categorize e-waste and hazardous waste at telecom sites.

2. Describe Central Pollution Control Board (CPCB) guidelines for telecom site waste disposal.

3. Demonstrate the process of maintaining logs and records for disposed, recycled, or repurposed telecom waste.

4. Identify safety standards for battery handling and disposal, including lead-acid and lithium-ion batteries.

5. Demonstrate safe handling procedures for hazardous materials, including the use of protective gear.

6. List recyclable telecom components and methods for minimizing telecom waste.

7. Demonstrate the reduction of packaging waste through the reuse of telecom materials and accessories.

8. Elucidate techniques for energy optimization, such as smart cooling, LED lighting, and hybrid power systems.

9. Demonstrate energy-efficient practices, such as optimizing power usage and using smart cooling systems.

10. Explain the role of renewable energy sources, like solar energy, in reducing telecom carbon footprint.

11. Show how to assist in adopting solar-powered telecom towers and integrating hybrid energy systems.

12. Describe best practices for managing telecom tower site waste and reducing fuel consumption in Diesel Generators (DG) sets.

13. Demonstrate guiding co-workers on eco-friendly practices and waste management policies.

14. Define water conservation principles and sustainable telecom site design.

15. Explain the importance of training telecom employees on environmental awareness and compliance.

16. Show how to conduct periodic environmental audits to ensure sustainability compliance.

Unit 4.1: Sustainability Practices in Telecom Infrastructure Management

Unit Objectives ⊚

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

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

Resources to be Used ⚙

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

Say 💬

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

Ask 🔘

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

Do ✓

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

Elaborate ⚙

Understanding E-Waste

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

Concept of Waste Management

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

Recycling Process of E-Waste

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

Demonstrate 📋

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

Activity

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

Notes for Facilitation

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

Exercise ✎

Answers to exercises for PHB

A. Multiple Choice Questions
1. b) E-Waste Management Rules
2. b) Lead-acid or lithium-ion battery
3. b) To track waste movement and ensure compliance
4. c) Metal frames and cables
5. b) Reducing carbon footprint

B. Fill-in-the-Blanks
1. handling
2. hazardous
3. energy

D. Short Answer Questions
1. To ensure safe, compliant, and environmentally responsible disposal that avoids pollution and legal violations.
2. Smart cooling systems, LED lighting, hybrid power systems, or solar energy (any two).
3. To track waste movement, ensure regulatory compliance, support audits, and promote responsible waste management.

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5. Employability Skills (30 Hours)

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

DGT/VSQ/N0101

6. Annexure

Annexure I: Training Delivery Plan
Annexure II: Assessment Criteria
Annexure III: List of QR Codes used in PHB
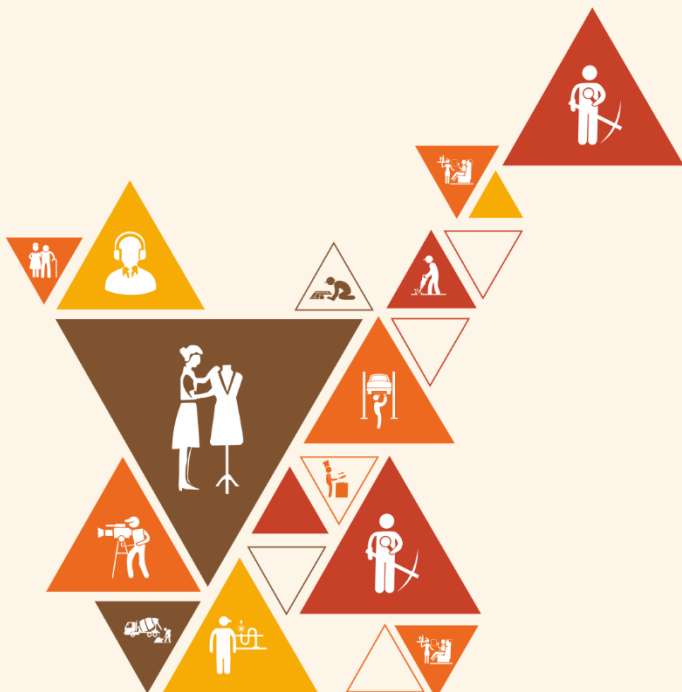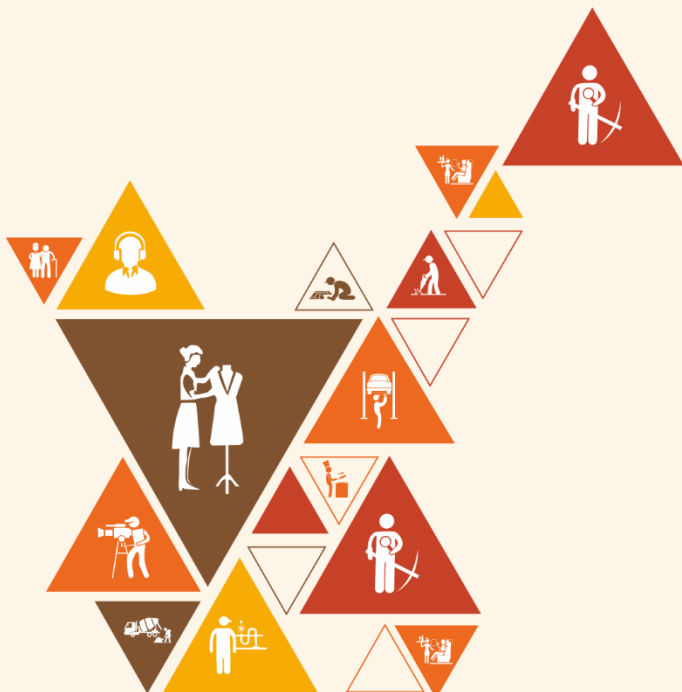
Annexure I
Training Delivery Plan

Training Delivery Plan			
Program Name:	Telecom Tower Site Maintenance Technician		
Qualification Pack Name & Ref. ID	TEL/Q4100, Version 5.0 NSQF Level: 4		
Version No.	5.0	**Version Update Date**	30-04-2028
Pre-requisites to Training (if any)	NA		
Training Outcomes	**After completing this programme, participants will be able to:** • Explain how to maintain tower site and report periodically. • Describe the process of managing site operation safely and hygienically. • Discuss the importance of following sustainability practices in telecom infrastructure management. • Discuss the Employability and Entrepreneurship Skills.		

SL	Module Name	Session Name	Session Objectives	NOS/PC Covered	Methodology	Training Tools/Aids	Duration (hours)
1.TEL/N 4138: Maintain tower site and report periodically **(Theory: 60, Practical: 120)**	Introduction to the sector and the job role of a Telecom Tower Site Maintenance Technician	Introduction to Telecom Tower Infrastructure	• Explain the telecom tower ecosystem and site components • Describe the role and responsibilities of a tower maintenance technician • Identify key infrastructure elements at tower sites	KU7	Lecture, Site Tours (Virtual/Actual), Role Understanding	Presentation slides, site diagrams, virtual tour software, role cards	(Theory: 3:00, Practical: 00:00)
		Safety Protocols & Documentation Standards	• Apply standard safety procedures for electrical and mechanical maintenance Understand documentation standards for telecom site maintenance • Use personal protective equipment correctly	KU6, KU8	Safety Workshops, Documentation Exercises	PPE kits, safety manuals, documentation templates, incident reports	(Theory: 2:00, Practical: 05:00)
	Maintaining Telecom Tower Site and Periodic Reporting	Renewable Energy Systems Maintenance	• Inspect, clean, and maintain solar panels and wind turbines • Service hybrid power systems and monitor their performance • Identify common faults in renewable energy systems	PC1, KU1	Hands-on Workshop, Field Practice	Solar panels, wind turbine models, cleaning kits, testing equipment	(Theory: 8:00, Practical: 15:00)
		Battery Technologies & Maintenance	• Test and service lead-acid, lithium-ion, and solid-state battery banks • Monitor battery health and charging cycles • Perform load testing and capacity verification	PC2, KU2	Battery Lab, Testing Procedures	Battery banks (various types), load testers, capacity analyzers, maintenance tools	(Theory: 7:00, Practical: 15:00)

SL	Module Name	Session Name	Session Objectives	NOS/PC Covered	Methodology	Training Tools/Aids	Duration (hours)
		Power Systems & Environmental Control	• Monitor and calibrate PIU, SMPS, diesel generators, and AC systems • Perform load balancing for efficient energy distribution • Maintain environmental control units	PC3, PC4, PC6	Systems Workshop, Calibration Practice	DG sets, SMPS units, PIUs, AC systems, load balancing tools	(Theory: 8:00, Practical: 15:00)
		Electrical Safety & Grounding Systems	• Inspect and rectify faults in grounding systems • Ensure electrical safety compliance • Test earth resistance and grounding integrity	PC5, KU6	Safety Labs, Grounding Practice	Grounding testers, earth resistance meters, safety inspection tools	(Theory: 5:00, Practical: 10:00)
		Remote Monitoring & Predictive Maintenance	• Use remote monitoring tools to track site health • Apply predictive maintenance principles • Analyze site data for early fault detection	PC7, KU3, KU4	Monitoring Software Training, Data Analysis	Remote monitoring software, predictive analytics tools, site data logs	(Theory: 6:00, Practical: 10:00)
		Fault Diagnosis & Corrective Maintenance	• Identify and troubleshoot site faults including power failures • Analyze site downtime using data analytics • Repair or replace faulty power components	PC8, PC9, PC10, KU5	Troubleshooting Labs, Fault Simulation	Fault simulators, diagnostic tools, spare components, repair kits	7 Theory / 15 Practical
		Connectivity Restoration & Emergency Repairs	• Restore connectivity by addressing transmission failures • Perform emergency repairs on alternative power sources • Handle alarm-triggered events effectively	PC11, PC12	Emergency Response Drills, Restoration Practice	Emergency repair kits, transmission testers, alarm systems	(Theory: 7:00, Practical: 15:00)

SL	Module Name	Session Name	Session Objectives	NOS/PC Covered	Methodology	Training Tools/Aids	Duration (hours)
		Energy Efficiency & Compliance Monitoring	• Track and analyze energy consumption for optimization • Identify and rectify power inefficiencies • Ensure regulatory compliance in energy management	PC13, PC14, PC15	Energy Audits, Compliance Checks	Energy meters, audit software, compliance checklists, efficiency tools	(Theory: 5:00, Practical: 10:00)
		Spare Parts Management & Inventory Control	• Maintain inventory of spare parts for power maintenance • Manage stock levels and reorder processes • Track component usage and shelf life	PC16	Inventory Management Exercises	Inventory software, stock tracking systems, spare parts samples	(Theory: 2:00, Practical: 10:00)
		Documentation & Reporting Systems	• Document preventive and corrective maintenance tasks • Maintain records of site power logs and energy audits • Use digital reporting tools for real-time updates	PC17, PC18, PC20	Reporting Workshops, Digital Tool Training	Reporting software, digital logs, audit templates, mobile reporting apps	(Theory: 4:00, Practical: 10:00)
		Issue Reporting & Escalation	• Report issues like fuel consumption, security breaches, or theft • Escalate critical problems to supervisors • Maintain communication protocols during incidents	PC19	Role-playing Scenarios, Escalation Drills	Incident report forms, escalation matrices, communication devices	(Theory: 3:00, Practical: 5:00)

Sr.No.	Module Name	Session Name	Session Objectives	NOS/PC Covered	Methodology	Training Tools/Aids	Duration (hours)
2. TEL/N4139: Manage site operation safely and hygienically **(Theory: 50, Practical: 70)**	Managing Telecom Site Operations Safely and Hygienically 234	Site Upkeep & Infrastructure Management	• Conduct routine checks on power equipment (solar panels, battery banks) • Ensure proper functioning of civil and mechanical infrastructure • Identify and clear unwanted materials for clutter-free sites	PC1, PC2, PC3, KU7	Hands-on Inspection Workshops, Site Audits, Cleaning Protocols	Inspection checklists, maintenance tools, cleaning equipment, infrastructure diagrams	(Theory: 8:00, Practical: 12:00)
		Documentation & Log Management	• Maintain accurate logs of equipment maintenance and power usage • Document vendor activities and service records • Create systematic documentation processes	PC4, KU9	Documentation Workshops, Record-keeping Exercises, Digital Tool Training	Log templates, digital documentation systems, record management software	(Theory: 6:00, Practical: 8:00)
		Safety Standards Implementation	• Implement national/international safety standards (IEC, OSHA, BIS) • Conduct regular checks on fire safety equipment and electrical installations • Apply fire safety measures and electrical hazard management	PC5, PC6, KU1, KU2	Safety Compliance Workshops, Inspection Drills, Standard Implementation	Safety standards manuals, inspection checklists, fire safety equipment, compliance tools	(Theory: 10:00, Practical: 15:00)
		Site Hygiene & Waste Management	• Conduct hygiene checks for DG sets, PIU, SMPS, and battery banks • Maintain site cleanliness through debris removal • Implement proper waste segregation systems	PC7, PC8, KU3	Hygiene Protocols Practice, Waste Management Exercises, Cleaning Procedures	Cleaning kits, waste segregation systems, hygiene checklists, PPE for cleaning	(Theory: 6:00, Practical: 10:00)

SL	Module Name	Session Name	Session Objectives	NOS/PC Covered	Methodology	Training Tools/Aids	Duration (hours)
		Alarm Monitoring & Response	• Track site alarms and sensor data using remote monitoring systems • Respond to security alerts and unauthorized access incidents • Respond to security alerts and unauthorized access incidents	PC9, PC10, PC12, KU4, KU5	Monitoring System Training, Response Drills, Trend Analysis	Remote monitoring software, alarm systems, response protocols, trend analysis tools	(Theory: 8:00, Practical: 12:00)
		Security Systems Management	• Ensure proper functioning of surveillance cameras and access control systems • Manage security system integration and maintenance • Implement access control protocols	PC11, KU6	Security System Workshops, Access Control Practice, Camera Maintenance	Surveillance cameras, access control systems, security software, maintenance tools	(Theory: 6:00, Practical: 8:00)
		Site Administration & Energy Management	• Verify electricity bill readings against site energy logs • Monitor vendor activities and SLA compliance • Conduct energy audits and implement efficiency strategies	PC13, PC14, KU8, KU9	Administration Workshops, Vendor Management Exercises, Energy Audits	Energy meters, audit software, SLA documents, vendor management tools	(Theory: 8:00, Practical: 10:00)
		Compliance Documentation & Record Keeping	• Ensure proper documentation of fuel supply and energy usage • Maintain records of safety inspections and repairs • Manage regulatory compliance documentation	PC15, PC16, KU1, KU9	Compliance Documentation Workshops, Record Management, Audit Preparation	Compliance templates, digital record systems, audit preparation tools, regulatory documents	(Theory: 4:00, Practical: 5:00)

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

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

Assessment Criteria for	
Job Role	Telecom Tower Site Maintenance Technician
Qualification Pack	TEL/Q6212 V5.0
Sector Skill Council	Telecom Sector Skill Council

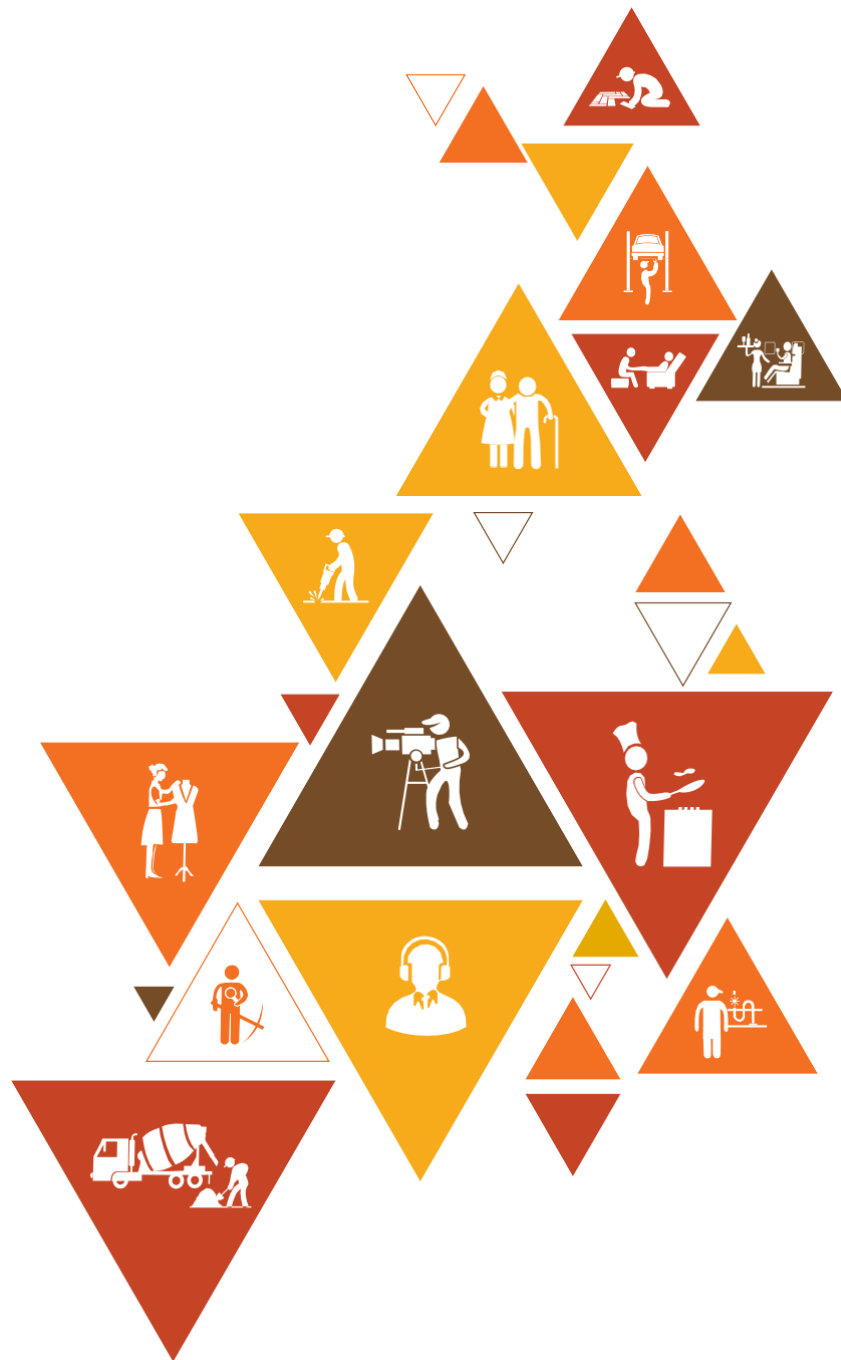| S. No.	Guidelines for Assessment
1	The assessment for the theory part will be based on knowledge bank of questions approved by the SSC.
2	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/ option NOS/ Set of NOS.
3	Individual assessment agencies will 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	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
TEL/N4138.Maintain tower site and report periodically	30	50	-	20	100	40
TEL/N4139.Manage site operation safely and hygienically	30	50	-	20	100	30
TEL/N9109.Follow sustainable practices in telecom infrastructure management	30	50	0	20	100	20
DGT/VSQ/N0101.Employability Skills (30 Hours)	20	30	-	-	50	10
Total	**110**	**180**	**0**	**60**	**350**	**100**

Annexure-III

QR Codes –Video Links

Chapter No	Unit No	Topic Name	QR Code
1Introduction to the sector & the job role of a Telecom Tower Site Maintenance Technician	1.1:Telecom Sector in India	Components of a Cellular Network	Click the QR code to view the video on how a telecom tower works
2. Maintaining Telecom Tower Site and Periodic Reporting	2.1 Telecom Power Systems and Preventive Maintenance	Types of Telecom Towers	Click the QR code to view the video on types of telecom tower
		Telecom tower and its components	Click the QR code to view the video on Telecom tower and its components
		General Maintenance activities	Click the QR code to view the video

Chapter No	Unit No	Topic Name	QR Code
3. Managing Telecom Site Operations Safely and Hygienically	3.1. Safety Standards and Site Compliance	Importance of safe working practices (First Aid Techniques)	Click/Scan this QR code to view the video for First Aid at work place
		Importance of safe working practices	Click/Scan this QR code to view the video on Hand Washing techniques
		Importance of safe working practices	Click/Scan this QR code to view the video on CPR Techniques
4. Sustainability Practices in Telecom Infrastructure Management	4.1. Sustainability Practices in Telecom Infrastructure Management	Waste Management	https://www.youtube.com/watch?v=ziwB8h4jVNg Click/Scan this QR code to view the video on Waste Management
		Extended Producer Responsibility (EPR)	https://www.youtube.com/watch?v=h6iOQ0bZt6k
		E-waste (Management) Rules, 2022	https://www.youtube.com/watch?v=qNj8ESmSwcI