



Content  
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# Lightning Protection Training

[View Course Details](#)

## COURSE DATES AND TIMES

Lightning damage to equipment results in losses exceeding twenty-six billion dollars annually in North America, and nearly three times that worldwide with more than 150 strikes per second. Insurance payout resulting from lightning damage, accounts for approximately 6.5 per cent of all industrial, commercial and institutional property and casualty claims. Ironically, lightning damage to equipment can be all but totally prevented.

Special lightning protection systems prevent damage and are simple, very reliable, and inexpensive, particularly when compared to the cost of equipment repair and replacement, as well as the possible consequences of harm to personnel. However, methods for lightning special protection cannot be found in the code books, i.e.; National Electrical Code (NEC).

In less than 20 years, cellular mobile towers have proliferated on every continent, and are perfect lightning targets! To a lesser extent, AM, FM, and TV towers have also sprouted, sometimes sharing with cell systems. Not only are the towers at lightning risk, but also the cellular, broadcast, and communications antennas mounted on them. At risk too, are the attached cell site equipment, radio transmitters, coaxial cables, and tower light systems.

This Lightning Protection Training course provides a general review of protection schemes and their impact on various industries. Strategies for mitigating damage and improving overall equipment performance are discussed.

## Learning Outcomes

- Lightning protection for grounded towers, wireless facilities, wind power structures, utility and industrial structures and equipment
- Divide and control lightning strike energy
- Tower location in respect to equipment building, electromagnetic radiation, need for a Faraday Cage
- Coordinate the coax cable entry with the building equipment grounding
- Voltage divider circuit from lightning traveling down a tower
- Lightning - A major source of Ground Potential Rise (GPR)

- Bulkhead or wave guide hatch
- Single point grounding location
- Isolate wire-line communications from remote ground
- AC power surge protection and UPS at the power entrance facility
- Standard telephone pair protection is worthless in a Ground Potential Rise

## WHO SHOULD ATTEND

This Lightning Protection Training course is designed for professionals responsible for the engineering, design, installation, inspection, operation, or maintenance of lightning protection and grounding systems, including:

- Electrical Engineers
- Project Engineers
- Design Engineers
- Site Engineers
- Electrical Consultants
- Electrical Contractors
- Construction Supervisors
- Maintenance Engineers
- Plant Engineers
- Facility Engineers
- Electrical Inspectors
- Technicians responsible for lightning protection or grounding systems

## STUDENTS RECEIVE

- Lightning Protection Training Course Certificate
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- FREE Electricity Forum 120-Page Digital Power Quality and Grounding Handbook (Value \$20.00)
- \$100 Coupon Toward Any Future Electricity Forum Event (Restrictions Apply)
- FREE Magazine Subscription (Value \$20.00)
- Course Materials In PDF Format

## COURSE OUTLINE

# Lightning Protection Training Course Outline

## DAY ONE

### Introduction

- Why Lightning a Problem/ Lightning Data

- Isocyanic Map of The US
- Why, When, What and Where
- Lightning Stroke phenomena/Stroke Development
- Lightning Waveform
- Induced Mechanical Damage
- Global Electrical Circuit
- Difference of Potential and Electrical Currents

## **Chapter 1 - Definitions**

- Definitions according to NFPA 780, UL 96A & LPI 175
- Building Classes

## **Chapter 2 - Lightning Protection Codes, Standards, Guidelines**

- UL (Underwriter Laboratories) and UL 96A
- What UL do? Why UL STD is relevant to LPS
- UL Lightning Protection System Personnel Certification Program
- UL 96A, the Standard for Installation Requirements for Lightning Protection Systems
- Lightning Protection Installer Certification Exam
- National Fire Protection Association (NFPA) and NFPA 780
- Lightning Protection Institute (LPI) and LPI 175
- CAN/CSA-B72

## **Chapter 3 - Grounding**

- Grounding Definitions/Grounding Connections
- Why Electrical grounding/ Grounding Major Cause of Trouble in an Electrical Distribution System
- National Electrical Code (NEC)/Grounding Industry Standards
- Grounding Subsystems/Primary and Secondary Grounding Systems
- Grounding Electrode System/Types of Grounding Electrodes
- Resistance -to-Ground/Soil Resistivities
- Single Point Grounding System
- Resistance to Ground of a Ground Rod
- Ground Rod and Coupling Specification
- Measuring Resistance-to-Ground and Ground Resistivity
- Connections & Connectors/Exothermic Connections
- Connectors to Use/Ground Accessories
- Ideal Grounding Testers/Typical Ground Resistance Requirements

## **Chapter 4 - Lightning Protection Systems**

- The Six Interdependent Disciplines that form the Protection Plan
- Need for Lightning Protection System for Structures
- Elements of Lightning Protection System (LPS)
- External & Internal Protection System

- Lightning Protection Systems Types
- An Integral Air Terminal and Mast Systems/Catenary System/Types of Terminals/Conventional System
- Ordinary Structures Lightning Protection System
- Minimum Class I and Class II Material Requirements
- Strike Termination Devices/ Class I and Class II Terminals and Conductors
- The Internal Lightning Protection System/ SPD's
- Typical Installation Drawings
- NFPA 780 Structural Steel Framework
- Air Terminals and Adaptors/Point Bases, Braces & Accessories
- Through Roof, Through Wall & Cable protectors

## **Chapter 5 - Conductors**

- Definitions/Characteristics
- Lightning protection Conductors Table
- Roof Conductors
- Down Conductors
- Down Conductors Entering Corrosive Soil
- Cable Fasteners & Accessories

## **Chapter 6 - Materials**

- Copper, Copper Alloys
- Materials
- Copper vs Aluminum
- Comparison Chart Braid, Wire, Strap
- Mechanical Damage or Displacement

## **DAY TWO**

### **Chapter 7 - Connectors**

- Connections
- Connectors & Fittings
- Connectors, Clamps, Plates & Lugs
- Bonding Clamps and Connectors

### **Chapter 8 - Zones of Protection**

- Zones of Protection
- Multiple Level Roofs/ Pitched Roofs
- Zones of protection/ Electro-geometric Method
- LPZ Lightning Protection Zone Fixed Angle Method
- The Rolling Sphere Methods/ Rolling Sphere Strategy

- Examples of Electro-geometric Method
- Practical Methods to determine the Protection Area
- Zone of Protection Rods, masts and Overhead Ground Wires
- Structures Protection including Tank Protection

## **Chapter 9 - Bonding**

- Definitions
- Bonding of Metal Bodies/Reinforced Concrete Structures
- Common Bonding of Grounded Systems/Structural Bonding
- Internal LPS -Bonding at Service Entrance
- Intersystem Bonding Termination
- Bonding of Metallic Bodies and Roof components
- Bonding Conductor Sizing
- Side flash, Definition /Why Flashover occur
- Inductive Effect/Examples
- Intersystem Bonding Termination

## **Chapter 10 - Surge Protection Devices (SPDs)**

- How Surge Occurs
- How a Surge Suppressor works
- SPD's Ratings
- What is a Surge/Transient Overvoltage
- The Effects of Transients on Business
- Service Entrance Surge Protection Devices
- IEEE C6241.2 Surge Suppression Categories
- How Surges Propagate
- Transients-A problem of "Electronic Age".
- Metal Oxide Varistor (MOV), Silicon Avalanche Diode (SAD)
- How does an SPD work?
- Cascading Location

## **Chapter 11 - Power Station/ Substation Lightning Protection**

- Overhead Shield
- Substation Shield Design
- Generator Terminal Equipment
- Substation Shield Design Methods
- Rolling Sphere Substation protection
- Lightning Arresters
- Grounding Surge Arresters
- Designing a Substation Ground Grid
- Transformer Protection

## **Chapter 12 - Wind turbine Lightning Protection**

- Lightning Protection Zones
- Lightning current distribution Path
- Lightning Strike meets turbines
- Turbines Lightning Distribution path
- Turbines proper grounding for Lightning protection
- Wind Farm ground Grid
- Fundamental design of Wind turbine grounding
- Wind turbine Grounding Layout & Resistance
- SPD's at Zone boundaries of a wind turbine

**Review of expectations  
Questions and Answers**

**COURSE SCHEDULE:**

**Both days:**

Start: 10 a.m. Eastern Time

Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company's location.

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