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COURSE BROCHURE

Advanced Circuit Breaker and Switchgear Maintenance Training Course

jupiterprime.uk

info@jupiterprime.uk

Registered in the United Kingdom and Saudi Arabia

Advanced Circuit Breaker and Switchgear Maintenance Training Course

Circuit Breaker and Switchgear Maintenance is a 2-week advanced training course for electrical engineers, electrical technicians and substation maintenance staff who keep low and medium voltage switchboards, breakers and protection relays ready to clear faults, ending with a Switchgear Maintenance and Test Plan. Ageing switchrooms, heavier loads and stricter electrical safety expectations make every untested breaker a hidden risk. Jupiter Prime Training offers this course for switchroom specialists.

Why Circuit Breaker and Switchgear Maintenance Matters Now

Three pressures shape switchgear upkeep today: installed equipment that has passed its original design life while carrying more load, insurers and safety managers who expect documented arc flash controls before any panel is opened, and operations leaders who cannot accept unplanned feeder outages. Sites that maintain breakers well clear faults selectively and keep supply running; sites that neglect them see breakers that fail to trip, burnt busbar joints and serious injuries. The course draws on IEC 62271-100 for high-voltage alternating-current circuit-breakers and NFPA 70B, the standard for electrical equipment maintenance, to frame tasks, intervals and test records.

Who Gains Most from Circuit Breaker and Switchgear Maintenance

- Engineers who set maintenance intervals and test criteria for switchboards and breakers
- Technicians who carry out breaker servicing, racking and functional checks
- Substation staff who perform isolation, earthing and permit-controlled switching
- Protection specialists who verify relay settings, trip circuits and secondary injection results
- Maintenance supervisors who plan switchgear outages and keep test records

An electrical maintenance section gains most when its engineer, a senior technician and the person who issues switching permits attend together and agree one test regime.

Circuit Breaker and Switchgear Maintenance Capabilities

Participants move from reacting to breaker failures to planning tests that reveal contact wear, insulation decay and slow mechanisms before a fault exposes them.

- Assess the condition of air, vacuum and SF6 circuit breakers from test trends — the repair or replace decision
- Apply contact resistance, insulation resistance and timing tests with correct acceptance limits — the return-to-service sign-off
- Test protection relays and trip circuits by secondary injection — the protection engineer confirming selectivity
- Specify safe isolation, earthing and lock-out steps for each switchboard — the permit issuer and the person in charge of work
- Calculate arc flash boundaries and select protective equipment — the safety manager approving live-adjacent tasks
- Design maintenance intervals and test schedules for a switchroom — outage planning with operations

Key Circuit Breaker and Switchgear Maintenance Terms

- Switchgear — the assembly of breakers, disconnectors, busbars, instrument transformers and relays that controls and protects power circuits.
- Contact resistance test — a micro-ohm measurement across closed breaker contacts that reveals wear, contamination or loose connections.
- Insulation resistance test — a direct-current voltage test that measures leakage through insulation to detect moisture, ageing or damage.
- Secondary injection — testing a protection relay by feeding simulated current and voltage signals to confirm its settings and trip outputs.
- Arc flash boundary — the distance from exposed live parts within which an arc could cause second-degree burns without protective clothing.
- Racking — moving a withdrawable breaker between the connected, test and disconnected positions in its cubicle.

Circuit Breaker and Switchgear Maintenance Day by Day

Day 1: The Switchroom in Context

- Switchgear Roles in Distribution Networks — Feeders, Incomers and Bus Couplers
- Low and Medium Voltage Arrangements — Single and Double Busbar Layouts
- Failure Statistics and Common Defects — Where Switchgear Typically Breaks Down
- IEC 62271-100 Ratings — Breaking Capacity and Operating Duty
- NFPA 70B Electrical Maintenance Elements — Policy, Survey and Records

Day 2: Circuit Breaker Types and Mechanisms

- Air, Vacuum and SF6 Interrupters — Arc Quenching Principles Compared
- Moulded Case and Air Circuit Breakers — Low Voltage Construction and Trip Units
- Spring and Magnetic Actuator Mechanisms — Lubrication and Wear Points
- SF6 Gas Handling — Density Monitoring, Leak Checks and Recovery
- Vacuum Bottle Integrity — Over-Potential Testing and Contact Erosion

Day 3: Safe Isolation and Switching

- Switching Schedules — Sequenced Steps and Independent Checks
- Isolation, Proving Dead and Earthing — Securing the Work Zone
- Lock-Out and Tag-Out Arrangements — Personal Locks and Key Safes
- Permit-to-Work for Electrical Tasks — Roles of Issuer and Recipient
- Racking Procedures and Remote Racking Devices — Reducing Exposure

Day 4: Arc Flash Precautions

- Arc Flash Hazard Mechanisms — Energy, Pressure and Molten Metal
- Incident Energy Studies — Inputs From Fault Levels and Clearing Times
- Arc Flash Boundary Labels — Reading and Maintaining Panel Warnings
- Protective Clothing and Equipment Selection — Matching Arc Ratings to Tasks
- Arc-Resistant Switchgear and Maintenance Switches — Engineering Controls

Day 5: Diagnostic Testing of Breakers

- Contact Resistance Measurement — Micro-Ohm Methods and Acceptance Limits
- Insulation Resistance and Polarisation Index — Test Voltages and Trends
- Breaker Timing and Travel Analysis — Open, Close and Bounce Times
- Coil Current Signature — Detecting Sticky Latches and Weak Springs
- Primary Injection of Low Voltage Trip Units — Verifying Pickup and Delay

Day 6: Protection Relays and Secondary Circuits

- Overcurrent and Earth Fault Relays — Settings, Curves and Grading
- Secondary Injection Testing — Pickup, Timing and Trip Output Checks
- Current and Voltage Transformer Checks — Ratio, Polarity and Burden
- Trip Circuit Supervision and DC Supplies — Battery and Charger Health
- Numerical Relay Event Records — Using Disturbance Data After Trips

Day 7: Busbars, Cables and Enclosures

- Busbar Joint Torque and Infrared Surveys — Finding Hot Connections
- Partial Discharge Detection — TEV and Ultrasonic Measurements
- Cable Termination Inspection — Stress Control and Tracking Marks
- Enclosure Condition — Ingress Protection, Dust, Humidity and Vermin
- Switchroom Environment Controls — Ventilation, Cooling and Heaters

Day 8: Condition-Based Switchgear Upkeep

- Condition Scoring Methods — Combining Age, Duty and Test Results
- Online Monitoring Options — Temperature, Gas Density and Partial Discharge Sensors
- Maintenance Interval Setting — Time-Based Versus Condition-Based Choices
- Fault Duty Counting — Tracking Interruptions Against Breaker Ratings
- Retrofit Versus Replacement Appraisal — Extending Life of Ageing Panels

Day 9: Outage Planning and Test Records

- Switchgear Outage Windows — Coordinating With Operations and Standby Supplies
- Test Sheet Design — Recording Values, Limits and Pass Criteria
- Trend Databases for Test Results — Spotting Gradual Deterioration
- Spares and Test Equipment Readiness — Breakers, Coils and Calibrated Instruments
- Return-to-Service Checks — Final Inspection and Energisation Sign-Off

Day 10: Practising the Switchgear Maintenance and Test Plan

- Isolation and Arc Flash Controls Applied — Defining Safe Access for Each Panel
- Breaker Diagnostic Tests Applied — Selecting Tests and Acceptance Limits
- Relay and Secondary Circuit Checks Applied — Scheduling Protection Verification
- Condition Scores and Intervals Applied — Ranking Panels for Attention
- Switchgear Maintenance and Test Plan Completion — Tasks, Tests, Intervals and Records

Applying Circuit Breaker and Switchgear Maintenance After the Course

- Review the last contact resistance and insulation resistance results for one switchboard and flag any breaker trending towards its limit.
- Walk down one switchroom with the arc flash labels and switching procedures, and record gaps in isolation points, labels and protective equipment.

Circuit Breaker and Switchgear Maintenance Questions FAQ

What is circuit breaker and switchgear maintenance and why does it matter now?

Circuit breaker and switchgear maintenance is the inspection, testing and servicing that keeps breakers, busbars and relays able to clear faults safely. It matters now because ageing switchrooms in utilities, oil and gas plants and hospitals carry heavier loads while arc flash expectations tighten.

Which roles gain most from circuit breaker and switchgear maintenance?

Electrical engineers, electrical technicians and substation maintenance staff gain most. They set test regimes, service breakers and isolate equipment, so shared methods for diagnostic testing, relay checks and arc flash controls make switchroom work safer and more consistent.

How does circuit breaker and switchgear maintenance differ from a power system protection design course?

It focuses on keeping installed equipment healthy. A protection design course calculates settings and coordination studies; here participants test breakers, verify relays in service, isolate panels safely and plan maintenance intervals for existing switchgear.

What do you bring back from circuit breaker and switchgear maintenance training?

You bring back a maintenance and test plan for your switchroom. It lists isolation and arc flash controls, diagnostic tests with acceptance limits, relay checks, condition scores and intervals for each panel.

Circuit Breaker and Switchgear Maintenance: The Way Forward

The Switchgear Maintenance and Test Plan gives engineers, technicians and permit issuers one agreed schedule of tasks, tests and safety controls for each panel. Its first decision is which breakers receive diagnostic testing at the next outage. Maintenance supervisors use it to book outages. After the first test cycle, revisit the acceptance limits against the trends recorded.