# Program Information

## Lesson:

### *Fiber Optic Installation*

## Training:

## Fiber Optics

## Time frame:

### 60 minutes

# Instruction Section

## Learning Objectives:

# Describe what is involved in fiber optic installation process.

# Explain the role of the contractor and installer.

# Identify how to verify the quality of an installation.

# Describe safety considerations for fiber optic installations.

## Assessment Tools/Methods:

# Participants should be assessed based on participation in group discussions and activities.

## Learner Prior Knowledge:

## Prior to class, participants will need to read:

## Reference Guide: Fiber Optic Installation (<https://www.thefoa.org/tech/ref/basic/install.html>)

## Reference Guide: Safety Rules for Fiber Optic Installation (<https://www.thefoa.org/tech/ref/safety/safe.html>)

## Reference Guide: Installing Fiber Optic Cable Plants (<http://www.thefoa.org/tech/guides/INSTL.pdf>)

## Reference Guide: Installing Cable-General Guidelines (<https://www.thefoa.org/tech/ref/install/installcbl.html>)

## Prior to class, the participants will need to watch:

## [FOA Lecture 8: Fiber Optic Installation](http://www.youtube.com/watch?v=K1m8I7VzLF0&list=PLC7CC6B17EF009849&index=19&feature=plpp_video)

## [FOA Lecture: Cabling Project Management](http://www.youtube.com/watch?v=24FmFaeYHaA&feature=youtu.be)

## Instructional Activities:

# Explain the objectives of the lesson and ask participants to share their current roles or experience with fiber optics.

# Activity 1: What is Involved in a Fiber Optic Installation:

# Begin by introducing the idea that fiber optic installations can vary widely depending on the application.

# Ask participants to discuss the common types of installations and their appliciation.

# Answers may include Outside Plant (OSP): Installed outdoors, often buried or aerial.

# Fiber to the Home (FTTH): Direct connection to homes, often involves complex routing.

# Cable Television (CATV): Used for cable television networks, typically involves multiple splices.

# Optical Ground Wire (OPGW): Installed alongside power lines, combines power and fiber optic cables.

# Premises cabling: Used inside buildings, typically in office environments.

# Traffic signals: Used for controlling traffic lights and monitoring systems.

# Continue the discussion by asking if participants have any experiences or personal knowledge about any of the types discussed.

# Activity 2: Role of the Contractor and Installer

1. Explain to the group that contractors and installers play a critical role in ensuring successful fiber optic installations. Contractors are responsible for managing the project, while installers handle the hands-on work.
2. Discuss the importance of communication and coordination with other professionals.
3. Discuss key qualifications and skills required including technical knowledge, attention to detail, problem-solving abilities, and a strong understanding of safety protocols.
4. Have the participants work in small groups to discuss the following scenario:
	1. Scenario: Imagine a large-scale FTTH project. Discuss the roles and responsibilities of the contractor and installer in this scenario.
5. Ask participants to discuss the primary responsibilities of the contractor and critical tasks for the installer in this scenario.

# Activity 3: How to Prepare for the Installation

1. Explain the critical pre-installation procedures to the group.
	1. Conducting a thorough site survey.
		1. To help identify potential obstacles and ensures a smooth installation process.
	2. Use the site survey data to map out the cable route.
		1. Ensure that the route avoids sharp bends and physical obstructions.
		2. Plan for adequate slack at termination points and service loops for future maintenance.
		3. Verify that the planned route complies with local building codes and standards.
2. Discuss the importance of having the right tools and materials for the job.
3. Ask participants to create a list of tools and materials they should use when on the job.
	1. Answers may include: Fiber optic cables (correct type and length), connectors and splices, fiber cleaver and stripper, splicing machine, OTDR and power meter for testing, pulling equipment (pulling eye, swivel, lubricant), safety equipment (gloves, safety glasses with shields, aprons).
4. Explain the importance of tool and material inspection through calibration of testing equipment, inspecting cables for damage, and ensuring connectors/splices are clean and functional.
5. Remind participants that they should Always adhere to the manufacturer's recommendations for handling and installing the cables to prevent damage and ensure warranty coverage.
6. Emphasize the importance of adhering to guidelines to avoid voiding warranties and ensure compliance with industry standards such as TIA/EIA and ISO/IEC. Non-compliance can result in additional costs and legal liabilities.
7. Facilitate a discussion on common pre-installation challenges and how following manufacturer recommendations can mitigate these issues.

# Activity 4: What is Involved in the Installation Process

1. Provide an overview of the installation steps, emphasizing the importance of following each step carefully to avoid damage and ensure proper functionality.
2. Discuss with the group what should be involved in the set-up phase.
	1. Answers may include: Laying out all tools and materials. Ensuring that the workspace is clean and free from debris that could damage the fiber optic cables.
3. Ask participants to describe the importance of the bend radius.
	1. Answers may include: Ensure the bend radius is at least 20 times the cable diameter during pulling and 10 times the cable diameter after installation. Use proper equipment like pulleys to maintain the correct bend radius.
4. Describe basics of proper cable twisting with the group.
	1. Twisting can stress the fibers and cause future failures.
	2. Use a figure-8 configuration when laying out cable to prevent twisting.
	3. Ensure that any tension applied does not induce twists in the cable.
5. Hold a group discussion to explain differences between indoor and outdoor installations.
	1. Indoor installations: Install cables in raceways or conduits. Use cable trays above ceilings or under floors. Secure the cables with appropriate ties, ensuring they are not too tight to avoid crushing the cable.
	2. Outdoor installations: Can involve direct burial, aerial installation, or running cables through conduits. Each method has its own set of challenges and precautions.
		1. Direct Burial: Bury cables in trenches at the required depth. Use protective coverings to prevent damage from soil pressure.
		2. Aerial Installation: Attach cables to poles using appropriate hardware. Ensure cables have sufficient slack to accommodate environmental changes.
		3. Conduit Installation: Pull or blow cables through conduits or innerducts. Ensure conduits are clean and free from debris.
6. In small groups, ask participants to work through the Installation Scenario Worksheet.
7. Have each group share their findings with the group, highlighting strategies for overcoming challenges and ensuring a successful installation.

# Activity 5: Verifying the Quality of an Installation

1. Explain that quality verification is a crucial step to ensure the installation meets all standards and specifications and testing helps identify any issues that need to be addressed.
2. Review parameters to test for verify quality.
	1. Attenuation: Loss of signal strength
	2. Return loss: Reflected signal
	3. Continuity: Unbroken signal path
3. Discuss tools and instruments for testing, such as OTDR, light sources, and power meters.

# Activity 6: Safety for Fiber Optic Installations and Conclusion

1. Hold a group discussion about the importance of following safety procedures when installing fiber.
2. Discuss common safety hazards, such as bare fiber, chemicals, splicing hazards, and electrical safety.
3. Discuss safety rules and guidelines for fiber optic installations.
	1. Wear protective gear.
	2. Ensure proper ventilation.
	3. Handle chemicals with care.
4. Review procedures for handling and disposing of fiber scraps.
	1. Collect and dispose of fiber scraps in designated containers to prevent injuries.
	2. Use a black work surface to easily spot and remove fiber shards.
5. Ask participants if they have any questions related to safety procedures.
6. Summarize key points from each part of the lesson.
7. Open the floor for any questions or clarifications regarding the lesson.

##  Resources:

# Whiteboard, markers or display to record discussion points

# Installation Scenario Worksheet

# Reflection Section

How did understanding the detailed steps of fiber optic installation enhance your approach to preparing and executing an installation? In what ways did the role of the contractor and installer impact your perspective on teamwork and communication within a fiber optic project? How do the safety considerations discussed today influence your daily practices and decision-making on the job site?

*This lesson is supplemental to the Fiber Optics lesson within FOA's Fiber U curriculum and not part of the FOA required curriculum to obtain the Certified Premises Cabling Technician certification. If interested in becoming an approved school and/or obtaining a certification, please contact FOA at* [*thefoa.org/contact-foa.html*](https://www.thefoa.org/contact-foa.html)*.*

*Note: AI, specifically ChatGPT 3.5, was used to generate scenarios for this contextualized lesson plan.*

# Installation Scenario Worksheet

Read through the scenario, analyze the scenario, and answer the discussion questions.

**Scenario: Office Building Premises Installation**

**Project Overview:** Your team has been contracted to install a fiber optic network in a multi-story office building. The installation will provide high-speed internet and network connectivity to all floors.

**Factors to Consider:**

1. **Cable Type:**
	* **Indoor Fiber Optic Cable:** Tight-buffered cable with a 12-fiber count.
2. **Environment:**
	* **Indoor Installation:** Office building with multiple floors, including server rooms, workstations, and conference rooms.
3. **Route Details:**
	* **Main Server Room (Ground Floor) to All Floors:**
		+ Route cables from the main server room on the ground floor to distribution points on each floor.
		+ Utilize existing cable trays, conduits, and raceways.
		+ Install cables above drop ceilings and along walls in cable trays.
4. **Potential Obstacles:**
	* **Building Structure:**
		+ Navigating through walls, floors, and ceilings.
		+ Limited space in conduits and raceways.
	* **Other Cables:**
		+ Existing electrical and communication cables.
	* **Access Restrictions:**
		+ Restricted access to certain areas during business hours.
	* **Safety Concerns:**
		+ Ensuring a safe work environment in an occupied building.

**Instructions for Scenario Analysis:**

1. **Analyze the Scenario:**
	* Identify the specific steps required for this installation, considering the factors provided.

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* + Discuss how to maintain pulling tension, bend radius, and avoid cable twisting during the installation.

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1. **Discussion Points:**
	* What tools and materials are necessary for this specific installation?

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* + How would you plan the cable route to minimize disruption and ensure a smooth installation?

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* + How would you handle the potential obstacles listed?

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