

An outage can cost thousands of dollars every hour the system is down — so it is critical to have a recovery program already in place for when problems do occur. Well-trained staff who can handle the emergency in a timely and cost-effective manner are an integral part of any restoration plan.

This two-day instructor-led course focuses on fault location, troubleshooting, and test equipment with a heavy emphasis on hands-on skills training that simulates actual field restorations for both retrievable and non-retrievable slack scenarios. After attending this class, you will have the tools and skills necessary for your organization to better deal with outages.

**Prerequisites:** Any Light Brigade foundational level course such as Fiber Optics 1-2-3, Broadband Fiber Optic Technician Level 1, Fiber Optics for Utilities Level 1, or equivalent field experience.

**Certifications and Credits:** Light Brigade Digital Credentialing

## Theory and Applications Review

### Optical Network Failures

- Digital communications
- Failure rates of fiber optic systems
- Optical network failure causes
- Connectors
- Inspection and cleaning
- Using an inspection scope
- Transmitters
- Receivers
- Fusion splices
- Mechanical splices
- Splice closures and cabinets
- Macrobending
- Microbending
- Lightwave transmission
- Excessive dispersion
- Cable
- Types of cable damage
- Aerial cable failure modes
- Underground cable failures
- Indoor cable failures

### HANDS-ON: Build a Network

- Build a fiber optic system consisting of two panels, one closure, and 200 feet of cable.

### Planning

- ER resources
- Internal and external personnel
- Equipment
- Test tools
- OTDRs
- Documentation
- The network lifecycle
- Purchasing and planning
- Physical versus logical route diversity
- Meshed networks
- Installation
- The need for slack cable
- Cable storage products
- Route marking and documentation
- GIS data
- Commissioning
- Provisioning
- Maintenance and troubleshooting



- Network monitoring systems
- Emergency restoration kits
- Standard tools for cable restoration

### HANDS-ON: Build an Emergency Restoration Kit

- Build an emergency restoration kit with a splice closure and 100 feet of cable.

### Identifying and Locating

- Identifying the event
- Personnel responsibilities
- Sectionalization
- Fault location flow charts
- Location tools
- The OTDR
- How the OTDR works
- OTDR dynamic range
- Pulse width
- Location tips
- Nonreflective OTDR events
- Reflective OTDR events
- Nonreflective end of fiber
- Fiber roll-off
- OTDR deadzone
- OTDR accuracy and helix factor
- Calculating helix factor

- Finding the fault
- Improving accuracy in restorations
- Visual fault locators
- Execute emergency repairs
- Outage restoration
- OSP emergency restoration
- OSP restoration of ducted cable
- OSP restoration of direct buried cable
- Underground restoration equipment
- Aerial restoration issues
- Mid-span entries for restorations

### HANDS-ON: Test and Repair a Failed Network

- Measure span loss with an optical loss test set
- Use a visual fault locator to find a stressed or broken fiber
- Identify and locate events with an OTDR
- Locate and fix the simulated failure with built ERK

### Post Restoration Tasks

- Post-restoration recommendations
- Update documentation
- Restoration reports and records

### Wrap-up and Review