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## Electrical Grounding For Oil and Gas Applications

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

<https://www.electricityforum.com/onsite-training-rfq>

The Oil & Gas sector relies on the efficient transportation, handling and processing of many hazardous and highly flammable chemical products. These operations generate hazardous levels of static electricity. The first line of defence for catastrophic ignition and explosions is proper grounding & static control measures.

Grounding is defined as electrical equipment connected directly to mother earth, or to some conducting body that serves in place of the earth, such as the steel frame of an oil drilling platform. Proper grounding is an essential for safely and reliably operating electrical systems. Improper grounding methodology has the potential to bring disastrous results from both an operational as well as a safety standpoint.

There are many different categories and types of grounding principles. This course covers proper grounding techniques for not only medium- and high-voltage systems but also low-voltage Instrument and Control Systems (IACS) that have been proven safe and reliable when employed in process control facilities.

The increased use of electrical and electronic equipment introduces risk of electromagnetic interference (EMI) problems to operations and performance.

As systems are added, they all contribute and could become susceptible to an intense electromagnetic environment (EME).

Controlling Static Hazards is the key to preventing combustible cloud explosions.

**After Attending, You Will Have a Better Understanding of:**

- Classification Of Various Oil & Gas Grounding Standards. Codes And Rules
- How to Comply with Oil & Gas Specifications
- How to Comply with Canadian Oil & Gas Safety and Health Administration Specifications
- Oil & Gas Emergency Power Systems
- Petrochemical Storage Tanks Grounding
- Vessels Grounding
- Data Highway grounds
- Logic Manager Grounds
- Cabinet Ground Connections
- Explosion Protection grounding
- Floating, Semi-submersible & Sea Floor Structures Grounding
- Cathodic Protection
- External & Internal Lightning Protection
- Field Transmitter Grounding
- Grounding for Static Electricity Protection

**WHO SHOULD ATTEND**

- Oil & Gas Electrical Engineers and Engineering Technicians
- Offshore Oil Installation Engineers & Technicians
- SCADA System Engineers/Technicians

- Oil & Gas project Engineers and Supervisors
- Oil & Gas design electrical Engineers
- Oil & Gas Engineers responsible for the engineering, design, construction, installation, inspection, operation, or maintenance of electrical grounding systems in Oil & Gas applications
- Oil Platforms Engineers/Technicians

### **STUDENTS RECEIVE**

- 100-Page Digital Electrical Grounding Handbook - Value \$20 (details below)
- 1.4 Continuing Education Unit (CEU) Credits
- A **FREE** Magazine Subscription (Value \$25)
- **\$100** Coupon toward any future Electricity Forum event (restrictions apply)
- Course materials in Paper Format

### **COURSE OUTLINE**

#### **Oil & Gas Applications - Electrical Grounding Techniques**

#### **Course Instructor**

*Pablo Diaz, Power Quality and Grounding Consultant, The Electricity Forum*

#### **DAY ONE**

#### **SESSION 1: ELECTRICAL GROUNDING – SCOPE**

- Definitions

- Applications
- Grounding methods
- Ground Faults
- Why Ground Circuits and Systems
- Grounding Systems

## **SESSION 2: CLASSIFICATION OF VARIOUS GROUNDING STANDARDS. CODES AND RULES**

- API (American Petroleum Institute)
- ASTM (American Society for Testing and Materials), AASHTO,
- AGA (American Gas Association),
- AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
- ANSI/IEEE
- ANSI, ASCE, ASHRAE, ASME, ASSE/SAFETY, ASTM, AWS (optional), AWWA, CTI, DNV, GPA, ICC, IEEE, IESNA, ISA, MSS, NACE, NEMA, NFPA, PFI, SAE, SSPC and UL

## **SESSION 3: ELECTRICAL GROUNDING ELECTRODE SYSTEM**

- Grounding Theory
- Parameters, Measurements and Calculations
- Types of grounds: Dirty Ground/Clean Ground
- Connecting IACS to the ground bed
- Star Point Ground, single point connection
- How not to ground
- Electrical Grounding and Corrosion
- Installation and Protection
- Sizing the Grounding Electrode Conductor

## **SESSION 4: CIRCUIT GROUNDING**

- Sources of electrical power
- Grounded Conductor
- Direct-Current Systems
- Alternating-Current System
- Solidly Grounding system
- Resistance Grounding
- MCC's-Motors grounding
- Rigging Shore Power
- External source through shore power cables

### **SESSION 5: EQUIPMENT BONDING & GROUNDING**

- Major Requirements:
- Identification of the Bonding Conductor
- Bonding/Grounding and electric Shock
- Equipment cabinets and hardware items
- Ground returns & machine grounding
- Pipelines containing gases or flammable liquids
- Grounding of arc welding & cutting machines
- Storage Tank's grounding
- Overall Petrochemical plant proper grounding

### **SESSION 6: EMERGENCY POWER SYSTEMS**

- Proper grounding of emergency power systems (generators)
- Three Pole emergency generator grounding
- Four Pole emergency generator grounding.
- Main Bonding Jumper
- Portable generators
- Vehicle Mounted Generators

## **DAY TWO**

### **SESSION 7: STATIC HAZARDS**

- The hidden dangers in hazardous areas
- Static discharge ignition of combustible atmospheres.
- Static in liquids
- Electrostatic charging of hoses
- Static grounding protection guidelines for tank trucks
- Road tanker filling & emptying
- Mobile grounding for vehicles
- Railroad filling & emptying
- Mixing & blending
- Plastic drums and containers in hazardous areas
- Vehicle mounted static grounding verification systems.
- Vehicle refueling

### **SESSION 8: LIGHTNING PROTECTION FOR OIL INSTALLATIONS**

- Electrical Grounding & Lightning
- Characteristics Protection Systems
- Electrogeometric & Rolling Sphere Concept
- NAVFAC Design Guides
- Ordnance Facilities Protection
- Storage and Handling Facilities Above Ground
- Earth-Covered Magazines
- Cranes on Piers and Wharves
- Marshalling Yards (Truck and Railroad)
- Explosives safety requirements
- Transient Overvoltage Protector Grounding
- Gas Tubes Metal Oxide Varistors Silicon Avalanche Diodes

## **SESSION 9: ELECTRONIC EQUIPMENT GROUNDING**

- Introduction and Definitions
- Computer and Electronic Equipment Grounding
- Telecommunication Rooms and Closets
- Data Processing Equipment
- Grounding Electronic Security Equipment Grounding

## **SESSION 10: TELECOMMUNICATIONS GROUNDING IN PETROCHEMICAL PLANTS**

- Grounding Subsystems
- Exterior Ground Ring
- Interior Ground Ring –
- Field transmitter grounding
- Techniques for floating transmitters
- Single Point grounding system
- Equipment & Cabinet grounding

## **SESSION 11: EMI ON ELECTRONIC CIRCUITS**

- Susceptibility - Immunity
- Cable Shielding and Grounding
- Losses by Absorption and reflection
- Grounding Low- and High-Frequency Shielding
- Grounding High-frequency Shielding
- Coaxial Cables
- Superficial Resistivity
- Resonance and Skin Effect

## **SESSION 12: TWO CASE HISTORIES:**

- Electrical Grounding in Petrochemical Plants

Review of expectations  
Questions and Answers

## **COURSE SCHEDULE**

### **Both days:**

Start: 8:00 a.m.

Coffee break: 10:00 a.m.

Lunch: 12:00 noon

Finish: 4:30 p.m.

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