Telecom
Sector
Skill
Council

Facilitator Guide

5G

Sector

Telecom

Sub-Sector
Passive Infrastructure

Optical Fiber Splicer

Occupation
Operations and Maintenance - Passive Infrastructure

Reference ID: **TEL/Q6400,** Version **4.0**
NSQF level: **3**

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

Shri Narendra Modi
Prime Minister of India

Acknowledgements

About this Guide

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

It includes the following National Occupational Standards (NOSs)-

1. TEL/N6400 – Splice Optical Fiber
2. TEL/N6401 – Test Effectiveness and Record Test Results
3. DGT/VSQ/N0101: Employability Skills (30 Hours)

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

Symbols Used

Ask	Activity	Do	Demonstrate	Explain	Elaborate	Example	Exercise

Facilitation Notes	Field Visit	Learning Outcomes	Notes	Objectives	Practical	Resources	Team Activity

Summarize	Say

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 Splicer

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

TEL/N6400

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 Splicer.

Unit 1.1: Introduction to Telecom Sector and Role of an Optical Fiber Splicer

Unit Objectives

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

1. Explain the significance of the telecom sector in modern communication and economic development.

2. Elucidate the key skills and technical expertise required for an Optical Fiber Splicer.

3. Describe the challenges faced in optical fiber Splicing.

4. Determine the impact of fiber optic technology on internet speed and connectivity.

5. Discuss the roles and responsibilities of an Optical Fiber Splicer.

Resources to be Used

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

Note

This is the first session of the program. Introduce yourself, the program and its purpose in detail. Welcome the trainees cordially to the session. Explain that you are going to put them at ease by playing a game. This game is meant to break the ice between everyone and get the trainees interested in the class.

The key learning outcomes and unit objectives were mentioned at the module's beginning. Make sure that these outcomes and objectives are shared with the participants at the beginning, and when the module gets over, do collective feedback to ensure all have been covered.

Say

Good morning, participants and a very warm welcome to this training program called """Optical Fiber Splicer""."

Do

• Start by welcoming all the participants to the training program and conveying a message of encouragement.

• Thank all the participants for joining and being a part of this training program

• Introduce yourself briefly to participants, your name and background, and your role in the training program

• Talk about your expectations from them about their conduct, laying ground rules

• Explain the rules of the game you are going to play as an "Ice Breaker".

Note

- Please ensure that while introducing yourself, you share at least one piece of personal information, such as your hobbies, likes, dislikes etc., with the participants. This will facilitate participation and exchange in many ways.
- Take a keen interest in understanding the needs and aspirations of the participants before actually conducting the training

Say

Before we start the training, let us spend some time introducing ourselves and knowing each other. We shall play a game.

Activity

- Arrange the class in a semi-circle/circle
- Each of us will tell the class their name, hometown, hobbies and special quality about themselves, starting with the 1st letter of their name. I will start with mine.
- Say your name aloud and start playing the game with your name.
- Say, "Now, each of one you shall continue with the game with your names till the last person in the circle/ semi-circle participates".
- Listen to and watch the trainees while they play the game.
- Ask questions and clarify if you are unable to understand or hear a trainee.

Activity	Duration	Resources used
Ice Breaker	60 minutes	Pen, Notebook, Notebook, etc.

Remember to:

- Discourage any queries related to one's financial status, gender orientation or religious bias during the game
- Try recognising each trainee by their name because it is not recommended for a trainer to ask the name of a trainee during every interaction

Say

Did you all enjoy this activity? I hope you all had a good time during this icebreaker session. Now we are all well acquainted with each other, and this will help us go ahead with our training session.

Note

In this unit, we will discuss about the Telecom Sector in India.

Say

Let us begin the session by discussing about the Telecom Sector in India.

Ask

Ask the trainees the following questions:

• Which government organisation do you think regulates the telecom sector in India?

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

Elaborate

In this session, we will discuss the following point:

• 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

Do

• Ensure all the trainees participate in the icebreaker session
• Jot down the crucial points on the whiteboard as the trainees speak

Notes for Facilitation

• Ask the participants if they have any questions
• Encourage peer learning in the class

Say 💬

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

Activity ⚙

- **Duration:** 60 Mins
- **Resources Required:** Participant Handbook, Pen, Notebook, Chart paper, Sketch pens, pencils, eraser, ruler, laptop, etc.
- This is a group activity
- Divide the class into four groups and provide chart paper and other required items to each group
- Now, ask each group to make a chart paper presentation on types of Optical Fibre:
  - o Based on the refractive index - Step Index Fibres & Graded Index Fibres
  - o Based on the materials used - Plastic Optical Fibres & Glass Fibers
  - o Based on the mode of propagation of light - Single-Mode Fibres & Multi-mode Fibres
- Ask them to explain each of the types
- They can use hand-drawn diagrams or pasted pictures
- After the groups complete their work, collect all the charts and evaluate them

Do ✓

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

Notes for Facilitation 📝

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

Exercise

Answers to exercises for PHB:

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

Short Answer Questions:

1. **Significance of telecom sector:**
   - Enables fast communication, internet access, and digital services.
   - Supports economic growth by facilitating business operations, remote work, and technological innovation.

2. **Three key skills of an Optical Fiber Splicer:**
   - Fiber cleaving and precise splicing skills.
   - Use of OTDR and power meters for testing.
   - Handling and preparing fiber cables safely and accurately.

3. **One major challenge & solution:**
   - Challenge: Precise alignment of fiber cores to avoid signal loss.
   - Solution: Use of high-precision fusion splicers and proper cleaning/cleaving techniques.

4. **Impact of fiber optic technology:**
   - Provides higher bandwidth and faster data speeds.
   - Ensures stable, low-latency connectivity for modern applications.

5. **Roles and responsibilities of an Optical Fiber Splicer:**
   - Splicing, jointing, and terminating fibers.
   - Testing signal quality with OTDR tools.
   - Installing, maintaining, and troubleshooting fiber networks.

Fill in the Blanks:
1. splicing and testing optical fibers
2. enabling faster data and voice transmission
3. alignment
4. total internal reflection
5. proper core alignment

Notes

2. Splicing Optical Fiber

Unit 2.1 - Handling and Maintenance of Tools and Spares

Unit 2.2 - Optical Fiber Fundamentals and Advanced Preparation
Techniques

Unit 2.3 - Advanced Fiber Splicing and Network Integration

TEL/N6400

Key Learning Outcomes

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

1. Explain how to check the availability of tools, spares, and advanced equipment for fiber optic installations.

2. Describe the process of preparing cables for splicing in new installations.

3. Discuss how to maintain and troubleshoot laid Optical Fiber Cables (OFCs).

4. Elucidate the steps involved in performing advanced splicing operations with automation and precision.

5. Describe how to utilize advanced fiber testing tools and document the results.

6. Explain the specialized splicing techniques used for micro and nano fibers.

Unit 2.1: Handling and Maintenance of Tools and Spares

Unit Objectives 🎯

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

1. Describe the tools and equipment used for splicing, including fusion splicers, inspection tools, smart cleavers, robotic arms, and safety equipment, along with the proper handling of splicing consumables.
2. Demonstrate how to check the availability and functionality of advanced optical testing tools such as OTDR, power meter, OSA, CD analyzer, and PMD analyzer.
3. Show how to check for availability and manage advanced splicing tools, including automated splicers, robotic arms, cleavers, and inspection tools.
4. Demonstrate how to manage splicing consumables like joint kits, connectors, heat-shrink sleeves, and fiber optic enclosures.
5. Show how to ensure that splicing machines and testing equipment are calibrated and updated to meet precision standards, and coordinate repair or replacement of faulty tools.
6. Show how to use AI-enabled OTDR for fault detection and accurate loss measurement, and test signal quality with tools like OSA, CD analyzer, and PMD analyzer.

Resources to be Used ⚙️

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

Note 📝

In this unit, we will discuss about managing tools and spares.

Say 💬

Good morning and welcome back to this training program on "Optical Fiber Splicer". In this session, we will discuss about managing tools and spares.

Ask 🗨️

Ask the trainees the following questions:

- What do you know about Total Internal Reflection?
- How can a light wave be polarised?

Write down the trainees' answers on the whiteboard/flipchart. Draw appropriate cues from the answers and start teaching the lesson.

Elaborate ⊚

In this session, we will discuss the following points:

- Characteristics of Optical Fibre
- Various optical equipment
- Handling and Management of Splicing Consumables
- Advanced Splicing Tools (Automated Splicers, Robotic Arms, Cleavers, Inspection Tools)

Say 💬

Let us participate in an extempore activity to understand this unit better.

Activity ⚙

- This is an individual activity
- Display the pictures of different fiber optics tools on the projector
- Ask the trainees to identify each type and mention their usages
- Ask them to note down the answers in the notebook

Activity	Duration (in mins)	Resources used
See and identify	30 minutes	Participant Handbook, Pen, Notebook, laptop, internet connection, overhead projector, etc.

Do ✓

- Show the following pictures of different transmission media

Notes for Facilitation

- Ensure that all the trainees participate in the activity
- Encourage participants to ask relevant questions
- Ensure that all the trainees answer every question listed in the participant handbook

Unit 2.2: Optical Fiber Fundamentals and Advanced Preparation Techniques

Unit Objectives 🎯

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

1. Explain the structure, types, and materials of optical fibers, including core, cladding, and jacket properties, as well as the optical properties like attenuation, dispersion, and wavelength.

2. Discuss the basic physics of light transmission in optical fibers and how it relates to signal performance.

3. Explain the advanced characteristics of optical fibers and the features/functions of advanced splicing machines and testing equipment.

4. Describe the regulatory compliance practices for optical fiber installation and maintenance, and how they affect network planning and design.

5. Discuss the role of AI-powered tools for fault detection, predictive maintenance, and optimization in fiber networks.

6. Discuss the integration of splicing tasks with IoT-enabled smart network management systems and the principles of cloud-based systems for remote monitoring, reporting, and troubleshooting.

7. Demonstrate how to locate and identify fibers for splicing using automated mapping tools and network plans, while checking for physical damage with advanced inspection tools.

8. Show how to prepare optical fibers for splicing by removing jackets, cleaning cores with automated systems, and securing cables within bend radius and stress limits.

9. Demonstrate how to perform micro and nano fiber splicing using specialized tools and document splicing details digitally.

Resources to be Used ⚙️

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

Note 📒

In this unit, we will discuss about pre-installation procedures.

Say 💬

Good morning and welcome back to this training program on "Optical Fiber Splicer". In this session, we will learn about the pre-installation procedures.

Ask

Ask the participants the following questions:

- What is the bend radius of a fiber optics?
- What is attenuation in transmission lines?

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

Elaborate

In this session, we will discuss the following point:

- Specifications of fibre optic cable
  - Tensile strength
  - Bend radius
  - Crush and impact
  - Attenuation
  - Fibre optic cable continuity
- Factors affecting OFC
- Factors affecting choosing of cables
- Handling optical fibre cable
  - Handling process
  - Cable unloading
  - Cable unwrapping
  - Cable storage
  - Environmental storage issues
- Pre-installation - Drum Inspection
- Colour coding of optical fibre cable
  - Cable jacket colours
  - Connector colour codes
  - Fibre colour codes

Say

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

Activity

- This is an individual activity
- Provide optical fiber and Continuity testers or a Visual fault locator
- Now, ask each trainee to perform the continuity test and check if the fiber optics cable is damaged or not
- Conclude the activity by summarising key takeaways

Activity	Duration (in mins)	Resources used
Optical fiber continuety test	45 minutes	Participant Handbook, Pen, Notebook, Laptop, Overhead projector, Optical fiber, Continuity testers, etc.

Do

- Ensure proper safety during the activity
- Ensure, all the trainees, gets the hands-on experience

Notes for Facilitation

- Encourage teamwork and active participation
- Answer all the doubts raised by the trainees in the class

Unit 2.3: Advanced Fiber Splicing and Network Integration

Unit Objectives

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

1. Elucidate the different splicing techniques (mechanical, fusion, ribbon, twist, crimp, etc.), their applications, and best practices for minimizing splice loss and ensuring joint durability.

2. Describe the use of fiber pigtails, connectorized fiber, routing inside junction boxes, and the various fiber jointing techniques.

3. Discuss the techniques for splicing in challenging environments like outdoor, submarine, or underground networks, and how to mitigate environmental effects on fiber and splice joints.

4. Demonstrate how to install joint closures, splitters, and pigtails with weatherproofing, route connectorized fibers, and document compliance with network plans.

5. Describe the proper use of splice closures (heat-shrink vs. cold-shrink) and sealing techniques for weatherproofing in various environments.

6. Demonstrate how to identify fiber faults using OTDR, OFIs, robotic arms, and smart cleavers for maintenance in challenging environments.

7. Demonstrate how to coordinate with NOC for outage windows, perform fault inspections for microbends and environmental wear, clean fibers, replace damaged sections, re-splice fibers, and ensure proper weatherproofing of cables.

8. Demonstrate how to verify performance KPIs, generate automated reports for monitoring and compliance, and maintain documentation for network optimization.

9. Demonstrate how to operate fusion splicing machines with automation to minimize errors, and perform various splicing methods (mechanical, fusion, ribbon, etc.) for different applications.

10. Show how to ensure splice quality using real-time diagnostics, precision cleavers, and advanced imaging tools, while sealing splices with heat-shrink or cold-shrink closures for protection.

11. Elucidate the advanced fusion splicing process, including fiber preparation, splicing machine operation, and ribbon fiber splicing techniques.

Resources to be Used

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

Note

In this unit, we will discuss about the installation of fiber optics

Say

Good morning and welcome back to this training program on "Optical Fiber Splicer". In this session, we will discuss the procedure for installing fiber optics.

Ask

Ask the trainees the following questions:

•   What is trenching?

Write down the trainees' answers on the whiteboard/flipchart. Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

•   Installing OFC

•   Fiber Splicing Techniques

•   Fiber Pigtails and Connectorization

•   Testing and Closing Activities

•   Splicing in Challenging Environments

•   Installation of Joint Closures, Splitters, and Pigtails with Weatherproofing

•   Proper Use of Splice Closures and Sealing Techniques for Weatherproofing

•   Identifying Fiber Faults in Challenging Environments

•   Coordinated Fiber Fault Management and Restoration Procedures

•   Verifying Performance KPIs, Automated Reporting, and Documentation for Network Optimization

•   Reporting and Documentation

•   Steps of Preparing the Cable for Splicing for New Installation

Say

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

Practical ✓

- Ask the trainees to gather at the practical lab
- Make small groups consisting of four trainees in each group
- Ask each group to perform OFC termination using fibre optics connector boot
- Provide them with the required tools and equipment
- Carefully observe them throughout the practical

Activity	Duration (in mins)	Resources used
Terminating OFC	120 minutes	Participant handbook, pen, notebook, laptop, overhead projector, fibre optics connector boot, wire striper, alcohol wipes, fiber cleaver, etc.

Do ✓

- Ensure proper safety during the activity
- Ensure that all the trainees get the hands-on experience
- Guide the trainees in performing correct procedures throughout the activity

Notes for Facilitation 📝

- Encourage teamwork and active participation
- Answer all the doubts raised by the trainees in the class

Ask 💬

Ask the trainees the following questions:

- What is the use of an Optical Time Domain Reflectometer?

Write down the trainees' answers on the whiteboard/flipchart. Draw appropriate cues from the answers and start teaching the lesson.

Say 💬

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

Activity

- This is an individual activity
- Display pictures of different instruments used for testing and splicing of optical fiber
- Ask each trainee to identify each instrument and note it down in the notebook
- After completing, ask random students to describe the use of each instrument they have identified, its specification and utility

Activity	Duration (in mins)	Resources used
See and identify	45 minutes	Participant handbook, Pen, Notebook, Laptop, Internet Connection, Overhead Projector, etc.

Do

- Display the following pictures on the projector for the trainees to identify

Notes for Facilitation

- Share your inputs and insight to encourage the trainees.
- Ensure that all trainees participate in the class.

Exercise

Answers to exercises for PHB:
Multiple Choice Questions (MCQs)
1. b) Smart cleaver
2. b) Weatherproofing and protecting splices
3. b) Fusion splicing
4. b) Using protective sleeves and closures
5. b) Fault detection, loss measurement, and network diagnostics

Short Answer Questions:
1. **Difference between fusion splicing and mechanical splicing (reliability & insertion loss):**
   - Fusion splicing: Uses electric arc to permanently fuse fibers.
   - Lowest insertion loss and highest long-term reliability.
   - Ideal for backbone and high-performance networks.
   - Mechanical splicing: Aligns fibers mechanically using a connector-like device.
   - Higher insertion loss, less durable, used for temporary or quick fixes.

2. Key splicing consumables & their roles:
   - Protective splice sleeves: Protect the fused joint from moisture, bending, and mechanical stress.
   - Cleaning wipes/isopropyl alcohol: Remove dust, oil, and dirt before splicing.
   - Fiber cleaving blades: Ensure clean, precise fiber end faces for low-loss splicing.

3. **How AI-powered tools enhance fault detection & predictive maintenance:**
   - Analyze OTDR traces automatically for faults, bends, or breaks.
   - Predict fiber degradation based on historical patterns.
   - Provide faster diagnostics and reduce human error.
   - Enable proactive maintenance before failures occur.

4. **Purpose of routing connectorized fibers & maintaining bend radius:**
   - Prevents stress, micro-bending, and signal loss.
   - Ensures orderly cable management inside junction boxes.
   - Protects fibers from damage due to sharp bends or compression.

5. **Steps to prepare an optical fiber for splicing & importance:**
   - Strip coating: Exposes bare fiber for fusion.
   - Clean fiber: Removes contaminants that cause poor splicing.
   - Cleave fiber: Creates a flat end face necessary for precision alignment.
   - Align in splicer: Ensures proper matching of fiber cores.
   - Each step ensures minimal insertion loss and a strong, reliable splice.

Fill in the Blanks:
1. splice sleeve
2. Fusion splicing
3. bending losses
4. Optical Time Domain Reflectometer
5. environmental protection

Notes

3. Testing and Recording Spliced Optical Fiber Performance

Unit 3.1 - Splice Protection, Testing, and Fault Mitigation

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

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: Splice Protection, Testing, and Fault Mitigation

Unit Objectives ◎

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

1. Elucidate the techniques for sealing and protecting splice closures using heat shrinking and multi-diameter seals.

2. Determine the threshold values for optical losses and how to mitigate them effectively.

3. Discuss the risks associated with improper testing or splicing, including long-term impacts on network reliability.

4. Demonstrate how to use AI-enabled OTDR to analyze splice joints, diagnose faults, and ensure conformance to design specifications.

5. Show how to ensure optical losses (e.g., reflectance, return, insertion losses) remain within acceptable thresholds.

6. Demonstrate the process of sealing joint closures using heat shrinking, multi-diameter seals, or mechanical seals to protect against adverse environmental conditions.

7. Show how to strengthen splices using appropriate reinforcement materials like Fiber Reinforced Plastic (FRP).

8. Show how to properly place joints in the chamber and coil spare cables (loop) within the joint enclosure.

Resources to be Used ⚙

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

Note 📋

In this unit, we will discuss about optical fibre splicing.

Say 💬

Good morning and welcome back to this training program on "Optical Fiber Splicer". In this session, we will discuss about optical fibre splicing.

Ask 💬

Ask the trainees the following questions:

• What is splicing?
• What is the need to splice fiber optics?

Write down the trainees' answers on the whiteboard/flipchart. Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- Splicing of OFC
    - o Why do we need to splice optical fibres?
- Types of Optical Fibre Splicing
    - o Mechanical Splicing
    - o Fusion Splicing
- Steps to perform mechanical splicing
- Types of mechanical splicing
    - o V-Grooved Splicing
    - o Elastic-Tube Splicing
- Fusion Splicing
    - o Steps for fusion splicing
- Material and equipment used for splicing
- Tips for better splices
- Evaluating splices
    - o Bad splices
    - o Splice problem troubleshooting
- Optical fibre safety overview
- Splicing safety – Norms and Rules

Say

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

Activity

- This is a practical activity
- Ask the trainees to gather at the practical lab
- Make small groups consisting 4 - 5 trainees in each group
- Ask each group to perform fusion splicing of an optical fiber cable sample
- Provide them with the required tools and equipment to perform the activity
- Carefully observe them throughout the practical and share your inputs whenever necessary

Activity	Duration (in mins)	Resources used
Fusion splicing	120 minutes	Participant handbook, pen, notebook, laptop, overhead projector, fibre optics cable sample, wire striper, IPA cleaner & wipes, fiber cleaver, Fusion splicer, heat shrink plastic, etc.

Do ☑

- Ensure proper safety during the activity
- Ensure all the trainees get the hands-on experience
- Guide the trainees throughout the activity

Notes for Facilitation 📝

- Encourage teamwork and active participation
- Answer all the doubts raised by the trainees in the class

Unit 3.2: Maintenance of Fibre Optics

Unit Objectives 🎯

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

1. Explain the procedures for documentation, reporting, and record-keeping as per company policies.

2. Discuss the protocols for testing optical fiber and ensuring quality assurance.

3. Describe the functions and applications of advanced optical testing tools, including AI-enabled OTDR and power meters.

4. Explain the concept of predictive maintenance and the role of AI-driven tools in minimizing downtime.

5. Demonstrate power source and power meter testing at both ends of the fiber to detect and eliminate cross-fiber issues.

6. Demonstrate predictive maintenance using data insights from AI-enabled tools to proactively identify potential faults.

7. Show how to integrate eco-friendly deployment techniques to minimize material waste during the testing process.

8. Demonstrate the process of maintaining a comprehensive jointing record for future reference.

9. Show how to record OTDR and power meter test results in the prescribed format.

10. Demonstrate how to submit test and jointing records to the appropriate authorities for validation and inspection.

11. Show how to update documentation on predictive maintenance and fault diagnostics conducted during testing.

Resources to be Used ⚙️

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

Note 📝

In this unit, we will discuss about the maintenance of fibre optics.

Say 💬

Good morning and welcome back to this training program on "Optical Fiber Splicer". In this session, we will discuss about the maintenance of fibre optics.

Ask 💬

Ask the trainees the following questions:

•   What is Tandem Connection Monitoring?

•   How to remove contaminations in fiber optics?

Write down the trainees' answers on the whiteboard/flipchart. Draw appropriate cues from the answers and start teaching the lesson.

Elaborate

In this session, we will discuss the following points:

- Principles of optical transport media
    - Optical Transport Network
    - Optical Transport Medium
- Signal strength of optical fibre cables
    - Quality KPIs of Optical Fibre Cables
- Factors affecting the performance of fibre optic installations
    - Poor connector terminations
    - Dirty connector ends
    - Poor installation
    - Patch leads
    - Crossed-over patch leads
- Preventive maintenance of fibre optic cables
    - Procedures for preventive maintenance
- Sealing joints
- Heat shrinking
- Multi-diameter seals
- Alignment errors in fibre optic cable

Say

Let us participate in a group discussion to explore the unit a little more.

Activity

- Conduct a group discussion in the class on "Preventive maintenance of fibre optic cables."
- Ask the participants what they have learnt from this exercise
- Ask if they have any questions related to what they have talked about so far
- Close the discussion by summarising the importance of preventive maintenance in maintaining the optimal signal strength

Activity	Duration (in mins)	Resources used
Group discussion	40 minutes	Participant handbook, pen, notebook, laptop, overhead projector, microphone (if needed), etc.

Do ☑

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

Notes for Facilitation 📝

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

Exercise

Answers to exercises for PHB:
Multiple Choice Questions (MCQs)
1. a. Splicing of OFC
2. a. Mechanical Splicing
3. a. 1.5
4. a. Stripping the fibre
5. a. Elastic-Tube Splicing

Short Answer Questions:
1. **The process of Optical Fibre Splicing.**
   - Optical fibre splicing joins two fibres permanently.
   - Steps include stripping the fibre, cleaning, cleaving, aligning fibres using a splicer, and fusing (fusion splicing) or securing (mechanical splicing).
   - Finally, the splice is protected using a sleeve or enclosure.

2. **The steps of Mechanical Splicing:**
   - Strip and clean the fibre.Cleave fibre ends precisely.
   - Insert fibres into a mechanical splice holder.
   - Align ends using index-matching gel.
   - Secure the splice in the mechanical assembly.

3. **Various types of splicing techniques:**
   - Fusion Splicing: Permanent joining using an electric arc.
   - Mechanical Splicing: Temporary/quick alignment using a mechanical fixture and gel.
   - Elastic Tube Splicing: Uses an elastic tube to join fibres.

4. **The process to evaluate splices:**
   - Use an Optical Time Domain Reflectometer (OTDR) to measure splice loss and locate faults.
   - Use a power meter and light source to verify insertion loss.
   - Visually inspect fibre alignment and protective sleeve placement..

5. **The safety rules of Fibre Optic Installation:**
   - Wear safety glasses to protect from fibre shards.
   - Dispose fibre scraps properly in a closed container.
   - Avoid touching fibre ends to prevent injury.
   - Keep food/drinks away from fibre work areas.
   - Use proper insulation and avoid bending fibres beyond the minimum radius..

Fill in the Blanks:
1. Fusion splicing and Mechanical splicing
2. index-matching gel
3. Total Internal Reflection
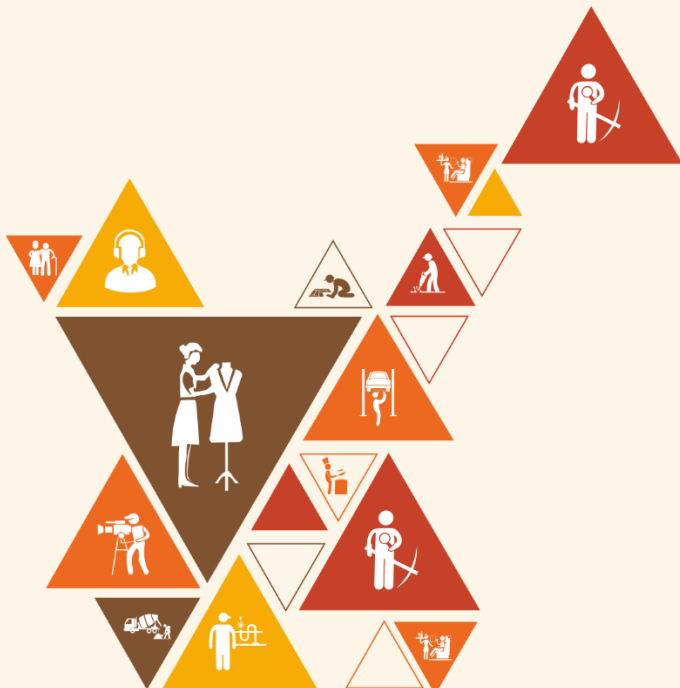4. OTDR testing
5. alignment errors
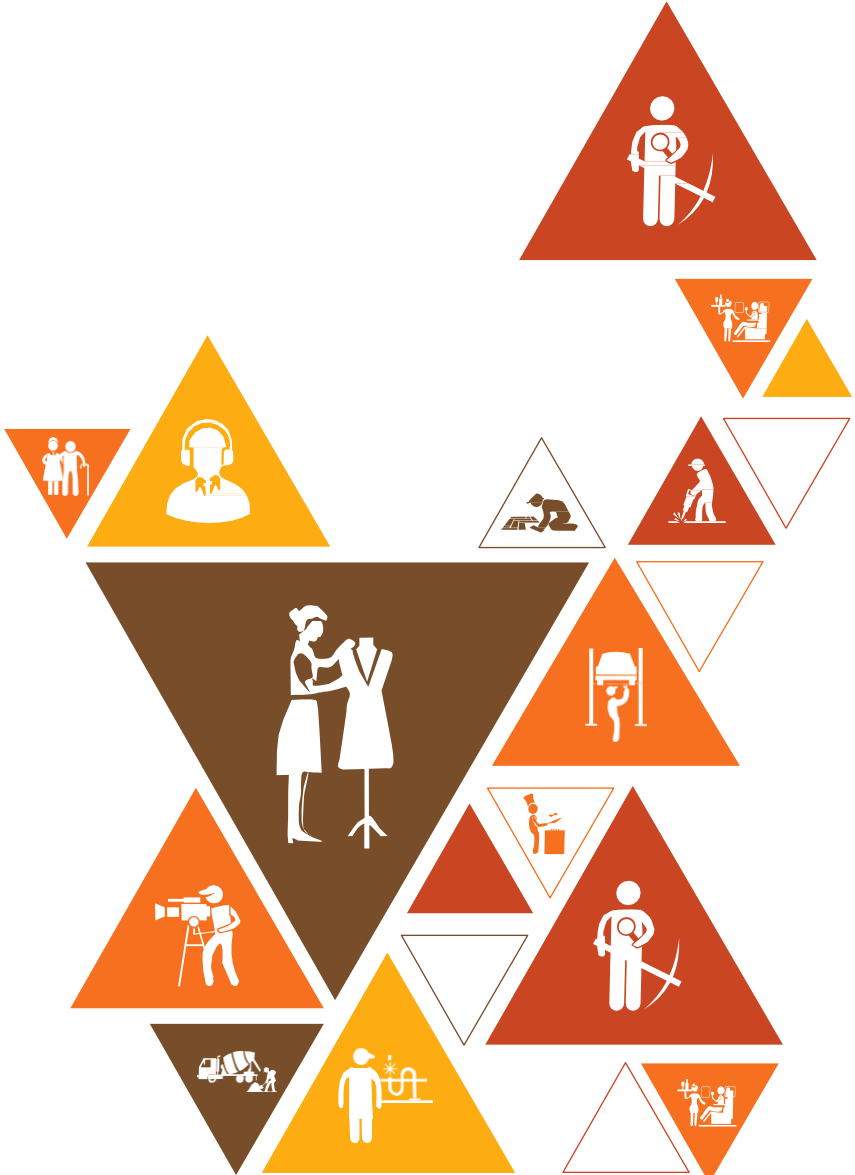
Notes

4. Health, Safety, and Sustainable Practices in Fiber Splicing

Unit 4.1 - Health, Safety, and Sustainablity Practices in Fiber Splicing

Key Learning Outcomes

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

1. Explain the working procedures of OTDR (Optical Time Domain Reflectometer) and Power meter
2. Elaborate the need and the method/procedure to measure the optical losses in the optical fibre cable
3. Discuss commonly occurring hazards, like Earth Potential Rise (EPR), while carrying out the work
4. Perform the procedure of troubleshooting optical fibre
5. Record all jointing test readings and analyse the test result to generate the acceptance report
6. Perform the procedure to generate a sample report using the results/findings in proper formats

Unit 4.1: Health, Safety, and Sustainability Practices in Fiber Splicing

Unit Objectives ⊚

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

1. Explain the procedures for recycling fiber waste and deploying eco-friendly materials during fiber splicing.

2. Describe Health, Safety, and Environment (HSE) protocols, including handling Earth Potential Rise (EPR).

3. Discuss the safe disposal of waste materials and adherence to global sustainability practices.

4. Elucidate first-aid procedures for injuries such as electrical shocks, cuts, and falls.

5. Demonstrate how to check sites for potential health, safety, and environmental risks before beginning work.

6. Show how to use Personal Protective Equipment (PPE) such as helmets, safety glasses, gloves, and trench guards while splicing.

7. Demonstrate compliance with site-specific risk controls, OHS standards, and environmental guidelines.

8. Show how to identify and address environmental hazards like Earth Potential Rise (EPR) during testing and splicing.

9. Demonstrate the process of incorporating fiber waste recycling and adopting eco-friendly materials to align with global sustainability goals.

10. Show how to dispose of waste materials such as cut fibers in a safe and eco-friendly manner.

Resources to be Used ⚙

Participant handbook, pen, pencil, notepad, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, PPE kits (helmets, gloves, glasses), fiber splicing tools, waste disposal containers, sample eco-friendly fiber sleeves, first-aid kit.

Note 📋

In this unit, we will discuss safety, sustainability, and best environmental practices to be followed during fiber splicing operations.

Say 💬

Good morning everyone!
Today we will focus on an extremely important aspect of field work—working safely and responsibly while performing fiber splicing. Whether you're in a trench, on a pole, or inside a customer premises, these practices ensure your safety and help protect the environment.

Ask

Ask the participants:

- What safety risks do you commonly associate with fiber splicing?
- Have you ever seen how fiber waste looks, and why it must be handled carefully?

Write their answers on the whiteboard or flipchart.

Use their thoughts to transition into the lesson.

Elaborate

In this session, we will discuss the following points:

- Health, Safety, and Environment (HSE) protocols
- Understanding Earth Potential Rise (EPR) and how to handle it
- PPE required during fiber splicing
- Site inspection and hazard identification
- First-aid responses for common field injuries
- Waste disposal techniques for fiber scraps, protective coatings, and sleeves
- Recycling procedures and eco-friendly materials in fiber management
- Compliance with Occupational Health & Safety (OHS) standards
- Environmental hazards associated with splicing activities
- Safe and sustainable fiber waste handling aligned with global goals

Say

Let us now participate in an activity to understand HSE risks more practically.

Activity

- **Duration**: 30 minutes
- **Resources**: Projector, photos/videos of fiber splicing sites, markers, chart paper.
- **Steps**:

1. Divide the class into small groups.
2. Display images of real fiber splicing sites—some safe, some unsafe.
3. Ask each group to identify:
    - o Visible safety hazards
    - o Missing PPE
    - o Environmental risks (open trenches, scattered fiber waste, exposed cables)
4. Groups will write their findings on chart paper.
5. After all groups present, discuss the correct safety protocol for each situation.

Do ☑

- Ask a student to note each group's observations on the whiteboard.
- Highlight common site hazards technicians often overlook.
- Share examples from industry practice to make learning more relatable.
- Ensure everyone participates and encourage quieter trainees to speak.
- Ask one participant to summarize the safety risks identified.

Say 💬

Let us now participate in another activity to understand Fiber Waste Recycling & Safe Disposal Drill

Activity ☑

- **Duration**: 25 minutes
- **Resources**: Fiber scraps (dummy), disposal containers, gloves, safety glasses, labels, eco-friendly sleeves.
- **Steps**:
1. Provide each group with sample fiber scraps, used sleeves, and coating pieces (dummy material).
2. Ask them to segregate the items into:
    - Recyclable
    - Non-recyclable
    - Hazardous (sharp fiber strands)
3. Participants will then demonstrate:
    - Safe handling using PPE
    - Correct disposal of hazardous fiber bits
    - Labeling and storing recyclable materials
    - Choosing eco-friendly materials where possible
4. The facilitator demonstrates proper disposal and highlights real industry methods.

Do ☑

- Ask a trainee to record correct and incorrect handling techniques observed during the drill.
- Reinforce why fiber shards are dangerous and must be collected using proper tools.
- Add insights on global sustainability practices and responsible recycling.
- Encourage each trainee to try handling, labeling, and disposal steps.

Notes for Facilitation 📝

- Allow trainees to ask questions about PPE, hazard management, and EPR.
- Encourage peer learning—ask students to answer each other's questions.
- Remind trainees to review the safety guidelines in the participant manual.
- Reinforce that safety and sustainability are not optional—they are part of every technician's daily routine.

Exercise ✏️

Answers to exercises for PHB:

Multiple Choice Questions (MCQs)
1. b) Collect them using scotch tape or designated containers
2. b) To protect personnel from injuries and chemical exposure
3. b) Earth Potential Rise (EPR)
4. c) Placing in designated bio-safe or industrial waste containers
5. c) Immediate repair after fibre fault occurs

Short Answer Questions:
1. **Importance of conducting a site risk assessment.**
   - Identifies potential hazards such as electrical risks, EPR, sharp objects, chemicals, or unstable work areas.
   - Ensures proper safety measures are planned in advance.
   - Reduces accidents and ensures compliance with industry safety standards.

2. **PPE used in fibre splicing & their purpose:**
   - Safety glasses: Protect eyes from fibre shards and chemicals.
   - Gloves: Prevent cuts and protect hands from chemicals and fibre splinters.
   - Lab coat or apron: Protects clothing and skin from chemicals and fibre waste.

3. **Procedures for recycling fibre waste & eco-friendly deployment:**
   - Collect fibre scraps in sealed, labelled containers for safe disposal.
   - Recycle packaging materials like cardboard and plastic when possible.
   - Use eco-friendly materials such as reusable splice trays, biodegradable wipes, and low-toxicity chemicals.

4. **First-aid steps for electrical shock:**
   - Immediately disconnect the power source if safe to do so.
   - Do not touch the victim directly—use a non-conductive object.
   - Check breathing and pulse; perform CPR if necessary.
   - Call emergency medical services and keep the victim still until help arrives.

5. **How safe waste disposal supports sustainability:**
   - Prevents soil, water, and air contamination from hazardous fibre waste.
   - Supports recycling efforts and reduces landfill pressure.
   - Ensures safer work environments and promotes long-term environmental protection.

Fill in the Blanks:
1. designated container
2. ssafety glasses
3. Earth Potential Rise (EPR)
4. eco-friendly materials
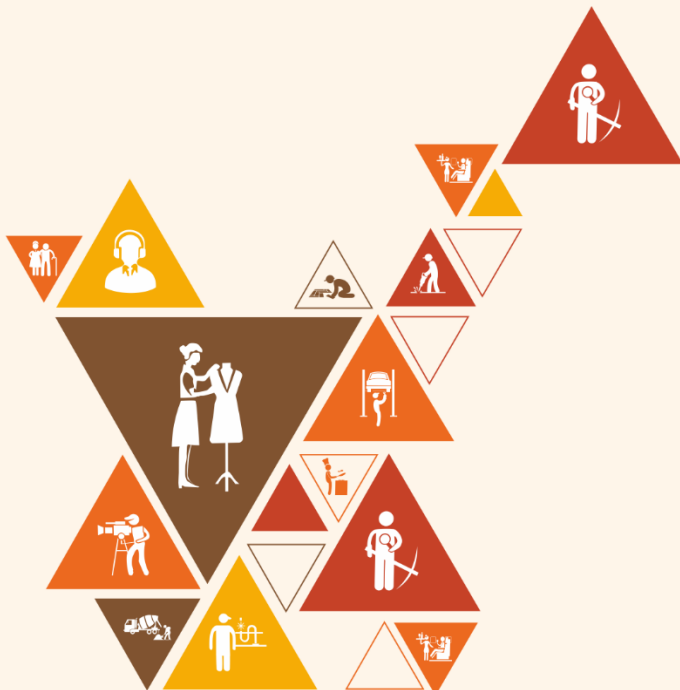5. preventive maintenance

Notes

5. Employability Skills
(30 Hours)

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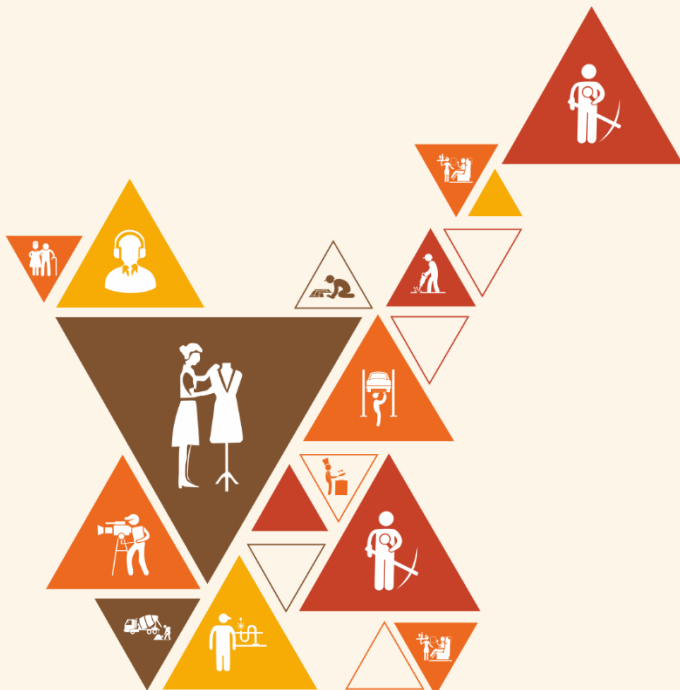
https://www.skillindiadigital.gov.in/content/list

DGT/VSQ/N0101

6. Annexure

Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Optical Fiber Splicer		
Qualification Pack Name & Ref. ID	Optical Fiber Splicer & TEL/Q6400		
Version No.	5.0	**Version Update Date**	08-05-2025
Pre-requisites to Training (if any)	Not Applicable		
Training Outcomes	**By the end of this program, the participants will be able to:** 1. Perform efficient splicing of optical fiber cable 2. Test the effectiveness of the optical fiber 3. Maintain OTDR (Optical Time Domain Reflectometer) register 4. Optimise resources, work efficiently and adhere to safety standards 5. Interact effectively with others while being sensitive to gender and persons with disabilities.		

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
1	Role and Responsibilities of an Optical Fiber Splicer (Theory-05:00 Hours)	Introduction to telecom sector	• Outline the course objectives and outcomes • Analyse the requirements of the course and prepare as per the pre-requisites of the course • Discuss the size and scope of the Telecom industry and Passive Infrastructure sub-sector • Explain the basics of telecom and the terminologies used in the work process	Bridge module	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Laptop with software like MS Office and internet, Whiteboard, Marker, Projector	T-(02:00) P-(0:00)
		Responsibilities and career progression	• Identify the roles and responsibilities of an Optical Fiber Splicer • Discuss the career progression of an Optical Fiber Splicer in the Telecom industry				T-(02:00) P-(0:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
		Scope of work	• Prepare for the role of an Optical fiber splicer by visiting a work site and interacting with others • Prepare a fibre optic technician for splicing				T-(01:00) P-(0:00)
2	**Splicing Optical Fiber (TEL/N6400) (Theory-25:00 Practical-60:00)**	**Ensure the availability of tools and spares**	• Explain how to ensure the availability of optical cable test equipment (Optical Time Domain Reflectometer (OTDR), power meter, etc.)	TEL/N6400 PC1, PC2, PC3, PC4	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training kit (Trainer guide, Pre-sentations), White-board, Markers, Duster, Computer, Projector, Participant Handbook, Optical cable test equipment (Optical Time Domain Re-flectometer (OTDR), power me-ter, etc.), Optical equipment (Spool, Joint clo-sure, Con-nectors, Splicer and Cleaver), Joint kits, Pigtails, Patch cords, FDF (Fiber Dis-tribution Frame), ODB (Opti-cal Distri-bution Box) Connector, Protection sleeves and Heat shrink,	T-(02:00) P-(06:00)
			• Discuss ways to confirm the availability of optical equipment (spool, joint closure, connectors, splicer and cleaver)	TEL/N6400 PC3, KU3			T-(02:00) P-(06:00)
			• Use appropriate techniques to check the availability of joint kits, pigtails, patch cords, FDF (Fiber Distribution Frame), ODB (Optical Distribution Box) connectors, protection sleeves and heat shrink	TEL/N6400 PC4, KU4			T-(02:00) P-(06:00)
			• Elaborate on the process of sending faulty equipment to the logistics team for repair or replacement	TEL/N6400 PC5, KU7			T-(02:00) P-(06:00)
			• Discuss the significance of the availability of RCC (Reinforced Cement Concrete) joint chambers with covers and adequate sand as per specifications	TEL/N6400 PC10, KU11			T-(02:00) P-(06:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Discuss the importance of the availability of one spare cable drum for the emergency replacement of laid cables • Apply appropriate ways to ensure the calibration status of the equipment to be performed (e.g., splicing machine, OTDR, power meter, cleaver)	TEL/N6400 PC13, PC14, PC15		RCC (Reinforced Cement Concrete) joint chambers, Cable drum	T-(02:00) P-(06:00)
		Prepare cable for splicing for new instal- lation	• Identify exact location and fiber/fiber group for which the splicing is to be done as per network route and connectivity plan • Demonstrate the process to inspect cable for sheath damage visually	TEL/N6400 PC17, PC18, PC19. PC20			T-(02:00) P-(06:00)
			• Show how to dismantle/install the fiber joint box/splitter box carefully • Explain the importance of maintaining minimum bend ratios as per manufacturer specifications to prevent cable damage and signal degradation	TEL/N6400 PC21, PC22, PC23. PC24			T-(02:00) P-(06:00)
			• Employ appropriate technique to secure cable in accordance with the industry practices to avoid cable and sheath damage • Determine appropriate fibers to be joined based on colour coding and sequence	TEL/N6400 PC25, PC26, PC27. PC28			T-(03:00) P-(04:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Identify an appropriate place for the joint chamber location	TEL/N6400 PC29, PC30, PC31			T-(03:00) P-(04:00)
			• Show how to clean fiber as per manufacturer specifications	TEL/N6400 PC32, PC33			T-(03:00) P-(04:00)
3	Testing and Recording Spliced Optical Fiber Performance (TEL/N6401) (Theory-50:00 Practical-40:00)	Carry out maintenance of Optical Fiber Cables	• Identify the route/fiber and location where splicing/maintenance needs to be done in coordination with Fiber Technician / Operation and Maintenance (O&M) team	TEL/N6401 PC1, PC2, PC3, PC4, KU1, KU2	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Training kit (Trainer guide, Presentations), Whiteboard, Markers, Duster, Computer, Projector, Participant Handbook, Optical cable test equipment (Optical Time Domain Reflectometer (OTDR), power meter, etc.), Optical equipment (Spool, Joint closure, Connectors, Splicer and Cleaver), Joint kits, Pigtails,	T-(04:00) P-(04:00)
			• Explain how to arrange outage exclusion time (maintenance window timeline) for the fiber and route in consultation with O&M team	TEL/N6401 PC1, PC2, PC3, PC4, KU1, KU2			T-(04:00) P-(04:00)
			Discuss the importance of visiting the site to identify the exact location and fiber/fiber group for which the splicing is to be done	TEL/N6401 PC1, PC2, PC3, PC4, KU1, KU2			T-(04:00) P-(04:00)
			• Explain the process to expose the fiber fault point (by digging for trenched fiber, or opening manholes etc., as required	TEL/N6401 PC5, PC6, KU3, KU4			T-(04:00) P-(04:00)
			• Show how to inspect cable for sheath damage visually • Demonstrate the steps to dismantle/install the fiber joint box/splitter box carefully	TEL/N6401 PC5, PC6, KU3, KU4			T-(04:00) P-(04:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Explain the importance of maintaining minimum bend ratios as per manufacturer specifications to prevent cable damage and signal degradation	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8		Patch cords, FDF (Fiber Distribution Frame), ODB (Optical Distribution Box) Connector, Protection sleeves and Heat shrink, RCC (Reinforced Cement Concrete) joint chambers, Cable drum	T- (04:00) P- (04:00)
			• Demonstrate the process to secure cable in accordance with the industry practice to avoid cable and sheath damage	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T- (04:00) P- (03:00)
			• Determine appropriate fibers to be joined based on color coding and sequence • Identify an appropriate place for the joint chamber location • Show how to clean the fiber as per manufacturer specifications	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T- (04:00) P- (03:00)
		Perform splicing operations	• Demonstrate the process to strip cables at areas where splicing has to be performed	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T- (04:00) P- (03:00)
			• Use a precision cleaver to cleave fiber • Illustrate the process to inspect cleaved fiber ends with magnifier to ensure appropriateness	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T- (04:00) P- (03:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Show how to insert fiber strands to the fusion machine in accordance with the product/equipment specifications in case of fusion splicing	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T-(05:00) P-(02:00)
			• Demonstrate the process to align fibers together by a precision-made sleeve and place the prepared fiber in mechanical splicing kit in case of mechanical splicing • Use proper splice protectors like heat shrink splice protectors to protect the splice	TEL/N6401 PC7, PC8, PC9, PC10, PC11, PC12, KU6, KU7, KU8			T-(05:00) P-(02:00)
4	Health, Safety, and Sustainable Practices in Fiber Splicing (TEL/N6401) (Theory-10:00 Practical-20:00)		• Explain the procedures for recycling fiber waste and deploying eco-friendly materials during fiber splicing. • Describe Health, Safety, and Environment (HSE) protocols, including handling Earth Potential Rise (EPR).	TEL/N6401 PC13, PC14, PC15, PC16, PC17, PC18, KU9, KU10, KU11			T-(02:30) P-(05:00)
			• Discuss the safe disposal of waste materials and adherence to global sustainability practices. • Elucidate the first-aid procedures for injuries such as electrical shocks, cuts, and falls. • Demonstrate how to check sites for potential health, safety, and environmental risks before beginning work.	TEL/N6401 PC13, PC14, PC15, PC16, PC17, PC18, KU9, KU10, KU11			T-(02:30) P-(05:00)

SL	Module Name	Session name	Session Objectives	NOS	Methodology	Training Tools/Aids	Duration (hours)
			• Show how to use Personal Protective Equipment (PPE) such as helmets, safety glasses, gloves, and trench guards while splicing. • Demonstrate compliance with site-specific risk controls, OHS standards, and environmental guidelines. • Show how to identify and address environmental hazards like Earth Potential Rise (EPR) during testing and splicing.	TEL/N6401 PC13, PC14, PC15, PC16, PC17, PC18, KU9, KU10, KU11			T-(02:30) P-(05:00)
			• Demonstrate the process of incorporating fiber waste recycling and adopting eco-friendly materials to align with global sustainability goals. • ow how to dispose of waste materials such as cut fibers in a safe and eco-friendly manner.	TEL/N6401 PC13, PC14, PC15, PC16, PC17, PC18, KU9, KU10, KU11			T-(02:30) P-(05:00)

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Optical Fiber Splicer	
Job Role	Optical Fiber Splicer
Qualification Pack	TEL/Q6400 V4.0
Sector Skill Council	Telecom Sector Skill Council

S. No.	Guidelines for Assessment
1	Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/ option NOS/set of NOS.
4	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6	To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.
7	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
TEL/N6400: Splice Optical Fiber	Check the availability of tools, spares, and advanced equipment	4	10	-	4
	PC1. check the availability and functionality of advanced optical testing tools such as AI-enabled Optical Time-Domain Reflectometer (OTDR), power meter, Optical Spectrum Analyzer (OSA), Chromatic Dispersion (CD) Analyzer, and Polarization Mode Dispersion (PMD) Analyzer	1	2	-	0.5
	PC2. check for the availability of tools for advanced splicing including automated splicers, robotic arms, precision cleavers, smart cleavers, splice trays, and inspection tools	1	2	-	0.5
	PC3. check for adequate stock of splicing consumables including joint kits, connectors, patch cords, heat shrink sleeves, and environmental sealing materials along with RCC joint chambers, fiber optic enclosures, and other site-specific materials	1	2	-	1
	PC4. ensure splicing machines and testing equipment are calibrated, updated with the latest firmware, and meet precision standards	0.5	2	-	1
	PC5. handle inventory and coordinate repair or replacement of faulty tools through defined channels	0.5	2	-	1
	Prepare cables for splicing for new installations	5	12	-	4
	PC6. . locate and identify fibers for splicing as per network designs, connectivity plans and colour-coded sequences using automated mapping tools	0.5	2	-	0.5
	PC7. check cables for physical and sheath damage using visual and advanced inspection tools	1	2	-	0.5
	PC8. prepare optical fibers by removing jackets and cleaning cores using automated cleaning systems	1	2	-	0.5
	PC9. secure cables and ensure compliance with bend radius and stress limits specified by manufacturers	0.5	2	-	0.5
	PC10. install and ground joint closures, splitters, and pigtails with weatherproofing measures to minimize environmental effects	0.5	2	-	1
	PC11. manage routing of connectorized fibers inside junction boxes and document compliance with network plans	0.5	1	-	0.5
	PC12. perform twist splicing for copper or hybrid cables where applicable	1	1	-	0.5
	Maintain and troubleshoot laid Optical Fiber Cables (OFCs)	8	12	-	4
	PC13. identify fiber faults using advanced tools such as AI-enabled OTDR and real-time monitoring systems	1	2	-	0.5
	PC14. use robotic arms, Optical Fiber Identifiers (OFIs), and smart cleavers for precise maintenance in challenging environments	1	1	-	0.5
	PC15. coordinate with the Network Operations Center (NOC) for outage windows and route updates	1	1	-	0.5
	PC16. access fault points safely and inspect for microbends, sheath damage, or environmental wear using advanced inspection tools	1	1	-	0.5
	PC17. clean and prepare all fibers for splicing as per applicable specifications	1	2	-	0.5
	PC18. replace damaged sections, re-splice fibers, and ensure all connections meet loss and reflection standards	1	2	-	0.5
	PC19. secure and weatherproof cables following the applicable standards	1	2	-	0.5
	PC20. document maintenance and troubleshooting activities digitally for analysis and reporting	1	1	-	0.5
	Perform advanced splicing operations with automation and precision	8	10	-	4
	PC21. operate advanced fusion splicing machines with automation features to minimize human error	1	1	-	0.5

PC22. perform mechanical, fusion, ribbon, crimp, mass and nano fiber splicing for various network applications, including harsh environments	1	2	-	0.5
PC23. ensure splice quality using real-time diagnostics integrated into automated splicing machines	1	1	-	0.5
PC24. minimize splice loss and optimize alignment using precision cleavers and advanced imaging tools	1	1	-	0.5
PC25. test splice quality using real-time monitoring systems integrated into splicers	1	2	-	0.5
PC26. seal splices with heat-shrink or cold-shrink closures, ensuring protection against environmental factors	1	1	-	0.5
PC27. conduct micro and nano fiber splicing using specialized tools for high-performance, low-loss connections in specialized industries such as medical and military communications	1	1	-	0.5
PC28. document splicing details and results digitally for future reference	1	1	-	0.5
Utilize advanced fiber testing tools and document results	5	6	-	4
PC29. use AI-enabled OTDR for real-time fault detection, predictive maintenance, and accurate loss measurement	1	2	-	1
PC30. test signal quality and propagation characteristics using advanced tools such as OSAs, CD analyzers, and PMD analyzers	1	1	-	0.5
PC31. verify performance KPIs, including attenuation, reflection, and chromatic dispersion, for spliced fibers	1	1	-	0.5
PC32. generate automated reports using cloud-based platforms for remote monitoring and compliance tracking	1	1	-	1
PC33. maintain proper documentation of test results for quality assurance and network optimization	1	1	-	1

	NOS Total	**30**	**50**	**-**	**20**
TEL/N6401: Test Effectiveness and Record Test Results	Test the effectiveness of the splice using advanced tools	13	25	-	9
	PC1. use AI-enabled OTDR to analyze splice joints, diagnose faults, and ensure conformance to design specifications	2	4	-	2
	PC2. ensure optical losses (e.g., reflectance, return, insertion losses) are within acceptable thresholds	2	3	-	1
	PC3. seal joint closures using appropriate methods (heat shrinking, multi-diameter seals, or mechanical seals) to ensure protection under adverse environmental conditions	2	3	-	1
	PC4. strengthen splices using appropriate reinforcement materials like Fiber Reinforced Plastic (FRP)	2	3	-	1
	PC5. conduct power source and power meter tests at both ends of the fiber to detect and eliminate cross-fiber issues	2	3	-	1
	PC6. ensure proper placement of joints in the chamber and coiling of spare cables (loop) within the joint enclosure	1	3	-	1
	PC7. perform predictive maintenance using data insights from AI-enabled tools to identify potential faults proactively	1	3	-	1
	PC8. integrate eco-friendly deployment techniques, minimizing material waste during the testing process	1	3	-	1
	Record test results for traceability and analysis	7	10	-	4
	PC9. maintain a comprehensive jointing record for future reference	2	3	-	1
	PC10. record OTDR and power meter test results in the prescribed format	2	3	-	1

	PC11. submit test and jointing records to the appropriate authorities for validation and inspection	2	2	-	1
	PC12. update documentation on predictive maintenance and fault diagnostics conducted during testing	1	2	-	1
	Follow health, safety, and sustainable practices during fiber splicing	10	15	-	7
	PC13. check sites for potential health, safety, and environmental risks before beginning work	2	3	-	2
	PC14. use Personal Protective Equipment (PPE) such as helmets, safety glasses, gloves, and trench guards while splicing	2	3	-	1
	PC15. comply with site-specific risk controls, OHS standards, and environmental guidelines	2	3	-	1
	PC16. identify and address environmental hazards like Earth Potential Rise (EPR) during testing and splicing	2	2	-	1
	PC17. incorporate recycling of fiber waste and adopt eco-friendly materials to align with global sustainability goals	1	2	-	1
	PC18. dispose of waste materials such as cut fibers in a safe and eco-friendly manner	1	2	-	1
	NOS Total	**30**	**50**	**-**	**20**
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	-	-	-	-
	NOS Total	**20**	**30**	**-**	

Annexure - III

QR Codes –Video Links

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
Module 1: Introduction to the Telecom Sector and the Role of Optical Fibre Splicer	UNIT - 1.2: Tele-com Sector in India	1.2.1 Introduction to Telecom Industry	https://youtu.be/Cag-bcbivtM	Introduction to Telecom Industry
		1.2.3 Broad Band Industry	https://www.youtube.com/watch?v=5SoTmES2UKM	Broad Band Industry
		1.2.4 Optical Fibre Technology	https://www.youtube.com/watch?v=jZOg39v73c4	Optical Fibre Technology
		1.2.5 Types of Optical Fibre	https://www.youtube.com/watch?v=pavBq7HIoIE	Types of Optical Fibre
		1.2.6 Optical Fibre Splicer	https://www.youtube.com/watch?v=d-xth2HzVYU	Optical Fibre Splicer
	UNIT - 1.3: Tele-com Basics	1.3.1 Basics of Telecom	https://www.youtube.com/watch?v=xRFe9jWY0hg	Basics of Telecom

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
Module 2: Prepare for Splicing Operations for New Installation	UNIT - 2.1 Manage tools and spares	2.1.1 Characteristics of Optical Fibre	https://www.youtube.com/watch?v=G-UyeFDsXlI	Characteristics of Optical Fibre
		2.1.2 Various Optical Equipment	https://www.youtube.com/watch?v=SDPfA8k0dUc	Various Optical Equipment
	UNIT - 2.2 Pre-Installation Procedures	2.2.1 Specifications of Fibre Optic Cable	https://www.youtube.com/watch?v=77dOO5hvd58	Specifications of Fibre Optic Cable
		2.2.3 Factors Affecting Choosing of Cables	https://www.youtube.com/watch?v=1oYYB7AGeMo	Factors Affecting Choosing of Cables
		2.2.6 Colour Coding of Optical Fibre Cable	https://www.youtube.com/watch?v=eCpujviAo9g	Colour Coding of Optical Fibre Cable
	UNIT - 2.3 Installation of Optical Fibre	2.2.1 Installing OFC	https://www.youtube.com/watch?v=fYwBgqDdLLQ	Installing OFC

Module No.	Unit No.	Topic Name	Link for QR Code (s)	QR code (s)
Module 3: Maintenance and Splicing of Optical Fibre	UNIT - 3.1: Optical Fibre Splicing	3.1.1 Splicing of OFC	https://www.youtube.com/watch?v=xba2MThR9Ls	Splicing of OFC
		3.1.2 Types of Optical Fibre Splicing	https://www.youtube.com/watch?v=rr9hHjYRbw8	Types of Optical Fibre Splicing
Module 4: Fibre Testing and Doc-umen-tation	UNIT - 4.1: Test-ing Opti-cal Fibre Cable	4.1.1 OTDR (Op-tical Time-Do-main Reflectom-eter)	https://www.youtube.com/watch?v=tXWa3xFUVGA	OTDR (Optical Time-Domain Reflectometer)