Static Electricity Hazards: Electrostatic Ignition, Bonding and Earthing Control

17 – 21 May 2027
Dubai - Five-star CBD venue



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Introduction:

Static electricity hazards cause fires and explosions when charge generated by pumping, filtering, splashing, powder transfer or people moving meets a flammable vapour or dust cloud with enough energy to ignite it. Unbonded drums, fast tank filling, wrong FIBC types and insulating footwear are frequent causes. This Core Concept course trains process safety, operations and electrical staff to identify where charge is generated and stored, judge discharges against minimum ignition energy and specify bonding, earthing, flow and inerting controls. Participants produce a Static Hazard Assessment for a loading and powder-handling operation.

Course Objectives:

- Identify where static charge is generated and accumulates in liquid, powder and personnel operations using a plant static source survey
- Compare the energy of spark, brush, propagating brush and cone discharges with the minimum ignition energy of the atmosphere present
- Specify bonding and earthing arrangements and resistance acceptance criteria for vessels, pipework, containers and vehicles
- Set filling velocities, relaxation times and conductivity additive needs for tank, road tanker, rail car and drum operations
- Select FIBC types, personnel controls and inerting for powder handling where flammable vapours or dusts are present
- Plan testing and inspection of static controls and produce a static hazard assessment for a loading and powder-handling operation

Target Audience:

- Process safety engineers who carry out hazard studies and ignition source assessments on process units
- Electrical engineers who design and verify bonding and earthing for tanks, pipework and loading equipment
- Operations engineers and supervisors who run tank filling, blending and powder charging activities
- Loading and terminal staff responsible for road tanker, rail car and drum filling
- HSE engineers who inspect static controls and investigate fires and near misses

Course Outline:

Day 1: Electrostatic Charge Generation, Accumulation and Relaxation

- Triboelectric Charging and Contact Separation Between Dissimilar Materials
- Flow Electrification in Pipes, Filters, Splash Filling and Mixing Vessels
- Charge Accumulation on Isolated Conductors, Insulators and Low-Conductivity Liquids
- Charge Relaxation Time, Liquid Conductivity in pS/m and Residence Time Downstream of Filters
- Plant Static Source Survey Checklist for Liquids, Powders and Personnel

Day 2: Discharge Types, Ignition Energy and Guidance Documents

- Spark Discharges from Isolated Conductors and Stored Capacitive Energy Calculation
- Brush, Propagating Brush and Cone Discharges from Insulating Surfaces and Bulk Powders
- Minimum Ignition Energy of Gases, Vapours and Dust Clouds Against Discharge Energy
- IEC TS 60079-32 Structure: Electrostatic Hazard Guidance for Explosive Atmospheres
- NFPA 77 Recommended Practice Structure and Static Hazard Evaluation Approach

Day 3: Bonding, Earthing and Controls for Liquid Handling

- Bonding and Earthing Design: Conductor Selection, Clamps and Resistance Acceptance Criteria
- Pipeline Flow Velocity Limits, Conductivity Additives and Relaxation Tanks
- Storage Tank Filling: Bottom Entry, Initial Low Velocity and Gauging and Sampling Restrictions
- Road Tanker and Rail Car Loading: Earth Verification Interlocks and Switch Loading
- Drum, IBC and Portable Container Filling with Dip Pipes and Bonded Funnels

Day 4: Powders, FIBCs, People, Inerting and Incident Lessons

- Powder Transfer, Pneumatic Conveying and Charge on Bulk Solids in Silos and Hoppers
- FIBC Type A, B, C and D Selection and Earthing of Type C Bags
- Personnel Charging Control: Dissipative Footwear, Conductive Flooring and Antistatic Garments
- Nitrogen Inerting and Oxygen Concentration Monitoring as a Static Ignition Control
- Incident Case Studies: Tank Filling, Road Tanker Loading and Powder Charging Fires

Day 5: Inspection Walkthroughs and the Static Hazard Assessment

- Loading Bay Walkthrough: Bond Continuity, Earth Clamp Condition and Interlock Tests
- Powder Handling Room Walkthrough: FIBC Earthing, Flooring and Footwear Tester Checks
- Static Control Inspection Schedule and Test Record Template
- Static Hazard Assessment Build for a Case Loading and Powder-Handling Operation
- Static Hazard Assessment Presentation and Peer Challenge

Skills You Will Gain:

- Static Source Identification
- Discharge Energy Evaluation
- Bonding and Earthing Specification
- Flow Velocity Limit Setting
- FIBC Type Selection
- Personnel Static Control
- Static Control Inspection
- Electrostatic Hazard Assessment

Why Attend This Course:

- Return with a Static Hazard Assessment for a loading and powder-handling operation, reviewed by peers
- Explain to operators and managers why a bonded drum can still ignite when the liquid inside is an insulator
- Challenge filling rates, bag types and footwear rules with discharge energy reasoning rather than habit
- Compare static control practice with engineers from refining, chemicals, pharmaceuticals and bulk powder plants

Conclusion:

Static electricity hazards are controlled when every step from charge generation to discharge is understood and matched with a control. The course moves from charging, accumulation and relaxation, through discharge types, minimum ignition energy and the guidance in IEC TS 60079-32 and NFPA 77, to bonding, earthing and liquid filling controls, then to powders, FIBCs, people, inerting and incident lessons. The final day applies the material in inspection walkthroughs and produces a Static Hazard Assessment for a loading and powder-handling operation.