NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

Telecom Sector Skill Council

Facilitator Guide



Sector
Telecom

Sub-Sector
Passive Infrastructure

Occupation
Customer Service - Passive Infrastructure

Reference ID: **TEL/Q6401,** Version **5.0**
NSQF Level **4**

Optical Fiber Technician

This book is sponsored by
Telecom Sector Skill Council
Estel House,3rd Floor, Plot No: - 126, Sector-44
Gurgaon, Haryana 122003
Phone: 0124-2222222
Email: tssc@tsscindia.com
Website: www.tsscindia.com

All Rights Reserved
First Edition, November 2025
Under Creative Commons License: CC BY-NC-SA
Copyright © 2025
Attribution-Share Alike: CC BY-NC-SA

Disclaimer

The information contained herein has been obtained from sources reliable to Telecom Sector Skill Council. Telecom Sector Skill Council disclaims all warranties to the accuracy, completeness or adequacy of such information. Telecom Sector Skill Council shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. Every effort has been made to trace the owners of the copyright material included in the book. The publishers would be grateful for any omissions brought to their notice for acknowledgements in future editions of the book. No entity in Telecom Sector Skill Council shall be responsible for any loss whatsoever, sustained by any person who relies on this material. The material in this publication is copyrighted. No parts of this publication may be reproduced, stored or distributed in any form or by any means either on paper or electronic media, unless authorized by the Telecom Sector Skill Council.

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

Shri Narendra Modi
Prime Minister of India

Acknowledgements

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

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

About this Guide

The facilitator guide (FG) for Optical Fibre Technician is primarily designed to facilitate skill development and training of people, who want to become professional Optical Fibre Technicians in the industry. The Facilitator Guide is aligned to the Qualification Pack (QP) and the National Occupational Standards (NOS) as drafted by the Telecom Sector Skill Council of India (TSSCI) and ratified by National Skill Development Corporation (NSDC).

It includes the following National Occupational Standards (NOSs):

1. TEL/N4137: Coordinate Installation and Commissioning of Optical Fiber Cables (OFCs)
2. TEL/N6403: Undertake Condition based Maintenance and Planned Repair Activities
3. TEL/N6404: Perform Corrective Maintenance/Restoration of Optical Fiber Faults
4. TEL/N9111: Follow sustainability practices in telecom cabling operations
5. DGT/VSQ/N0101: Employability Skills (30 Hours)

Post this training, the participants will be able to perform tasks as professional Optical Fibre Technician. We hope that this Facilitator Guide provides a sound learning support to our young friends to build a lucrative career in the telecom industry.

Symbols Used

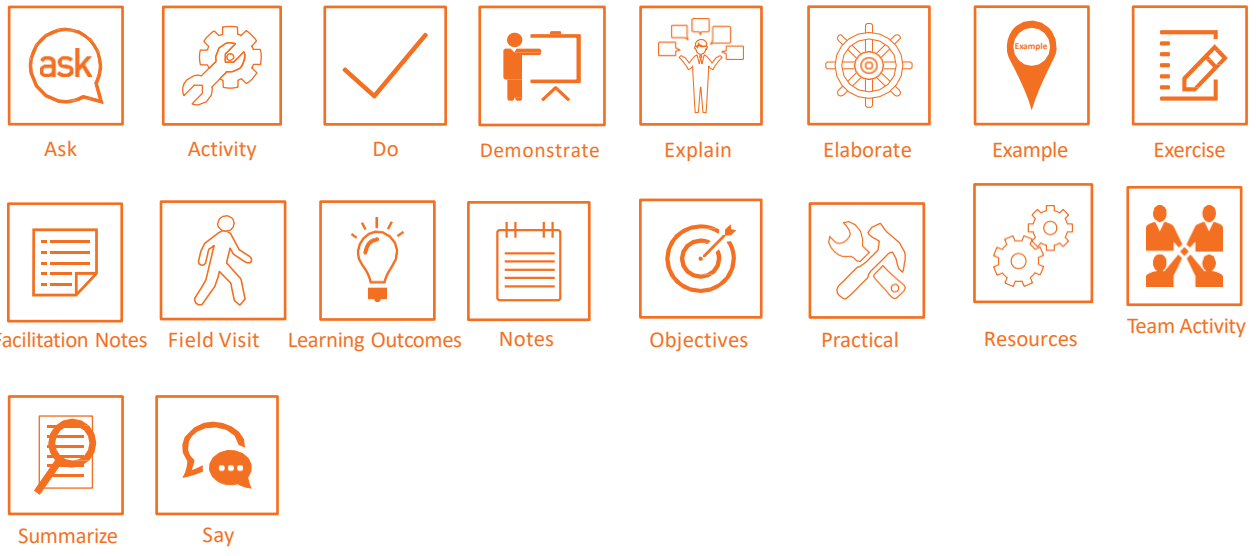
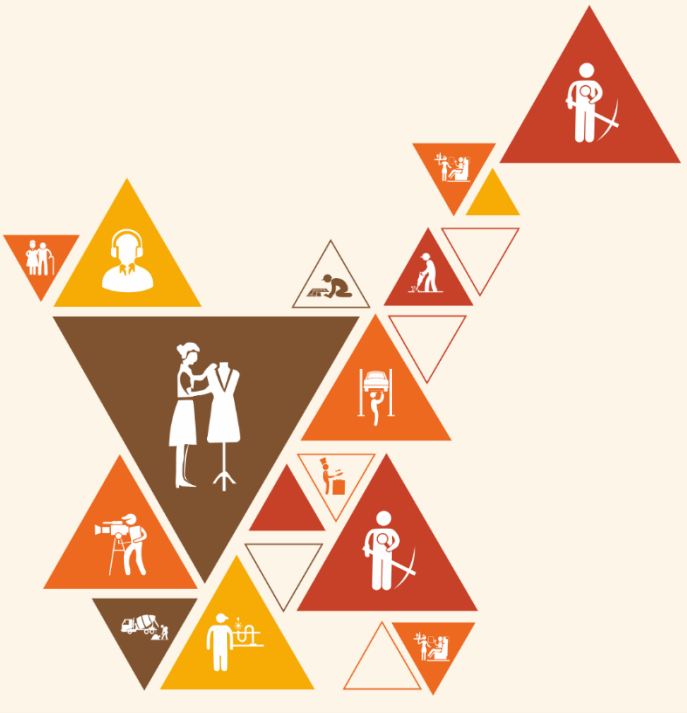


Table of Contents

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 and the Job Role of an Optical Fiber Technician

Unit 1.1 - Introduction to Telecom Sector and Role of an Optical Fiber Technician



TEL/N4137

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 role and responsibilities of an Optical Fiber Technician.

UNIT 1.1: Introduction to Telecom Sector and Role of an Optical Fiber Technician

Unit Objectives

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

1. Explain the significance of the telecom sector in the installation and maintenance of optical fiber networks.
2. Elucidate the key skills and technical expertise required for an Optical Fiber Technician.
3. Describe the challenges faced in splicing, testing, and troubleshooting optical fiber cables in telecom networks.
4. Determine the impact of precision and quality control in optical fiber installation and maintenance for reliable telecom services.
5. Discuss the roles and responsibilities of an Optical Fiber Technician in ensuring efficient and high-quality network performance.

Resources to be Used

Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, projector, fiber samples (dummy), splicing tool visuals, laser pointer.

Note

In this unit, we will understand the telecom sector's scope and explore the crucial role played by Optical Fiber Splicers in building and maintaining modern communication networks.

Say

Good morning everyone!
Let's begin our training journey with an introduction to the telecom industry and the important role you will play as Optical Fiber Splicers. Today's session will help you understand where you fit into the larger telecom ecosystem and what skills the industry expects from you.

Ask

Ask the participants:

- Why do you think optical fiber has become the backbone of telecom networks?
- Have you ever seen an optical fiber cable or splicing machine in real life?

Write their answers on the whiteboard or flipchart.
Use their responses to transition into the lesson.

Elaborate

In this session, we will discuss the following point:

- Introduction to Telecom Industry
- Various Sub-Sectors of the Telecom Industry
- Broadband Industry
- Optical Fibre Technology
- Types of Optical Fibre
- Roles and Responsibilities of Optical Fibre Splicer
- Skills Required to be a successful Optical Fiber Technician
- Fiber Optic Infrastructure growth
- Public Switched Telephone Network (PSTN)
- Traditional Forms of Retailing in India

Say

Let's participate in an activity to explore this unit further on Understanding the Telecom Ecosystem.

Activity

- **Duration**: 25 minutes
- **Resources**: Projector, images/videos of telecom infrastructure, markers, chart paper.
- **Steps**:
  1. Divide the class into small groups.
  2. Show images/videos of telecom towers, fiber ducts, junction boxes, customer premises installations, and NOCs.
  3. Ask each group to identify:
     - Where optical fiber is used
     - What happens if splicing is poor
     - Which part of the ecosystem requires the role of a splicer
  4. Groups prepare a quick chart and present their observations.

Do

- Write key insights from each group on the whiteboard.
- Connect their observations to real-world telecom operations.
- Encourage trainees to share their experiences or assumptions.
- Ask one trainee to summarize the key takeaways from the activity.

Say

Let's participate in an activity to explore this unit further on Skill Mapping – What Makes an Optical Fiber Splicer?

Activity

- **Duration**: 20 minutes
- **Resources**: Whiteboard, markers, sample fiber cable or pictures.
- **Steps**:
  1. Create three columns on the board:Technical Skills, Soft Skills, Field Responsibilities.
  2. Ask trainees to suggest skills they think an Optical Fiber Splicer must have.
  3. Write their suggestions under the appropriate column.
  4. After discussion, reveal the industry-expected skills such as:
     - Fiber handling
     - OTDR testing
     - Splice machine operation
     - Safety compliance
     - Documentation and reporting
  5. Groups prepare a quick chart and present their observations.

Do

- Add missing skills to complete the picture of an OFC splicer's role.
- Share examples of how these skills affect network performance.
- Encourage every trainee to contribute at least one skill or responsibility.
- Ask one volunteer to recap the entire skill-mapping discussion.

Notes for Facilitation

- Encourage questions about fiber technology and field roles.
- Allow trainees to answer each other to promote peer learning.
- Suggest reading the introductory chapter in the participant handbook.
- Reinforce the idea that precision, safety, and responsibility are central to the role of an Optical Fiber Splicer.

Exercise

Answers to exercises for PHB

A. Short Answer Questions:

1. The telecom sector is significant because it enables seamless digital communication, supports economic activities such as e-commerce, remote work, and digital services, and contributes to national development by improving connectivity and information flow.
2. Three key technical skills are:
   - Precision fiber cleaving
   - Fusion or mechanical splicing
   - Use of OTDR and power meter for testing
3. A major challenge is achieving precise fiber core alignment; it can be addressed by using high-quality cleavers, calibrated fusion splicing machines, and maintaining clean fiber ends.
4. Fiber optic technology improves internet speed and connectivity by transmitting data using light signals, which offer higher bandwidth, lower latency, and minimal signal loss over long distances.
5. Main responsibilities include installing fiber cables, splicing and joining fibers, testing network quality, performing repairs, and ensuring proper documentation and safety compliance.

B. Multiple Choice Questions (MCQs):

1. b) Facilitates high-speed data and voice connectivity
2. b) Precision fiber cleaving and splicing
3. b) Aligning fiber cores precisely to minimize signal loss
4. b) Internet speed and connectivity
5. b) Installing, splicing, and testing fiber optic cables

C. Fill in the Blanks:

1. splicing; joining
2. data; communication
3. Alignment
4. total internal reflection
5. core alignment

Notes

2. Coordinate Installation and Commissioning of Optical Fiber Cables

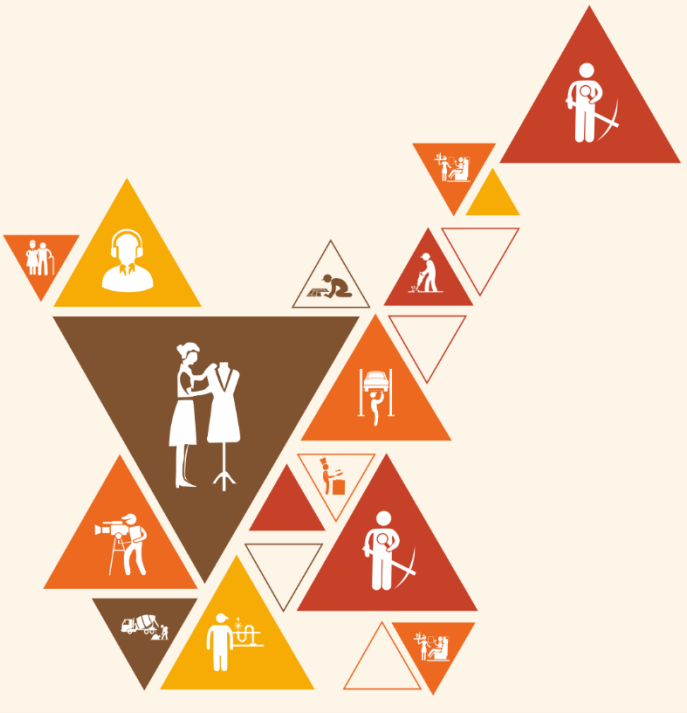
Unit 2.1 - Site Visit and Route Inspection

Unit 2.2 - Choosing the Right Type of Optical Fiber

Unit 2.3 - Fiber Optic Tools and Tool Kit

Unit 2.4 - Installation of Fiber Optic Cable

Unit 2.5 - Safety, Quality, and Environmental Compliance in Optical Fiber Installation



TEL/N4137

Key Learning Outcomes 

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

1. Explain the key steps involved in inspecting the route plan for optical fiber cable installation.
2. Elucidate the process of coordinating cable laying and pulling to ensure compliance with industry standards.
3. Discuss the importance of adhering to health and safety guidelines in optical fiber installation projects.
4. Explain the significance of reporting and recording installation activities for project tracking and fault management.

UNIT 2.1: Site Visit & Route Inspection

Unit Objectives

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

1. Demonstrate how to obtain and review the OFC route plan from the planning team or supervisor.
2. Show how to verify the proposed route, ensuring compliance with manufacturer-specified bend ratios and industry standards.
3. Demonstrate how to identify dependencies and create an effective installation work plan.
4. Show how to determine the required statutory permissions and liaise with relevant authorities to secure clearances.
5. Discuss the different types of clearances and municipal approvals required for optical fiber installation work.
6. Demonstrate how to supervise trenching to ensure it is carried out as per the route plan and site terrain.
7. Show how to use specially designed dispensers for accurate duct placement in trenches.
8. Demonstrate how to check pipe/duct depths for compliance with laying standards and rectify collapsed or twisted ducts.
9. Show how to confirm ducts are clean and sealed with appropriate end plugs to prevent contamination.
10. Show how to confirm the use of protective materials such as GI or RCC pipes where necessary.

Resources to be Used

Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, projector, duct samples, OFC route plan samples, measuring tape, duct dispenser (demo tool), GI/RCC pipe samples, safety cones, and route marking sheets.

Note

In this unit, we will understand how OFC routes are inspected, planned, and prepared before installation begins.

Say

Good Morning everyone!
Today we're going to explore the very first stage of optical fibre installation—the site visit and route inspection. This stage is extremely important because a single mistake in route planning can create long-term maintenance issues. So let's dive into how to do it the right way.

Ask

Ask the participants the following questions:

- Have you ever seen an OFC route plan or a trenching activity in your locality?
- What challenges do you think might occur while inspecting a fiber route?

Write down their answers on the whiteboard or flipchart.

Use their responses as your starting point for the lesson.

Elaborate

In this session, we will discuss the following point:

- How to obtain the OFC route plan
- Reviewing route alignments and bends
- Manufacturer bend-ratio guidelines
- Identifying site dependencies (road crossings, culverts, utilities)Creating the installation work plan
- Statutory permissions and municipal clearances
- Supervising trenching activities
- Using duct dispensers for accurate placement
- Checking pipe/duct depth and alignment
- Ensuring ducts are clean, sealed, and free from defects
- Use of protective materials like GI/RCC pipes
- Ensuring compliance with Telecom, NHAI, PWD, and municipal guidelines

Say

Let's do an activity 'Route Plan Review Simulation' to connect these concepts with practical field situations.

Activity

- **Duration**: 30 minutes
- **Resources**: Sample OFC route plans, projector, markers, duct bend-radius chart.
- **Steps**:
  1. Divide the class into small groups.
  2. Provide each group with a sample OFC route plan.
  3. Ask them to:
     - Identify the fibre path
     - Mark possible dependencies (junctions, culverts, road crossings)
     - Highlight sections where bend ratios could be violated
  4. Groups present their observations.
  5. Facilitator explains the correct interpretation based on industry standards.

Do

- Ask a trainee to write each group's findings on the board.
- Share practical examples of poorly planned routes and their consequences.
- Encourage trainees to compare their route markings with actual standards.
- Ask one participant to summarize the key learning points.

Say

Let's do an activity 'Trenching & Duct Placement Demonstration' to connect these concepts with practical field situations.

Activity

- **Duration**: 25 minutes
- **Resources**: Duct dispenser demo tool, duct samples, end plugs, measuring tape, trench depth chart.
- **Steps**:
  1. Demonstrate how trench depth is measured according to standard guidelines.
  2. Show trainees how dispensers are used to place ducts uniformly.
  3. Ask each group to:
     - Place a duct sample using the dispenser (mock setup)
     - Check for twists, collapses, and uneven placement
     - Seal duct ends using plugs to prevent dust/water entry
  4. Discuss the use of GI/RCC pipes in high-load or critical zones (roads, culverts)..

Do

- Observe trainees' handling of ducts and correct any mistakes immediately.
- Reinforce why incorrect depth or twisted ducts cause huge maintenance problems.
- Encourage every trainee to handle the dispenser and sealing tools.
- Ask one trainee to summarize the key trenching and duct-placement practices.

Notes for Facilitation

- Ask trainees if they have any doubts related to route planning or trenching.
- Promote peer learning by asking participants to answer each other's questions.
- Remind trainees to refer to the trenching and duct-laying guidelines in the participant handbook.
- Reinforce the importance of safety, compliance, and quality checks during a site visit.

Notes

UNIT 2.2: Choosing the Right Type of Optical Fiber

Unit Objectives

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

1. Show how to select the appropriate optical fiber mode (Single Mode or Multi-Mode) based on the project location and network design.
2. Elucidate the basics of network design, including LAN/WAN integration and patch panel management.

Resources to be Used

Participant handbook, optical fiber samples (SMF/MMF), pen, pencil, notepad, whiteboard, flipchart, markers, laptop, projector, laser pointer, patch panel demo, fiber mode identification charts.

Note

In this unit, we will understand how to select the correct type of optical fiber and how it fits into the overall network design.

Say

Good Morning everyone!

Today, we are going to learn one of the most fundamental skills for a broadband technician—choosing the right optical fiber for the right job. Whether you are working on a building LAN, a long-distance backbone, or integrating fiber into a patch panel, choosing the correct fiber type is essential.

Ask

Ask the participants the following questions:

- What is the difference between Single Mode and Multi-Mode fiber?
- Which type of fiber have you seen in your locality or previous worksite?

Write their responses on the whiteboard/flipchart and use their answers to ease into the concepts.

Elaborate

In this session, we will discuss the following point:

- Basics of optical fiber modes
- Single Mode Fiber (SMF) vs. Multi-Mode Fiber (MMF)
- How distance and bandwidth requirements influence fiber selection
- Choosing fiber based on:
    - Building networks
    - Campus networks
    - Long-distance connections
    - Backbone/WAN design
- Network design fundamentals
- LAN/WAN integration basics
- Patch panel management and fiber organization
- Color coding, connector types, and labeling practices
- Practical examples of selecting fiber mode for different project scenarios

Say

Let’s move into an activity to understand fiber selection in real-world scenarios.

Activity

- **Duration**: 25 minutes
- **Resources**: Scenario cards, fiber samples (SMF/MMF), projector, whiteboard.
- **Steps**:

1. Divide the class into small groups.
2. Give each group a scenario—for example:
3. Ask them to:
    - Connecting two floors inside the same building
    - Extending fiber between two buildings 2 km apart
    - Designing a 30-km backbone link
4. Ask the groups to decide whether SMF or MMF should be used and explain the reason.
5. Each group presents their choice briefly.
6. Summarize the correct fiber selection logic..

Do

- Ask a trainee to list each scenario and the chosen fiber type on the board.
- Guide participants when their reasoning needs improvement.
- Add insights about industrial standards and commonly used fiber types.
- Make sure all groups get a chance to speak.

Say

Let's do an activity 'Patch Panel Planning Task' to connect these concepts with practical field situations.

Activity

- **Duration**: 20 minutes
- **Resources**: Patch panel demo unit, connector samples, color-coding chart, fiber routing diagram.
- **Steps**:
  1. Show a basic patch panel layout on the projector.
  2. Provide sample connectors and a patch panel (demo or picture).
  3. Ask trainees to plan:
     - Which fibers enter the panel
     - How they should be arranged
     - How to label SMF vs. MMF ports
  4. Discuss the use of GI/RCC pipes in high-load or critical zones (roads, culverts)..

Do

- Ask a trainee to capture key patch panel planning steps on the board.
- Emphasize the importance of labeling and avoiding fiber mix-ups.
- Add examples from field installations to help them visualize real scenarios.
- Encourage everyone to practice or mimic routing gestures even if a physical panel isn't available.

Notes for Facilitation

- Encourage trainees to ask questions related to fiber selection and network organization.
- Motivate peer learning—invite participants to answer each other's queries.
- Remind trainees to review diagrams and tables in the participant manual.
- Reinforce that choosing the correct fiber mode prevents costly errors later in installation.

Notes

UNIT 2.3: Fiber Optic Tools and Tool Kit

Unit Objectives

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

1. Describe the importance of maintaining a proper and complete tool kit.
2. Demonstrate how to arrange tools, including advanced cable-handling equipment and spares, for installation.
3. Show how to confirm the proper placement of the cable drum at the site.
4. Demonstrate how to test cables on the drum for optical continuity.

Resources to be Used

Participant handbook, fiber splicing toolkit, safety gloves, notepad, markers, whiteboard, projector, fiber stripper, cleaver, cutter, visual fault locator (VFL), power meter, cable drum (demo or image).

Note

In this unit, we will learn about the essential tools used in fiber installations and how to maintain a complete, well-organized toolkit.

Say

Good Morning everyone!

Today we'll explore the tools that every fiber technician must carry. Whether you're installing, testing, or maintaining fiber networks, having the right tools—and keeping them organized—can make your work smoother, faster, and safer.

Ask

Ask the participants the following questions:

- What tools do you think are essential for fiber installation?
- Have you ever worked with any fiber splicing tools before?

Write down their answers on the whiteboard or flipchart.

Use their responses as your starting point for the lesson.

Elaborate

In this session, we will discuss the following point:

- Types of basic and advanced fiber optic tools
- Importance of tool maintenance and readiness
- Arranging tools and spare parts for installation work
- Cable drum placement at site: safety and alignment
- Optical continuity testing on the drum (using VFL, power meter, etc.)
- Preventing tool damage and avoiding loss of critical items

Say

Let's move into an activity to understand Fiber Tool Kit Preparation Drill.

Activity

- **Duration**: 25 minutes
- **Resources**: Demo tool kit, fiber tools (stripper, cleaver, cutter), VFL, power meter, spare connectors, labels, cable drum (or picture).
- **Steps**:
  1. Divide the class into small groups.
  2. Provide each group with a mixed set of tools, spares, and unused items.
  3. Ask trainees to plan:
     - Identify the essential fiber tools
     - Arrange the tools in proper order (testing tools together, splicing tools together, etc.)
     - Label the compartments of the toolkits
  4. Show a cable drum setup (real or picture) and ask trainees to explain the correct placement.
  5. Each group briefly demonstrates how they would test the cable on the drum for continuity using a VFL or power meter.
  6. Conclude by showing the ideal toolkit layout and correct cable drum testing procedure.

Do

- Ask a trainee to write down the essential tools identified by the groups on the board.
- Highlight mistakes and guide them toward proper toolkit organization.
- Share field tips on tool safety and avoiding tool loss at work sites.

Notes for Facilitation

- Invite trainees to ask questions about tool functions and handling.
- Encourage peer learning—let trainees explain tool uses to each other.
- Refer them to the tool list in the participant manual for reinforcement.

Notes

UNIT 2.4: Installation of Fiber Optic Cable

Unit Objectives

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

1. Describe the standard procedures for trenching, cable laying, splicing, jointing, blowing, and back-filling.
2. Discuss the procedures for sealing joints using heat shrinking, multi-diameter seals, and mechanical seals.
3. Determine the key steps involved in developing an effective installation work plan.
4. Describe the methods for managing labor and coordinating with third-party vendors in optical fiber projects.
5. Demonstrate how to ensure adherence to manufacturer-specified bend radii and manage tension during installation.
6. Demonstrate how to oversee cable blowing/jetting using advanced blowing machines.
7. Show how to verify additional cable length (loop) is available at jointing locations for future use.
8. Demonstrate how to ensure proper uncoiling and alignment of PLB ducts.
9. Explain the installation procedures for ultra-low loss cables and their significance in network performance.
10. Demonstrate how to ensure compatibility of ultra-low loss cables with project requirements.
11. Explain the importance of standard reporting, documentation, and as-built diagram protocols in optical fiber installation.

Resources to be Used

Participant handbook, notepad, pen, pencil, whiteboard, flipchart, markers, projector, laser pointer, sample PLB ducts, fiber cable reels, duct alignment diagrams, joint closure samples, bend radius chart, installation checklist.

Note

In this unit, we will discuss the complete installation process of fiber optic cables, from trenching to documentation.

Say

Good Morning everyone!
Today, we're going to explore how fiber optic cables are installed safely and effectively in the field. From trenching and duct preparation to sealing joints and maintaining bend radius, this unit will prepare you for real-world fiber deployment scenarios.

Ask

Ask the participants the following questions:

- What installation challenges have you seen or heard about in optical fiber projects?
- Why do you think bend radius and tension management are so critical?

Write down their answers on the whiteboard or flipchart.

Use their responses as your starting point for the lesson.

Elaborate

In this session, we will discuss the following point:

- Trenching and duct preparation
- Cable laying and proper uncoiling techniques
- Jointing, splicing, and back-filling
- Heat shrinking, mechanical sealing, and multi-diameter sealing
- Cable blowing/jetting methods
- Creating an installation work plan with manpower allocation
- Vendor coordination and quality checks
- Managing bend radius and installation tension
- Ultra-low loss cable installation considerations
- Documentation, reporting, and as-built diagram practices

Say

Let's move into an activity on Fiber Installation Planning Exercise

Activity

- **Duration**: 30 minutes
- **Resources:** Projector, whiteboard, duct/fiber routing diagrams, bend radius chart, scenario handouts.
- **Steps**:

1. Divide the class into groups of 3–4 trainees.
2. Provide each group with a project scenario—for example:
   - A 500-meter trench route with 4 joints and 1 road crossing
   - A building-to-building fiber run requiring duct alignment and blowing
3. Ask each group to prepare a small installation plan covering:
   - Trenching and duct alignment steps
   - Cable laying/blowing method
   - Joint closure type (heat shrink/mechanical)Required manpower and vendor support
   - How they will maintain bend radius and manage tension
   - Required loops at jointing points
4. Each group briefly presents their plan.
5. Summarize the correct installation steps and highlight industry best practices.

Do

- Ask one trainee to note the key points from each group's plan on the whiteboard.
- Add practical insights such as common field mistakes and how to avoid them.
- Ensure each trainee understands why proper planning prevents rework and cable damage.
- Encourage participation from all groups and provide positive reinforcement.
- Ask one participant to summarize the major installation steps learned in the session.

Notes for Facilitation

- Invite questions on duct alignment, blowing machines, sealing techniques, and documentation.
- Encourage trainees to explain concepts to one another to strengthen peer learning.
- Remind participants to review installation diagrams and charts in their handbook for clearer understanding.

Notes

UNIT 2.5: Safety, Quality, and Environmental Compliance in Optical Fiber Installation

Unit Objectives

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

1. Explain the importance of OHS and environmental regulations in optical fiber projects.
2. Discuss quality assurance, Acceptance Testing (AT) standards, and key signal quality KPIs.
3. Identify and use relevant PPE correctly for fiber optic work.
4. Recognize and manage electrical, chemical, and environmental hazards.
5. Demonstrate proper use of fire safety equipment and first-aid procedures.
6. Follow standard procedures for disposal of fiber waste and hazardous materials.
7. Comply with site-specific risk controls, OHS guidelines, and environmental regulations.
8. Document cable IDs, drum numbers, test results, and obtain sign-offs for audits and NOC updates.

Resources to be Used

Participant handbook, fiber installation toolkit, PPE kit (helmet, gloves, goggles, safety shoes), notepad, whiteboard, flipchart, projector, markers, fire extinguisher (demo), first-aid kit, waste disposal containers.

Note

In this unit, we will learn how to maintain safety, quality, and environmental compliance during fiber optic installation.

Say

Good Morning everyone!
Today we are going to focus on the most important aspect of fiber installation—working safely, ensuring quality, and protecting the environment. These practices not only keep you safe but also ensure a reliable network for customers.

Ask

Ask the participants the following questions:

- Why do you think PPE is mandatory while working with fiber optics?
- What are some common hazards you have seen at installation sites?

Write down their answers on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- Occupational Health & Safety (OHS) rules in fiber installations
- Environmental compliance practices
- PPE requirements and correct usage
- Quality assurance steps and Acceptance Testing (AT)Key KPIs like attenuation, splice loss, and power levels
- Common hazards (electrical, chemical, dust, sharp fiber scraps)Fire safety and first-aid basics
- Waste segregation and disposal methods
- Documentation for audits and NOC reporting

Say

Let's move into an activity on Safety Compliance Drill

Activity

- **Duration**: 30 minutes
- **Resources**: PPE kit (helmet, gloves, safety glasses, fiber apron), fire extinguisher demo, first-aid kit, waste boxes, fiber scraps (dummy), projector.
- **Steps**:

1. Divide the class into small groups.
2. Provide each group with a mixed set of PPE, Fire safety equipment, Dummy fiber scraps, and Hazard labels.
3. Display three real-world scenarios on the projector such as:

- A technician splicing fiber without eyewear
- A drum number undocumented in the installation sheet
- Fiber waste scattered near the trench

4. Ask each group to identify:

- Safety violations
- Missing PPE
- Environmental or quality compliance issues

5. Each group shares how they would correct the situation.
6. Conclude with the correct safe practices and documentation steps.

Do

- Ask one trainee to list the violations observed on the board.
- Add your insights about common mistakes made at installation sites.
- Encourage all trainees to demonstrate correct PPE usage.
- Reinforce the importance of proper documentation and disposal practices.
- Ask one participant to summarize the compliance steps discussed.

Notes for Facilitation

- Invite questions about safety protocols and AT standards.
- Encourage peer-to-peer explanations for better understanding.
- Remind trainees to practice safe disposal and correct PPE use during practical sessions.

Exercise

Answers to exercises for PHB

A. Short Answer Questions:

1. Reviewing an OFC route plan is important to understand the exact cable path, avoid underground utilities, ensure compliance with local regulations, plan resources, and prevent rework or accidental damages during installation.
2. Single Mode fibers have a small core, support long-distance and high-bandwidth transmission, and are used for backbone and long-haul networks. Multi-Mode fibers have a larger core, support shorter distances, and are used in LANs or data centers.
3. Steps include verifying trench depth and width, ensuring proper duct placement as per route plan, checking soil conditions, confirming marking and safety barricades, ensuring gradient consistency, and documenting any deviations.
4. Manufacturer-specified bend ratios are critical because bending beyond limits can cause micro-bending or macro-bending losses, fiber breakage, and long-term degradation of signal quality.
5. Common permissions include right-of-way (RoW) approvals, municipal/NHAI permissions, utility clearances, traffic permissions, and environmental or forest department approvals where applicable.

B. Multiple Choice Questions (MCQs):

1. b) Enhanced network performance with minimal signal loss
2. b) Organize and manage network connections for easy maintenance
3. b) Pipe/duct depth and alignment as per laying standards
4. b) Optical Time Domain Reflectometer (OTDR)
5. a) Heat shrinking

C. Fill in the Blanks:

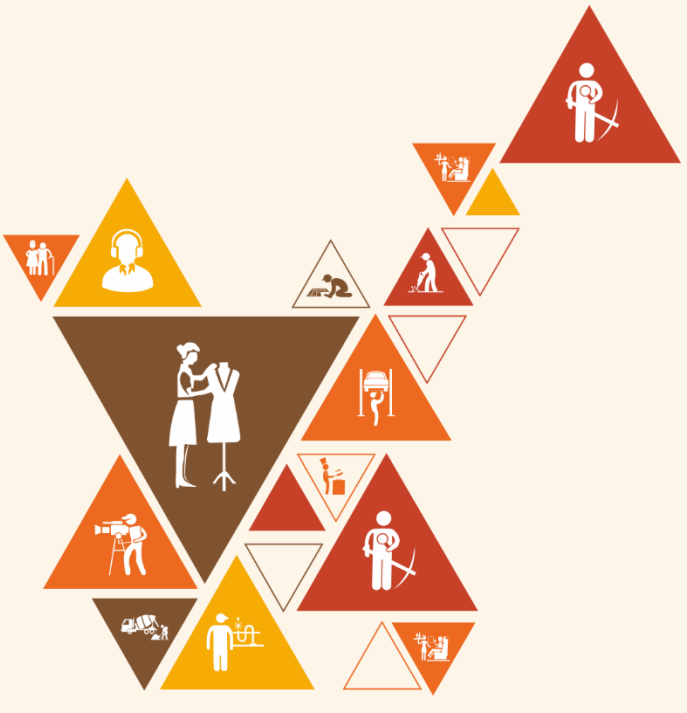
1. bend radius
2. Single Mode
3. Approvals
4. Troubleshooting
5. obstructions

Notes

3. Undertake Condition Based Maintenance and Planned Repair Activities

Unit 3.1 - Carry Out Testing of Optical Fiber

Unit 3.2 - Optical Fiber Testing, Documentation, and Predictive Maintenance



TEL/N6403

Key Learning Outcomes

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

1. Explain how advanced tools are used to test the effectiveness of a fiber splice.
2. Describe the process of recording test results for traceability and performance analysis in fiber splicing.

UNIT 3.1: Carry Out Testing of Optical Fiber

Unit Objectives

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

1. Explain the principles of optical transport media and OFC communication.
2. Elucidate the characteristics of optical fibers, including refraction, polarization, attenuation, and dispersion.
3. Discuss the impact of different wavelength bands on signal transmission in optical fiber networks.
4. Explain the working principles of optical test equipment like OTDR, power meters, and light meters.
5. Determine the optimal values for OTDR, power meter, and light meter test results to ensure network efficiency.
6. Discuss the importance of spare part management and the repair/return processes for faulty optical fiber equipment.
7. Show how to use advanced testing tools like OTDR, power meters, and light meters to validate optical fiber installations.
8. Demonstrate how to identify and eliminate cross-fiber issues using power source and power meter tests.
9. Demonstrate how to perform final transmission loss tests and rectify any issues exceeding manufacturer specifications.

Resources to be Used

Participant handbook, OTDR, power meter, light source, fiber cables, notepad, markers, projector, whiteboard, spare fiber components, fiber cleaning tools.

Note

In this unit, we will learn how to test optical fibers effectively and ensure that the network meets the required performance standards.

Say

Good Morning everyone!

Today we're going to explore one of the most crucial parts of fiber optic work — testing the fiber. Testing tells us whether the fiber installation is good, whether the signal can travel efficiently, and whether any faults need correction.

Ask

Ask the participants the following questions:

- Have you ever seen or used an OTDR or power meter before?
- What do you think happens if a fiber link is installed but never tested?

Write down their answers on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- What optical transport media are
- How OFC communication works
- Refraction, polarization, attenuation, and dispersion
- Wavelength bands and their impact on transmission
- OTDR working principles
- Power meter and light meter fundamentals
- Cross-fiber errors and how to identify them
- Importance of spare part management and RMA (Return Material Authorization) processes

Say

Let's now take part in an activity to understand OTDR and power meter usage more practically.

Activity

- **Duration**: 30 minutes
- **Resources**: OTDR, power meter, light source, fiber patch cords, fiber spool, projector, whiteboard..
- **Steps**:

1. Divide the class into small groups.
2. Provide each group with a fiber patch cord and ask them to connect the power meter and light source.
3. Ask them to:
   - Measure the power loss
   - Record the reading
   - Compare their results with acceptable industry values
4. Then demonstrate an OTDR trace on the projector.
5. Ask each group to identify: a. Event points, b.Splice points, c. Loss values, d. Any abnormal spikes
6. Each group shares their findings and explains the probable cause of any loss.

Do

- Ask a student to note the readings from each group on the whiteboard.
- Guide the participants if they misinterpret an OTDR trace.
- Share additional examples from real-world installations.
- Encourage trainees to hold the tools and try the measurement steps themselves.
- Ask one participant to summarize the key readings and learning points.

Notes for Facilitation

- Ask if trainees have questions about OTDR functions or test parameters.
- Let participants respond to each other to encourage peer learning.
- Remind trainees to read the detailed tool specifications in their participant manual.
- Reinforce that accurate fiber testing prevents future failures and service downtime.

Notes

UNIT 3.2: Optical Fiber Testing, Documentation, and Predictive Maintenance

Unit Objectives

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

1. Describe the compatibility requirements for advanced connectors and protection sleeves in OFC installations.
2. Explain the different types of OFC connectors based on equipment specifications and their applications.
3. Determine the functionality and usage of optical equipment like cleavers, fusion splicers, and mechanical splicing kits.
4. Discuss the operation and importance of fiber strippers, protection sleeves, and fiber-reinforced plaster in fiber optic installation.
5. Describe the use of advanced tools like multi-joiner fusion splicers and cable blowing machines in optical fiber deployment.
6. Demonstrate how to verify the availability and proper operation of advanced multi-joiner fusion splicers.
7. Show how to supervise multi-fiber splicing to ensure proper alignment and minimal signal loss.
8. Demonstrate how to use advanced protection sleeves and connectors during fiber termination.
9. Show how to follow step-by-step splicing and termination techniques to maintain quality standards.
10. Show how to ensure splice quality meets established quality assurance standards.
11. Show how to check for proper backfilling, crowning, and the installation of route/joint markers.
12. Demonstrate how to update as-built documentation with accurate joint locations and installed fiber routes.
13. Show how to ensure site cleanup and proper disposal of debris after fiber optic installation.

Resources to be Used

Participant handbook, whiteboard, flipchart, markers, projector, laptop, optical connectors (SC, LC, FC, ST), advanced protection sleeves, fiber cleaver, mechanical splicing kit, fusion splicer (multi-joiner, if available), fiber stripper, cable blowing machine demo/video, joint closure samples, route marker samples, documentation templates.

Note

In this unit, we will understand how to test, document, and maintain optical fiber networks using both traditional and advanced tools.

Say

Good Morning everyone!
Today's session will focus on how to properly test optical fiber networks, maintain installation quality, and ensure accurate documentation. This forms the backbone of predictive maintenance and long-term network reliability.

Elaborate

In this session, we will discuss the following point:

- Types of OFC connectors and their compatibility
- Importance of choosing the right protection sleeves
- Working principles of cleavers, fusion splicers, and mechanical splicing kits
- Using fiber strippers, sleeves, and reinforcements during installation
- Overview of multi-joiner fusion splicers
- Cable blowing machines and their purpose
- Supervising multi-fiber splicing
- Ensuring quality termination practices
- Backfilling, crowning, and route marker installation
- Maintaining splice quality as per standards
- Updating as-built site documentation
- Site cleaning and safe disposal of debris

Say

Let's now take part in an activity to understand Connector Identification and Compatibility Mapping.

Activity

- **Duration**: 30 minutes
- **Resources**: SC, LC, FC, ST connectors, protection sleeve samples, compatibility chart, projector.
- **Steps**:

1. Divide the class into small groups.
2. Provide each group with a set of connectors and protection sleeves.
3. Ask them to identify:
   - The connector type
   - The equipment it is compatible with
   - The correct sleeve required for termination
4. Groups will map compatibility on chart paper.
5. Each group presents their findings.

Do

- Ask a trainee to list connector compatibility tables on the board.
- Correct any mismatches and explain industry-standard pairings.
- Share insights from real deployments where incorrect connectors caused major issues.
- Encourage each group to handle the connectors physically for better understanding.

Notes for Facilitation

- Ask if trainees have questions.
- Encourage peer-to-peer explanation to build collaborative understanding.
- Remind participants to practice connector identification and splicing techniques using the handbook diagrams.
- Reinforce that neat documentation and clean installation practices are part of quality assurance.

Exercise

Answers to exercises for PHB

A. Short Answer Questions:

1. Refraction guides light through the core, while dispersion spreads light pulses, causing signal distortion and reduced speed.
2. Fusion splicing melts fibers for a permanent low-loss joint; mechanical splicing aligns fibers using a V-groove and gel, offering quicker but slightly higher loss.
3. Wavelength choice affects attenuation, dispersion, and overall transmission distance—common low-loss bands (1310 nm, 1550 nm) give better performance.
4. Compatible connectors and sleeves ensure proper alignment, prevent physical damage, and maintain low signal loss.
5. OTDR identifies fault locations using backscatter traces; power meters measure actual signal loss to verify link performance.

B. Multiple Choice Questions (MCQs):

1. B. Refraction
2. C. Fusion splicer
3. C. To protect the fiber from mechanical stress
4. B. Power meter
5. C. To keep accurate records for maintenance and troubleshooting

C. Fill in the Blanks:

1. Refraction
2. fiber stripper
3. attenuation
4. OTDR
5. as-built documentation

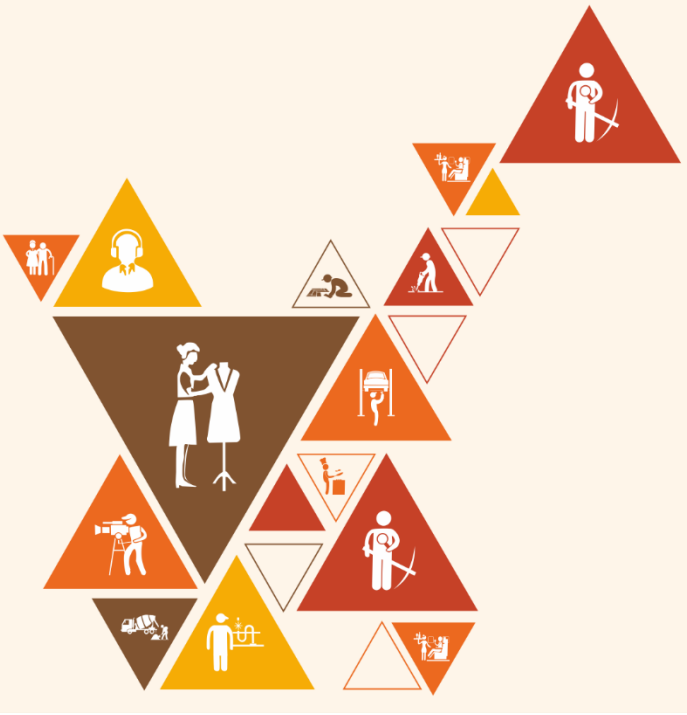
Notes

4. Perform Corrective Maintenance/ Restoration of Optical Fiber Faults

Unit 4.1 - Fault Notification

Unit 4.2 - Fault Localization and Restoration

Unit 4.3 - Preventive and Corrective Maintenance



TEL/N6404

Key Learning Outcomes

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

1. Explain the process of handling fault notifications in an optical fiber network.
2. Describe the steps involved in rectifying faults at Points of Presence (POPs).
3. Discuss the importance of documenting and reporting fault rectification status.

UNIT 4.1: Fault Notification

Unit Objectives

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

1. Discuss signal strength and quality Key Performance Indicators (KPIs) used in optical fiber networks.
2. Describe network design principles and fiber optic system integration.
3. Discuss proper fiber cable termination techniques, including the use of advanced protection sleeves and connectors.
4. Describe the route and cable marking conventions for long-term maintenance and identification.
5. Demonstrate how to interpret fault notifications received from the Network Operation Center (NOC) or supervisors.
6. Show how to determine Turn Around Time (TAT) for fault rectification based on Service Level Agreements (SLAs).
7. Demonstrate how to access and interpret as-built drawings for fault location analysis.
8. Show how to verify the necessary tools and safety gear before heading to a fault location.

Resources to be Used

Participant handbook, whiteboard, flipchart, markers, laptop, projector, laser pointer, sample fault notification formats, SLA/TAT tables, as-built drawings, PPE kit, termination tools, fiber connectors, sleeves.

Note

In this unit, we will understand how technicians receive, interpret, and respond to fault notifications in fiber optic networks.

Say

Good Morning everyone!
In this session, we are going to explore what happens when a fault occurs in a fiber network and how technicians like you must respond. From understanding KPIs to checking your tools before leaving for the site—every step plays a major role in restoring connectivity quickly and safely.

Ask

Ask the participants the following questions:

- What comes to your mind when you hear the word “fault” in fiber networks?
- Have you ever seen a fault ticket or notification from a NOC? What did it look like?
- Write their responses on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- Key optical fiber performance indicators (Power Level, Loss, Reflection, SNR)Network design basics and integration concepts
- Proper fiber cable termination techniques and advanced sleeve usage
- Importance of high-quality connectors and protective elements
- Route marking and cable identification practices for long-term maintenance
- Understanding NOC-generated fault notifications
- Decoding fault details (location, type, priority, timestamp)SLA expectations and determining TAT for closure
- Reading and interpreting as-built drawings for pinpointing fault sections
- Preparing tools, instruments, and PPE before dispatch
- Field-readiness checks and safety considerations

Say

Let's move into an activity on Fault Notification Decoding Exercise

Activity

- **Duration**: 30 minutes
- **Resources**: Sample NOC fault tickets (paper or projected), SLA chart, whiteboard.
- **Steps**:

1. Divide the class into small groups.
2. Provide each group with a sample NOC fault ticket.
3. Ask each group to identify:
   - Fault type
   - Fault location
   - Priority
   - Expected TAT based on SLA
4. Groups present their analysis.
5. Discuss the correct interpretations and clarify doubts.

Do

- Ask one trainee to write the interpreted details of each ticket on the board.
- Encourage participants to justify their analysis logically.
- Share real examples and tips for recognizing high-priority faults.
- Make sure all groups participate and feel included.

Notes for Facilitation

- Ask if trainees have questions.
- Ask trainees if they have ever worked with or seen real fault tickets or as-built drawings.
- Invite participants to answer each other's questions for peer learning.
- Remind them to review the material in the participant handbook.
- Reinforce that good interpretation skills help reduce downtime and improve customer satisfaction.

Notes

UNIT 4.2: Fault Localization and Restoration

Unit Objectives

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

1. Discuss the functionalities of advanced OTDR and how to interpret OTDR traces for fault diagnosis.
2. Describe the techniques for diagnosing and rectifying faults in optical fiber systems using specialized tools.
3. Determine the testing procedures for duct integrity, including air-tightness and kink-free tests.
4. Explain Wavelength Division Multiplexing (WDM) fundamentals and troubleshooting techniques.
5. Demonstrate how to use advanced test equipment (OTDR, power meter, light sources, precision cutters, etc.) for fiber testing and troubleshooting.
6. Show how to identify fault locations using OTDR traces, signal loss patterns, and Wavelength Division Multiplexing (WDM) analysis.
7. Demonstrate how to interpret as-built drawings to locate physical sites and underground cable routes.
8. Show how to coordinate excavation, cable pulling, and preparation of jointing pits if required.
9. Demonstrate the proper technique for fiber splicing using advanced protection sleeves and connectors.
10. Show how to analyze OTDR and power meter test results to assess splicing effectiveness.
11. Demonstrate how to secure fiber joints using couplers, sleeves, and Fiber Reinforced Plastic (FRP).
12. Show how to evaluate the need for additional duct protection (e.g., RCC pipes, chambering) based on site conditions.
13. Demonstrate the correct procedure for back-filling trenches while ensuring structural integrity and environmental safety.
14. Show how to verify fault rectification by performing final OTDR tests and confirming network stability.
15. Demonstrate how to monitor and supervise fault rectification activities to ensure adherence to SLAs and minimize downtime.
16. Show how to escalate unresolved faults or significant delays according to organizational policies.

Resources to be Used

Participant handbook, OTDR, power meter, light source, cleaver, precision cutter, fusion splicer, protection sleeves, FRP couplers, fiber joint closures, duct testing kits, as-built drawing samples, laptop, projector, safety gear, whiteboard, markers.

Note

In this unit, we will explore how to locate, diagnose, and restore optical fiber faults using advanced tools, proper field techniques, and structured troubleshooting practices.

Say

Good Morning everyone!
In today's session, we will dive into one of the most critical responsibilities of a fiber technician—locating faults quickly and restoring the network efficiently. Understanding OTDR traces, reading drawings, coordinating field work, and ensuring proper restoration are essential skills for minimizing downtime in broadband networks.

Ask

Ask the participants the following questions:

- What tools have you used or seen for fiber fault testing?
- Have you ever looked at an OTDR trace? What did it show?

Write their responses on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- Advanced OTDR functions and interpretation of traces
- Common fault indicators (spikes, loss, breaks, bends, reflections)Duct integrity testing methods (air pressure, kink-free verification)Basics of Wavelength Division Multiplexing (WDM)WDM troubleshooting and channel analysis
- Using test equipment for fault localization
- Reading and interpreting as-built drawings
- Identifying underground cable routes and landmarks
- Field coordination: excavation, cable pulling, jointing pit preparation
- Proper fiber splicing and use of advanced protection sleeves
- Assessing splice performance using OTDR and power meter
- Securing joints using couplers and FRP materials
- When and why additional duct protection is needed
- Backfilling and site restoration best practices
- Verifying network stability and conducting final OTDR tests
- Monitoring rectification activities and meeting Service Level Agreements
- Escalation procedures and communication protocols

Say

Let's now participate in an activity to deepen our understanding of OTDR traces and fault patterns.

Activity

- **Duration**: 30 minutes
- **Resources**: OTDR screenshots (printed or projected), sample fiber link diagrams, markers, whiteboard.
- **Steps**:

1. Divide participants into small groups.
2. Share OTDR trace images showing different faults such as:
   - Fiber break
   - Macro bend
   - High splice loss
   - Connector reflection
3. Ask each group to identify the fault location and its probable cause.
4. Groups will then mark the loss events and distances on the whiteboard/chart.
5. Reveal the correct interpretation and explain each trace in detail.

Do

- Ask a trainee to document each type of fault identified in the traces.
- Point out best practices and highlight unsafe or inefficient suggestions.
- Emphasize environmental safety and structural integrity during backfilling.
- Encourage active discussion on coordination challenges and SLA timelines.
- Ask a trainee to summarize the restoration process and its verification steps.

Notes for Facilitation

- Ask if trainees have questions.
- Promote peer learning—allow trainees to respond to each other's queries.
- Refer them to relevant diagrams and tables in the participant manual.
- Reinforce that accurate diagnosis and timely restoration significantly improve customer satisfaction and network reliability.

Notes

UNIT 4.3: Preventive and Corrective Maintenance

Unit Objectives

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

1. Explain the applicable reporting and documentation standards for optical fiber maintenance.
2. Describe the Standard Operating Procedures (SOPs) for OFC maintenance and fault rectification.
3. Elucidate the requirements for documentation management, including updating OTDR registers and as-built diagrams.
4. Explain the compliance requirements for safe excavation and installation in various terrains.
5. Discuss environmental safety and risk management practices in fiber network maintenance.
6. Elucidate emergency response protocols for handling optical fiber damage and minimizing downtime.

Resources to be Used

Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, projector, OTDR device (demo), sample maintenance logs, SOP sheets, fiber maintenance toolkit, safety PPE.

Note

In this unit, we will explore both preventive and corrective maintenance techniques that help ensure stable fiber network performance and quick fault resolution.

Say

Good Morning everyone!

Today we will focus on what keeps a fiber network healthy—proper maintenance, documentation, and quick response during faults. As technicians, your ability to maintain clear records and follow safety and SOP guidelines can significantly reduce downtime and improve network reliability.

Ask

Ask the participants the following questions:

- Have you ever seen an OTDR report or maintenance log? How detailed was it?
- Why do you think documentation is important during fiber maintenance?

Write their responses on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- Documentation and reporting standards for OFC maintenance
- Importance of maintaining OTDR registers and as-built diagrams
- Preventive vs. corrective maintenance
- SOPs for fiber maintenance, inspections, and troubleshooting
- Safe excavation requirements
- Environmental safety and risk control measures
- Emergency response actions during fiber cuts or outages
- Coordination with local authorities, contractors, and site teams
- Techniques for minimizing downtime through quick isolation of faults
- Record keeping and updating network diagrams post-repair

Say

Let's move into an activity on OTDR Report Interpretation Workshop

Activity

- **Duration**: 30 minutes
- **Resources**: Sample OTDR trace reports, projector, markers, whiteboard..
- **Steps**:

1. Divide the participants into small groups.
2. Provide each group with a sample OTDR trace (printed or displayed on screen).
3. Ask them to identify:
   - Event points
   - Loss per kilometer
   - Splice points
   - Fault location
4. Each group presents its findings.
5. Trainer explains the correct interpretation and highlights common mistakes

Do

- Ask a trainee to list the key OTDR parameters identified by each group.
- Clarify any misunderstanding about event markers and loss representation.
- Share examples of real OTDR issues that occur in the field.
- Encourage all participants to analyze at least one OTDR event.
- Request a trainee to summarize the major learnings.

Notes for Facilitation

- Encourage trainees to ask questions about documentation, SOPs, and emergency response.
- Promote peer learning—invite other trainees to answer questions where possible.
- Remind participants to review OTDR interpretation examples in their handbook.
- Stress the importance of accurate records and safe working practices—they are essential for long-term network reliability.

Exercise

Answers to exercises for PHB

A. Short Answer Questions:

1. Key documents to update: OTDR test reports, splice records, as-built diagrams, route maps, fault rectification logs, maintenance reports, and fiber health/attenuation records.
2. OTDR traces: They show reflection peaks and loss events along the fiber. Sudden spikes or drops indicate faults such as breaks, bends, splices, or high-loss points, helping identify fault distance and type.
3. Safety precautions: Wear PPE, check tools, verify power isolation, review route plans, assess site hazards, ensure traffic/safety barricading, and follow electrical and excavation safety guidelines.
4. Importance of sleeves/connectors: They protect spliced fibers from bending and moisture, maintain alignment, reduce signal loss, and ensure long-term reliability of joints.
5. WDM improvement & troubleshooting: WDM increases capacity by transmitting multiple wavelengths over a single fiber. Troubleshooting includes wavelength power monitoring, filter checks, OTDR testing using appropriate wavelength, and isolating channel-level faults.

B. Multiple Choice Questions (MCQs):

1. b. Checking air-tightness and kink-free conditions
2. b. To locate physical sites and underground routes accurately
3. a. Safety boots, helmet, gloves
4. b. When traffic load or soil instability is high
5. b. Insertion loss and optical return loss

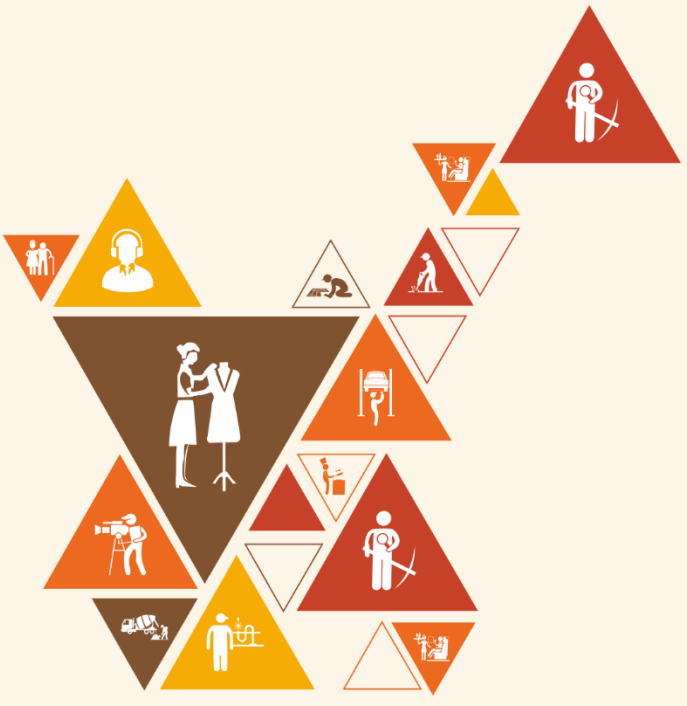
C. Fill in the Blanks:

1. Optical Time Domain Reflectometer
2. documentation management
3. WDM (Wavelength Division Multiplexing)
4. PPE
5. operational safety

Notes

5. Follow Sustainability Practices in Telecom Cabling Operations

Unit 5.1 - Sustainability Practices in Telecom Cabling Operations



TEL/N9111

Key Learning Outcomes

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

1. Identify recyclable, reusable, and hazardous materials in fiber optic installations and explain how to categorize them.
2. Describe the waste management, recycling, and disposal protocols for materials used in fiber optic installations.
3. Explain how to optimize material and energy usage during cabling work in fiber optic installations.
4. Discuss the environmental and regulatory standards that must be complied with during fiber optic installations.

UNIT 5.1: Sustainability Practices in Telecom Cabling Operations

Unit Objectives

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

1. Explain organizational policies on sustainability, waste reduction, and material reuse in telecom infrastructure projects.
2. Describe the procedures for recycling, hazardous waste handling, and safe disposal of telecom-related materials.
3. Discuss the importance of sustainability in long-term infrastructure planning and the environmental impact of telecom waste.
4. Elucidate the classification of materials used in optical fiber cabling, including recyclable, reusable, and hazardous components.
5. Explain standard waste management procedures for telecom operations, including segregation, labeling, and disposal methods.
6. Describe methods to reduce material wastage, such as accurate measurements, careful handling of fiber optic cables, and optimized trenching techniques.
7. Discuss the environmental hazards associated with improper disposal of optical fibers, batteries, and chemical adhesives.
8. Explain the regulations and compliance requirements for hazardous material disposal under national and international environmental laws.
9. Elucidate energy-efficient work practices, including low-power tools, optimized route planning, and reduced excavation techniques.
10. Describe the importance of proper record-keeping for disposal and recycling to ensure compliance and accountability.
11. Demonstrate how to identify, segregate, and store materials used in cabling operations, including recyclable, reusable, and hazardous materials, ensuring compliance with safety and waste management procedures.
12. Show how to follow SOPs for safe handling, disposal, and documentation of non-recyclable and hazardous materials, including fiber shards, cable sheaths, and chemical adhesives.
13. Demonstrate how to ensure proper labeling, safe storage, and disposal of hazardous waste to prevent contamination or accidents.
14. Show how to minimize waste by reducing excess material use, reusing components, and optimizing cabling work through accurate measurements and efficient layout designs.
15. Demonstrate how to maintain clean, organized work sites to prevent environmental contamination, promote safety, and comply with environmental guidelines.
16. Show how to use energy-efficient tools and machinery and ensure proper maintenance of cabling tools and equipment to reduce material consumption and unnecessary repairs.
17. Demonstrate how to coordinate and dispose of waste materials at designated collection points and report any violations or environmental hazards.
18. Show how to use and promote eco-friendly materials, such as low-impact protective coatings and biodegradable packaging.
19. Demonstrate how to follow national and local environmental regulations, workplace policies, and sustainability practices related to telecom cabling operations.
20. Show how to maintain accurate documentation of sustainability activities, including logs of disposed and recycled materials, to meet regulatory and audit requirements.
21. Demonstrate how to conduct periodic self-audits and educate team members on best practices for sustainability, waste segregation, and responsible energy consumption.
22. Show how to report violations of environmental policies, hazardous material spills, or unsafe disposal practices to the designated supervisor or regulatory body.

Resources to be Used

- Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, PPE kit, sample cable sheaths, fiber scraps (dummy), waste bins (color-coded), eco-friendly materials, safety labels, documentation logs.

Note

In this unit, we will explore how sustainability is practiced during telecom cabling operations and how technicians can reduce waste and environmental impact during field work.

Say

- Good Morning everyone!
- Today we will discuss one of the most important aspects of modern telecom operations—working in a way that protects the environment and reduces waste. Every technician plays a key role in sustainability, from selecting materials to maintaining clean worksites.

Ask

Ask the participants the following questions:

- What types of waste have you seen during cabling or fiber installations?
- Why do you think sustainability is becoming more important in telecom projects today?

Write their responses on the whiteboard.

Elaborate

In this session, we will discuss the following point:

- Organizational sustainability policies
- Waste reduction and material reuse techniques
- Classification of cabling materials (recyclable, reusable, hazardous)Safe disposal of fiber shards, batteries, and adhesives
- National and international environmental regulations
- Eco-friendly cabling materials and biodegradable packaging
- Accurate measurement and optimized trenching for reducing waste
- Proper labeling, storage, and segregation of waste
- Maintaining records of recycling and disposal
- Energy-efficient tools and reduced excavation methods
- Clean site practices and preventing environmental contamination
- Reporting mechanisms for spills, violations, and unsafe practices
- Conducting self-audits and guiding team members

Say

Let's participate in an activity to understand material segregation and waste handling more practically.

Activity

Duration: 30 minutes

Resources: Sample materials (dummy fiber scraps, cable sheaths, packaging, adhesives), color-coded bins, labels, PPE.

Steps:

1. Divide the participants into small groups.
2. Provide each group with mixed materials used in cabling operations.
3. Ask them to segregate the materials into:
    - Recyclable
    - Reusable
    - Hazardous
    - General waste
4. Each group places the items into the correct bins and labels them.
5. The facilitator reviews and explains industry-standard segregation techniques.

Do

- Ask a trainee to note down correct vs. incorrect segregation practices.
- Highlight common mistakes (e.g., mixing adhesive tubes with general waste).
- Add real-life examples from telecom sites.
- Encourage participation from each group.
- Ask one participant to summarize the segregation logic.

Notes for Facilitation

- Ask the trainees if they have questions regarding sustainability or waste handling.
- Encourage peer learning by asking participants to answer one another's queries.
- Motivate learners to read the sustainability section in the participant handbook.
- Reinforce that clean, sustainable cabling operations reflect professionalism and compliance.

Exercise

Answers to exercises for PHB

A. Short Answer Questions:

1. Organizational policies promote reuse and recycling of telecom materials, reducing landfill waste, lowering procurement costs, and encouraging environmentally responsible practices in infrastructure projects.
2. Steps for handling hazardous waste: wear PPE, segregate waste by type, store in labeled containers, avoid mixing incompatible chemicals, transport according to regulations, and hand over to authorized disposal/recycling facilities.
3. Accurate record-keeping ensures compliance with environmental laws by documenting waste handling, disposal methods, and regulatory adherence, which supports audits and reduces legal risks.
4. Methods to reduce material wastage: precise cable measurement, pre-planning route layouts, avoiding unnecessary cable cuts, recycling scrap, and training technicians in efficient installation practices.
5. Energy-efficient tools reduce power consumption, and optimized route planning minimizes trenching and cable use, supporting sustainable, low-impact telecom infrastructure projects..

B. Multiple Choice Questions (MCQs):

1. b. To prevent contamination and ensure safe disposal
2. b. Biodegradable packaging
3. b. Waste disposal logs with hazard classification
4. b. Basel Convention
5. c. Using accurate measurements and optimized layouts

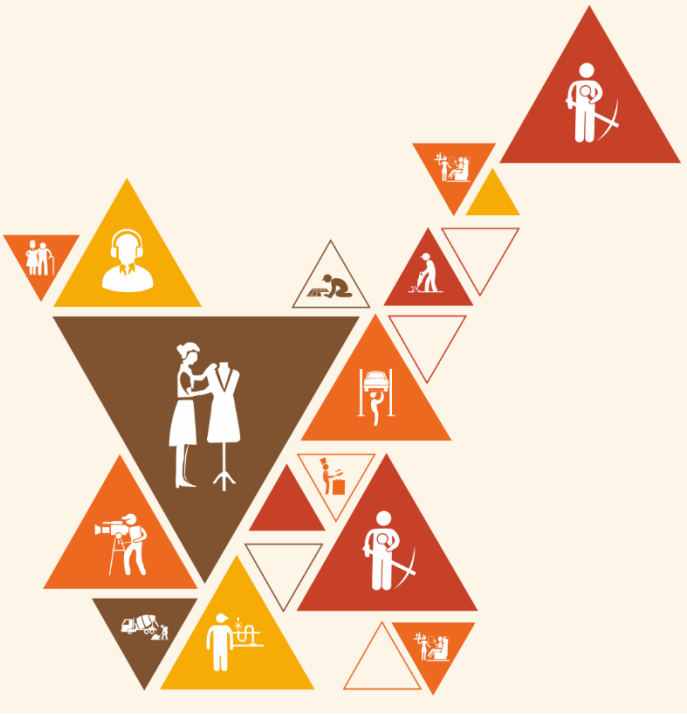
C. Fill in the Blanks:

1. designated containers
2. \record-keeping
3. Basel Convention
4. energy-efficient tools
5. documentation

Notes

6. Employability Skills (30 Hours)

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



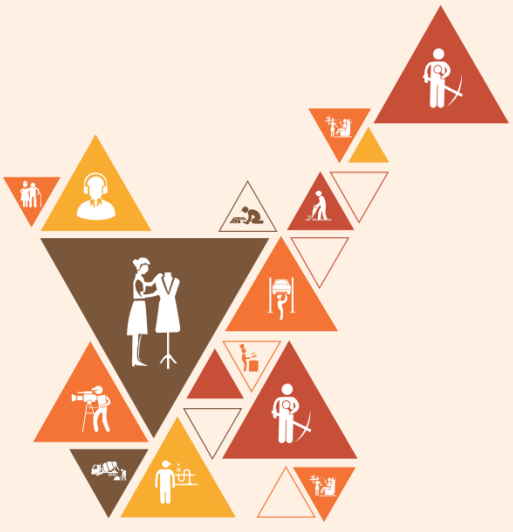
DGT/VSQ/N0101

7. Annexure

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria

Annexure III: List of QR Codes used in PHB



Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Optical Fiber Technician		
Qualification Pack Name & Ref. ID	TEL/Q6401		
Version No.	5.0	**Version Update Date**	08-05-2025
Pre-requisites to Training (if any)	N.A.		
Training Outcomes	**After the completion of this program, the participants will be able to:** 1. Explain the key steps involved in coordinating the installation and commissioning of optical fiber cables (OFCs). 2. Discuss the importance of condition-based maintenance and planned repair activities in telecom operations. 3. Describe the process of performing corrective maintenance and restoring optical fiber faults effectively. 4. Elucidate the role of sustainability practices in telecom cabling operations and their impact on the environment. 5. Discuss the Employability and Entrepreneurship Skills.		

Sl. No.	Module Name	Session Name	Session Objectives	NOS Reference	Method ology	Training Tools / Aids	Duration (in Hours)
1	**1. Introduction to the sector and the job role of an Optical Fiber Technician Thery: 05:00**	Introduction to Telecom Sector and Role of an Optical Fiber Technician	•Discuss the size and scope of the Telecom industry and Passive Infrastructure sub-sector •Identify the roles and responsibilities of an Optical Fiber Technician •Discuss the career progression of an Optical Fiber Technician in the Telecom industry •Explain the fundamentals and concept of telecommunication and the terminologies used in the work process	Bridge Module	Facilitator - led discussion	Laptop, book, pen, discussion duster, Projector/ slides	T: 05:00. P:0hrs
2	**Coordinate Installation and Commissioning of Optical Fiber Cables Theory: 25:00 Hours Practical: 80:00 Hours**	Site visit and route inspection	•Discuss how to obtain OFC route plan from the planning team or the supervisors •Explain to verify the proposed route to ensure that bend ratios meet manufacturer's specifications and industry standards •State how to develop installation work plan and identify dependencies, if any	TEL/4137 PC1, PC2, PC3,PC4,PC5,PC 6	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Test Equipment – Fiber Optic Power Meter, Fiber Optic Test Source, Adapters for Power Meter (Various types of optical cables), OTDR, Cable Cutter, Cable Splitter,	T: 02:00 P: 06:00
			•Explain to determine the statutory permissions required and the relevant authorities involved • Discuss ways to liaise with the concerned authorities to obtain relevant clearances •Determine the best suited optical fiber mode (Single Mode or Multi Mode) as per the location of the project	TEL/4137 PC1, PC2, PC3,PC4,PC5,PC 6			T: 02:00 P: 06:00

		Choosing the right type of optic fiber cable	•verify the cables are spliced as per the standard fusion/ mechanical splicing mechanisms •ascertain usage of proper protection material for cables such as GI (galvanised iron) pipes, RCC (reinforced cement concrete) pipes, RCC half cut pipes etc.	TEL/4137 PC24 till PC28		Reference Test Cables	T: 02:00 P: 06:00
			• ensure use of push fit couplers as duct joints •confirm usage of appropriate optical connectors as per the terminating equipment requirements •check ducts to confirm requirement of additional protection like cover of RCC pipes, chambering and concreting based on site location and terrain	TEL/4137 PC24 till PC28			T: 02:00 P: 06:00
		Tools and tool kit	•arrange tools and spares for installation •confirm placement of cable drum near the site location •test the cable on drum for optical continuity • ensure trenching is carried out by labor workers as per the detailed route plan requirements and site terrain	TEL/4137 PC7, PC8, PC9,PC10,PC11, PC12,PC13,PC14			T: 02:00 P: 06:00
			• ensure minimum radius is maintained, where bends are necessary • ascertain usage of special designed dispensers to place the ducts in the trench as straight as possible • assess the depths of the pipe/ ducts as per the laying standards after approval from competent personnel	TEL/4137 PC7, PC8, PC9,PC10,PC11, PC12,PC13,PC14			T: 02:00 P: 06:00

			• verify the ducts are free from twists and collapsed portions and ensure rectification of all such portions using appropriate couplers • check proper uncoiling of PLB (permanently lubricated) ducts • examine duct joints for airtightness to ensure smooth cable blowing using cable blowing machines • ascertain carrying out the cable blowing/ jetting using rodder as per the standard process • ensure availability of additional cable length (loop) at jointing locations, for future use in case of failures	TEL/4137 PC7, PC8, PC9,PC10,PC11, PC12,PC13,PC14			T: 02:00 P: 06:00
			•confirm that the ends of the ducts are closed with end plugs to avoid ingress of mud, water or dust •examine that the entire length of the duct is cleaned to remove sand and dust that may damage the optical fiber cable • check the cables are appropriately prepared for jointing based on color and/ or sequence matching • determine alignment errors during splicing of optical fibers • assess any drop in signal due to attenuation	TEL/4137 PC15,PC16,PC17 ,PC18,PC19,PC1 0,PC21,PC22,PC 23			T: 02:00 P: 06:00

		Installation of fiber optic cable	•ensure completion of installation activity within the defined SLAs (Service Level Agreements) •monitor activities performed by the labor workers and optical splicers for timely completion of work • escalate instance of delay as per organization policy	TEL/4137 PC29,PC30,PC31			T: 01:00 P: 04:00
			•determine the availability of test equipment like Optical Time Domain Reflectometer (OTDR) and power meter for carrying out optical tests •use appropriate colour for route and joint indicators as per the standards • check the splices are within quality assurance/AT standards	TEL/4137 PC32 TILL PC41			T: 02:00 P: 06:00
			• identify instances of cross fiber using power source and power meter tests and ensure their elimination • test the joint for transmission loss and strength and re-terminate it if the transmission loss exceeds the manufacturer specifications	TEL/4137 PC32 TILL PC41			T: 01:00 P: 07:00
			•ensure backfilling and crowning in coordination with the labour workers as per standard requirements • confirm placement of a stone marker at the jointing pit for identification of route and jointing pit •check cables markings for appropriateness as per the guidelines	TEL/4137 PC32 TILL PC41			T: 01:00 P: 07:00

			•update as-build documents based on joint location and installed fiber route •clear site from debris and other items				T: 02:00 P: 04:00
			•ensure cable id/drum numbers are recorded for future fault localization •document the OTDR report and summary of tests and share with appropriate teams •obtain sign-off from the projects team and communicate status to NOC for cable integration •ensure all documents available for appropriate authorities to inspect	TEL/4137 PC46 TILL PC49			T: 02:00 P: 04:00
3	**Perform planned Maintenance and Repair Activities** **Theory: 20:00 Hours** **Practical: 60:00 Hours**	Carry out testing of optical fiber	•obtain as-build drawing from NOC/supervisors and identify the route assigned for maintenance of Optical Fiber Cables (OFCs) • ensure patrolling and surveillance of OFCs route as per the maintenance plan	TEL/N6403 PC1 TILL PC6	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Optical test tools (Optical Time Domain Reflectometer (OTDR), Power meter, Light meter, etc.), Sample as-build drawing , Cable Jacket Stripper , Connector Crimper	T: 02:00 P: 04:00
			• monitor the jobs undertaken by other agencies in the vicinity of the network to ensure the safety of OFCs. •coordinate with authorities regarding any planned construction/activity in the vicinity of the OFCs • ensure sample check of as-build drawings •communicate any changes made to as-build drawings to the NOC/supervisors for updating the document	TEL/N6403 PC1 TILL PC6			T: 02:00 P: 04:00

			•ensure availability of optical test tools like Optical Time Domain Reflectometer (OTDR), Power meter, Light meter etc. • check performance of OTDR and power meter tests for all the dark/spare fibers as per required periodicity • test end-to-end link for adherence to link budget and identify loss and reflection points •advise planning team for developing route strengthening workplan based on test results	TEL/N6403 PC7 TILL PC10		, Fiber optic stripper, Tweezers, Cleaver, polishing puck for connectors, Polishing Plate, Black work mats, Fusion Splicer (Splicing machine), Related Standard Operating Procedures (SOPs), Format of various related reports	T: 02:00 P: 04:00
		Carry out splicing of optical fiber	•arrange outage for carrying out activity by coordinating with Network Operation Centre (NOC) prior to undertake the planned repair activities •ensure completion of planned repair activities within defined timelines	TEL/N6403 PC11 TILL PC25			T: 02:00 P: 04:00
			•conduct optical tests on spare fibers to confirm effectiveness of the planned repair process •ensure taking precautions with regard to the power launched on to the fiber, in case active fibers are used for testing • escalate instances of	TEL/N6403 PC11 TILL PC25			T: 02:00 P: 04:00
			• delays and emergency/unresolved issues according to established organisation procedure •conduct periodic (monthly, quarterly, half yearly) maintenance activities •maintain co-located electronic equipment and ensure testing of alarms in coordination with NOC	TEL/N6403 PC11 TILL PC25			T: 02:00 P: 04:00

			• ensure active fibers are not disturbed while testing •carry out planned repairs on existing joints and terminations in co-ordination with NCC (Network Color Code) for improvement of link margin				T: 02:00 P: 04:00
			•ensure raising of the tickets to the respective vendors by the NOC for the maintenance of third party elements				T: 02:00 P: 04:00
			•ensure completion of OFC/OTDR register with record of all fiber tests •maintain account of diesel oil at respective stations and ensure maintenance of assets register for sites under supervision				T: 02:00 P: 04:00
			•dispatch OTDR test results to supervisors for planning and monitoring of OFCs • ensure availability of the documents to all appropriate authorities for inspection				T: 02:00 P: 04:00
4	**Perform Corrective Maintenance Activities** **Theor: 30:00 Hours** **Practical: 50:00 hours**	Fault notification	•receive fault notifications from Network Operation Center (NOC)/supervisors •obtain Turn Around Time (TAT) for fault rectifications as defined in Service Level Agreements (SLAs) •obtain latest as-build drawing from the NOC/supervisors	TEL/N6404 PC1,PC2,PC3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Test equipment (Optical Time Domain Reflectometer (OTDR), Power meter, etc.), Related Standard Operating	T: 03:00 P: 05:00
		Fault localization and restoration	•make available test equipment (Optical Time Domain Reflectometer (OTDR), Power meter, etc.) for carrying out optical tests	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00

			• identify exact fault location using OTDR tests on fiber at POP location	TEL/N6404 PC4 TILL PC15		Procedures (SOPs), Format of various related reports	T: 03:00 P: 05:00
			• analyze as-build drawing to locate the physical site on the ground • coordinate excavation, pulling of appropriate cables (if feasible) and preparation of jointing pit at site through laborers	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00
			•coordinate with the optical splicer to carry out splicing as per standard process • assess effectiveness of the jointing activity by reviewing OTDR and power test results	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00
			•ensure joints are protected and strengthened appropriately using couplers, sleeves and FRPs (Fiber Reinforced Plastic) as required	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00
			•verify if ducts require additional protection like cover of Reinforced Cement Concrete (RCC) pipes, chambering, etc. based on site location and terrain	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00
			•coordinate back-filling of the trench through laborers and ensure rectification of network problem/fault alarms within SLA	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00
			•monitor activities for timely completion of work by laborers and Optical Splicers •ensure compliance with the organisation policy while escalating unresolved faults/instances of delays	TEL/N6404 PC4 TILL PC15			T: 03:00 P: 05:00

		Preventiv e and corrective maintena nce	•ensure appropriate cable marking and route marker for direction and route identification •prepare jointing record for future reference	TEL/N6404 PC16,PC17,PC18 ,PC19			T: 03:00 P: 05:00
			•ensure identification of the documents to be updated •ascertain completion of OTDR register showing complete record of jointing tests	TEL/N6404 PC16,PC17,PC18 ,PC19			T: 03:00 P: 05:00
5	**Follow sustainabili ty practices in telecom cabling operations** **Theory: 10:00 Hours Practical: 20:00 Hours**	Sustainabil ity Practices in Telecom Cabling Operations	•Explain organizational policies on sustainability, waste reduction, and material reuse in telecom infrastructure projects. •Describe the procedures for recycling, hazardous waste handling, and safe disposal of telecom-related materials.	TEL/N9111 PC1, PC2, PC3, PC4, PC5	Classroom lecture / PowerPoin t Presentati on / Question & Answer / Group Discussion	White board/ black board marker / chalk, dust- er, comput- er or laptop attached to LCD projector , Personal Protectio n Equipme nt: safety glasses, head protectio n, rubber gloves, safety footwear , warning signs and tapes, fire extinguis h- er and first aid kit	T: 02:30 P: 05:00
			•Elucidate the classification of materials used in optical fiber cabling, including recyclable, reusable, and hazardous components. •Explain standard waste management procedures for telecom operations, including segregation, labeling, and disposal methods.	TEL/N9111 PC6, PC7, PC8, PC9, PC10			T: 02:30 P: 05:00
			•Demonstrate how to identify, segregate, and store materials used in cabling operations, including recyclable, reusable, and hazardous materials, ensuring compliance with safety and waste management procedures.	TEL/N9111 PC11, PC12, PC13, PC14, PC15			T: 02:30 P: 05:00
			•Show how to use and promote eco-friendly materials, such as low-impact protective coatings and biodegradable packaging	TEL/N9111 PC16, PC17, PC18, PC19, PC20			T: 02:30 P: 05:00

Annexure II
Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for	
Job Role	Optical Fiber Technician
Qualification Pack	TEL/Q6401
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.

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Viva Marks
TEL/N4137: Coordinate Installation and Commissioning of Optical Fiber Cables (OFCs)	Inspect the route plan	5	10	3
	PC1. obtain and review the OFC route plan from the planning team or supervisor	1	2	0.5
	PC2. verify the proposed route, ensuring compliance with manufacturer-specified bend ratios and industry standards	1	2	0.5
	PC3. identify dependencies and create an installation work plan	1	2	0.5
	PC4. determine required statutory permissions and liaise with relevant authorities to secure clearances	1	2	0.5
	PC5. ensure compatibility of ultra-low loss cables with project requirements	0.5	1	0.5
	PC6. select appropriate optical fiber mode (Single Mode or Multi Mode) based on the project location and network design	0.5	1	0.5
	Coordinate cable laying and pulling	10	15	6.5
	PC7. arrange tools, including advanced cable-handling equipment, and spares for installation	1	2	1
	PC8. confirm placement of the cable drum at the site	1	2	0.5
	PC9. test cables on the drum for optical continuity	1	2	0.5
	PC10. supervise trenching to ensure it is carried out as per the route plan and site terrain	1	1	0.5
	PC11. ensure adherence to manufacturer-specified bend radii and manage tension during installation	1	1	0.5
	PC12. use specially designed dispensers for accurate duct placement in trenches	1	1	0.5
	PC13. check pipe/duct depths for compliance with laying standards and rectify collapsed or twisted ducts	1	1	0.5
	PC14. confirm ducts are clean and sealed with appropriate end plugs to prevent contamination	1	1	0.5
	PC15. oversee cable blowing/jetting using advanced blowing machines	0.5	1	0.5

	PC16. verify additional cable length (loop) is available at jointing locations for future use	0.5	1	0.5
	PC17. ensure proper uncoiling and alignment of PLB ducts	0.5	1	0.5
	PC18. confirm the use of protective materials such as GI or RCC pipes where necessary	0.5	1	0.5
	Use multi-fiber splicing and termination techniques	4	6	2.5
	PC19. verify availability and proper operation of advanced multi-joiner fusion splicers	1	2	0.5
	PC20. supervise multi-fiber splicing to ensure alignment and minimal signal loss	1	1	0.5
	PC21. use advanced protection sleeves and connectors during termination	0.5	1	0.5
	PC22. follow step-by-step splicing and termination techniques to ensure adherence to quality standards	0.5	1	0.5
	PC23. test for signal attenuation and ensure re-termination if required	1	1	0.5
	Test and validate cable effectiveness	5	8	3.5
	PC24. use advanced testing tools like OTDR, power meters, and light meters to validate installations	1	2	0.5
	PC25. identify and eliminate cross-fiber issues using power source and power meter tests	1	1	0.5
	PC26. ensure splice quality meets quality assurance standards	1	1	0.5
	PC27. perform final transmission loss tests and rectify issues exceeding manufacturer specifications	0.5	1	0.5
	PC28. check for proper backfilling, crowning, and installation of route/joint markers	0.5	1	0.5
	PC29. update as-built documentation with accurate joint locations and installed fiber routes	0.5	1	0.5
	PC30. ensure site cleanup and disposal of debris	0.5	1	0.5
	Adhere to applicable health and safety guidelines	4	6	2.5
	PC31. comply with site-specific risk controls, OHS guidelines, and environmental regulations	1	2	0.5
	PC32. use appropriate PPE, including helmets, knee pads, safety boots, and trench guards	1	1	0.5
	PC33. manage environmental hazards such as Earth Potential Rise (EPR) effectively	1	1	0.5
	PC34. adhere to emergency protocols for safety incidents	0.5	1	0.5
	PC35. ensure cleanliness and proper handling to avoid fiber contamination	0.5	1	0.5
	Report and record installation activities	2	5	2
	PC36. record cable ID/drum numbers for fault localization	0.5	2	0.5
	PC37. document test reports, including OTDR results, and share them with relevant teams	0.5	1	0.5
	PC38. obtain sign-off from project teams and update the network operations center (NOC) for integration	0.5	1	0.5
	PC39. maintain all installation documents for audits and inspections	0.5	1	0.5
	Total Marks	30	50	20
TEL/N6403: Undertake Condition based Maintenance and Planned Repair Activities	Obtain maintenance schedule and patrol assigned route	10	16	7
	PC1. obtain as-built drawings from NOC/supervisors and identify the assigned maintenance route for Optical Fiber Cables (OFCs)	2	3	1
	PC2. conduct patrolling and surveillance of OFC routes per the maintenance plan	2	3	1
	PC3. monitor activities by third parties near the network to ensure the safety of OFCs	2	2	1
	PC4. coordinate with authorities regarding planned construction/activity in the vicinity of OFCs	1	2	1
	PC5. follow the applicable preventative maintenance measures and schedules to ensure the longevity and performance of OFCs	1	2	1

	PC6. perform sample checks of as-built drawings	1	2	1
	PC7. communicate any updates to as-built drawings to NOC/supervisors for documentation	1	2	1
	Carry out maintenance testing of dark/spare OFCs	5	10	3
	PC8. use advanced tools like Optical Time Domain Reflectometer (OTDR), Power Meter, Light Meter, and Visual Fault Locator (VFL) for maintenance testing	1	2	0.5
	PC9. perform OTDR and power meter tests on all dark/spare fibers as per required periodicity	1	2	0.5
	PC10. measure attenuation and loss to ensure adherence to network performance standards	1	2	1
	PC11. interpret OTDR results to identify transmission losses and reflection points	1	2	0.5
	PC12. advise the planning team on route strengthening based on test results	1	2	0.5
	Repair OFCs as per plan	6	10	4
	PC13. arrange outage in coordination with the Network Operation Centre (NOC) before repair activities	1	2	1
	PC14. use advanced multi-joiner fusion splicers to minimize signal loss during repair work	1	2	0.5
	PC15. complete planned repair activities within defined timelines	1	2	0.5
	PC16. conduct optical tests on spare fibers to confirm the effectiveness of repairs	1	2	1
	PC17. follow necessary precautions when testing active fibers to prevent disruptions	1	1	0.5
	PC18. escalate delays and unresolved issues as per organizational procedures	1	1	0.5
	Carry out equipment maintenance at Points of Presence (POPs)	5	8	4
	PC19. perform periodic maintenance (monthly, quarterly, half-yearly) of equipment at POPs	1	2	1
	PC20. maintain co-located electronic equipment and test alarms in coordination with NOC	1	2	1
	PC21. ensure active fibers remain undisturbed during maintenance activities	1	2	1
	PC22. conduct planned repairs on joints and terminations in coordination with NCC for link margin improvement	1	1	0.5
	PC23. raise maintenance requests for third-party elements through the NOC	1	1	0.5
	Record and report fiber test results	4	6	2
	PC24. maintain OFC/OTDR registers with records of all fiber tests conducted	1	2	0.5
	PC25. maintain asset registers and track diesel oil usage at respective sites	1	2	0.5
	PC26. dispatch OTDR test results to supervisors for network planning and monitoring	1	1	0.5
	PC27. ensure all documents are available for inspection by appropriate authorities	1	1	0.5
	Total Marks	30	50	20
TEL/N6404: Perform Corrective Maintenance/Restoration of Optical Fiber Faults	Handle fault notifications	6	10	4
	PC1. interpret fault notifications after obtaining them from the Network Operation Center (NOC)/supervisors	2	3	1
	PC2. determine Turn Around Time (TAT) for rectification per Service Level Agreements (SLAs)	2	3	1
	PC3. access and interpret the latest as-built drawings for fault location analysis	1	2	1
	PC4. verify necessary tools and safety gear before heading to the fault location	1	2	1
	Rectify faults at POPs	18	30	12
	PC5. use advanced test equipment (OTDR, power meter, light sources, precision cutters, etc.) for fiber testing and troubleshooting	2	3	1
	PC6. identify fault location using OTDR traces, signal loss patterns, dispersion and Wavelength Division Multiplexing (WDM) analysis	2	3	1
	PC7. interpret as-built drawings to locate physical sites and underground cable routes	2	3	1
	PC8. coordinate excavation, cable pulling (if required), and preparation of jointing pits	2	3	1
	PC9. conduct fiber splicing using proper techniques and advanced protection sleeves/connectors	2	3	1
	PC10. analyze OTDR and power meter test results to assess splicing effectiveness	1	2	1
	PC11. secure fiber joints with appropriate reinforcements like couplers, sleeves, and Fiber Reinforced Plastic (FRP)	2	3	1
	PC12. evaluate the need for additional duct protection (e.g., RCC pipes, chambering) based on site conditions	1	2	1
	PC13. oversee back-filling of trenches, ensuring structural integrity and adherence to environmental safety standards	1	2	1
	PC14. verify fault rectification by performing final OTDR tests and confirming network stability	1	2	1

	PC15. monitor and supervise activities to ensure adherence to SLAs and minimize downtime	1	2	1
	PC16. escalate unresolved faults or significant delays following organizational policies	1	2	1
	Document and report the status	6	10	4
	PC17. ensure accurate cable marking and placement of route markers for future maintenance	2	2	1
	PC18. maintain comprehensive jointing records, including OTDR test reports and loss analysis	1	2	1
	PC19. update all relevant documents, including as-built diagrams and OTDR registers	1	2	1
	PC20. archive historical data for fault trends and preventive maintenance planning	1	2	0.5
	PC21. comply with industry standards for documentation and reporting	1	2	0.5
	Total Marks	30	50	20
TEL/N9111: Follow sustainability practices in telecom cabling operations	Identify recyclable, reusable, and hazardous materials	8	15	5
	PC1. identify different types of materials used in cabling operations, such as optical fiber, connectors, protective ducts, and joint enclosures	2	3	1
	PC2. segregate materials into recyclable (e.g., plastic ducts, fiber offcuts, packaging), reusable (e.g., spare connectors, splitters), and hazardous (e.g., lead-based cables, old batteries, chemical adhesives) categories	2	3	1
	PC3. follow workplace procedures for storing recyclable materials separately from hazardous and general waste	2	3	1
	PC4. label and store hazardous waste safely to prevent contamination or accidents during handling and disposal	1	3	1
	PC5. ensure all recyclable and hazardous waste is recorded in logs for traceability and compliance	1	3	1
	Follow waste management, recycling, and disposal protocols	6	15	5
	PC6. adhere to applicable SOPs for safe handling and disposal of non-recyclable and hazardous materials, such as fiber shards, cable sheaths, and chemical adhesives	2	3	1
	PC7. coordinate safe disposal of waste materials at designated collection points or through approved vendors, as per organizational policies and environmental guidelines	1	3	1
	PC8. reduce waste by minimizing excess material use and reusing components wherever possible	1	3	1
	PC9. maintain clean and organized work sites to prevent environmental contamination and promote workplace safety	1	3	1
	PC10. check for and report any issues related to improper waste disposal, unauthorized dumping, or environmental hazards to the relevant authority	1	3	1
	Optimize material and energy usage in cabling work	8	10	5
	PC11. plan cabling work to minimize material wastage by accurately measuring fiber optic lengths, ducts, and accessories before cutting or installing	2	2	1
	PC12. use energy-efficient tools and machinery where possible, ensuring minimal power consumption without compromising work efficiency	2	2	1
	PC13. ensure proper maintenance of cabling tools and equipment to reduce unnecessary repairs and replacements that contribute to waste	2	2	1
	PC14. optimize the use of trenching and ducting by following efficient layout designs to minimize excavation and reduce material consumption	1	2	1
	PC15. use and promote eco-friendly materials (such as low-impact protective coatings and biodegradable packaging) wherever feasible	1	2	1
	Comply with environmental and regulatory standards	8	10	5
	PC16. follow national and local environmental laws, regulations, and workplace policies related to telecom cabling operations	2	2	1
	PC17. maintain proper documentation of sustainability-related activities, including logs of disposed and recycled materials, to meet regulatory and audit requirements	2	2	1
	PC18. conduct periodic self-audits to verify compliance with environmental policies	2	2	1
	PC19. educate team members on best practices for sustainability, including waste segregation, material reuse, and responsible energy consumption	1	2	1
	PC20. report any violations of environmental policies, hazardous material spills, or unsafe disposal practices to the designated supervisor or regulatory body	1	2	1
	Total Marks	30	50	20

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Viva Marks
DGT/VSQ/N0101: Employability Skills (30 Hours)	Introduction to Employability Skills	*1*	*1*	-
	PC1. understand the significance of employability skills in meeting the jobrequirements	-	-	-
	Constitutional values – Citizenship	*1*	*1*	-
	PC2. identify constitutional values, civic rights,duties, personal values and ethics and environmentally sustainable practices	-	-	-
	Becoming a Professional in the 21st Century	*1*	*3*	-
	PC3. explain 21st Century Skills such as Self- Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and culturalawareness, emotional awareness, continuous learning mindset etc.	-	-	-
	Basic English Skills	*2*	*3*	-
	PC4. speak with others using some basic English phrases or sentences	-	-	-
	Communication Skills	*1*	*1*	-
	PC5. follow good manners while communicatingwith others	-	-	-
	PC6. work with others in a team	-	-	-
	Diversity & Inclusion	*1*	*1*	-
	PC7. communicate and behave appropriatelywith all genders and PwD	-	-	-
	PC8. report any issues related to sexualharassment	-	-	-
	Financial and Legal Literacy	*3*	*4*	-
	PC9. use various financial products and servicessafely and securely	-	-	-
	PC10. calculate income, expenses, savings etc.	-	-	-
	PC11. approach the concerned authorities for any exploitation as per legal rights and laws	-	-	-
	Essential Digital Skills	*4*	*6*	-
	PC12. operate digital devices and use its features and applications securely and safely	-	-	-
	PC13. use internet and social media platforms securely and safely	-	-	-
	Entrepreneurship	*3*	*5*	-
	PC14. identify and assess opportunities for potential business	-	-	-
	PC15. identify sources for arranging money andassociated financial and legal challenges	-	-	-
	Customer Service	*2*	*2*	-
	PC16. identify different types of customers	-	-	-
	PC17. identify customer needs and address them appropriately	-	-	-
	PC18. follow appropriate hygiene and groomingstandards	-	-	-
	Getting ready for apprenticeship & Jobs	*1*	*3*	-
	PC19. create a basic biodata	-	-	-
	PC20. search for suitable jobs and apply	-	-	-
	PC21. identify and register apprenticeship opportunities as per requirement	-	-	-
	Total Marks	20	30	-
Grand Total		**140**	**230**	**80**

Annexure - III

QR Codes –Video Links

Chapter No.	Unit Name	Topic	URL Links	QR code (s)
Chapter 1: Introduction to the Sector and the Job Role of an Optical Fiber Technician	Unit 1.1 - Introduction to Telecom Sector and Role of an Optical Fiber Technician	What is Fiber-Optic Cable with Full Information	https://www.youtube.com/watch?v=77dOO5hvd58	
Chapter 2: Coordinate Installation and Commissioning of Optical Fiber Cables	Unit 2.2 - Choosing the Right Type of Optical Fiber	Optical fiber cables, how do they work?	https://www.youtube.com/watch?v=jZOg39v73c4	
	Unit 2.3 - Fiber Optic Tools and Tool Kit	Fiber Optic cable splicing	https://www.youtube.com/watch?v=fCX7U2oCWes	
	Unit 2.4 - Installation of Fiber Optic Cable	10 tips for installing fiber optic cables	https://youtu.be/46JAjiQfCkg	
	Unit 2.5 - Safety, Quality, and Environmental Compliance in Optical Fiber Installation	Fiber Optic Safety Introduction	https://www.youtube.com/watch?v=mkwScwUVyuM	
Chapter 3: Undertake Condition Based Maintenance and Planned Repair Activities	Unit 3.1 - Carry Out Testing of Optical Fiber	VFL(visual Fault Locator)	https://www.youtube.com/watch?v=wnCOnzGc0iU	
		How to test the insertion loss of Fiber Optic Cable	https://www.youtube.com/watch?v=jML7kgQ-MjA	

Chapter No.	Unit Name	Topic	URL Links	QR code (s)
	Unit 3.2 - Optical Fiber Testing, Documentation, and Predictive Maintenance	Optical Fiber Splicing Safety	https://www.youtube.com/watch?v=A-190m4LvEg	
Chapter 4: Perform Corrective Maintenance/Restoration of Optical Fiber Faults	Unit 4.2 - Fault Localization and Restoration	Optical Fiber Cable (OFC) Splicing	https://www.youtube.com/watch?v=7GL9nDCEJQk	
Chapter 5: Follow Sustainability Practices in Telecom Cabling Operations	Unit 5.1 - Sustainability Practices in Telecom Cabling Operations	What Are Regulatory Compliance Requirements?	https://www.youtube.com/watch?v=WvyWmXrDTwM	

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

Telecom Sector Skill Council

Telecom Sector Skill Council
Estel House,3rd Floor, Plot No: - 126, Sector-44
Gurgaon, Haryana 122003
Phone: 0124-2222222
Email: tssc@tsscindia.com
Website: www.tsscindia.com