Power and Control Systems Design Training Course for Project Leaders: Load Lists and Review Gates

19 – 23 October 2026
Cape town

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Programme Summary

Power and control systems design, covering electrical and instrumentation design packages from load lists to control loops and review gates, is the subject of this one-week training course for project, engineering and operations managers at foundation level, ending in a design review file for one plant area. Managers who sign off drawings they cannot read risk late changes, missed interfaces and costly rework at site. The programme moves from design basis to electrical distribution, instruments and control loops, interfaces and review gates, using a prepared design package. Mars Training Centre UK delivers this programme on power and control systems design to mixed-organisation cohorts.

The Business Case

Process plants, utilities, buildings and manufacturing sites depend on power and control design that is complete before construction starts. Managers who can read the main drawings, ask the right questions and hold design reviews at fixed points find gaps while they are still cheap to fix and give construction teams a package that can be built.

- Design Rework: Falls when load lists, diagrams and instrument data are checked for consistency at each review gate.
- Interface Gaps: Decrease when electrical, instrument and process teams agree shared data early.
- Handover Quality: Improves when the design file records decisions and open points in one place.

Principles and Evidence Base

- Single-Line Diagram Convention: A standard way of showing power flow and protection, applied in Session 2 to read how a site is supplied.
- Piping and Instrumentation Diagram Reading: A method of tracing instruments and control loops on process drawings, applied in Session 3 to link devices to functions.
- Hazardous Area Classification Principle: A zoning idea that limits ignition sources where flammable atmospheres may occur, applied in Session 4 to screen equipment choices.
- Stage-Gate Design Review: A method of fixing review points before work proceeds, applied in Session 5 to control the design file.

Intended Participants

- Project managers who receive and approve electrical and instrumentation design packages.
- Engineering managers from other disciplines who work with the power and control team.
- Operations managers who will run and maintain the installed systems.
- Procurement and contract managers who buy equipment against design data.
- Construction and commissioning leaders who need a package they can build and test.

Typical settings include process plants, power utilities, manufacturing sites and large building projects.

Learning Outcomes

1. Participants will be able to construct a design basis for power and control systems from stated needs.
2. Participants will be able to evaluate a load list and a single-line diagram for completeness and consistency.
3. Participants will be able to diagnose gaps in an instrument index, datasheets and control loop drawings.
4. Participants will be able to prioritise interface issues between electrical, instrument and process teams.
5. Participants will be able to justify review gate decisions and open points to a project board.

Programme Structure

Day 1: Power and Control Systems Design Basis

What must the design achieve, and what data fixes it?

- Design Basis Statement
- Process and Power Demand Summary
- Deliverables List
- Design Responsibility Matrix
- Assumptions and Open Points Log

Day 2: Electrical Distribution and Load Lists

How is a site supplied, and does the load list hold together?

- Electrical Load List
- Single-Line Diagram Reading Guide
- Cable Sizing Check
- Motor Control and Switchgear Selection Table
- Earthing Concept Sheet

Day 3: Instruments and Control Loops

How do measurements and control loops appear in the design?

- Piping and Instrumentation Diagram Extract
- Instrument Index and Datasheets
- Control Valve and Transmitter Basics Sheet
- Loop Drawing Reading Guide
- Control System Architecture Sketch

Day 4: Hazardous Areas and Interfaces

Where do electrical, instrument and process designs meet?

- Hazardous Area Zoning Overview
- Equipment Protection Screening Table
- Cable Route and Termination Interface Sheet
- Signal List Cross-Check
- Interface Issue Register

Day 5: Design Review File for One Plant Area

Do the findings join into a file that a project board can approve?

- Applying the Session 1 Design Basis Statement
- Testing the Session 2 Electrical Load List
- Checking the Session 3 Instrument Index
- Resolving the Session 4 Interface Issue Register
- Completing the Design Review File

Methodology

The programme is a structured exercise built on a prepared design package for a small process area, with a load list, a single-line diagram, a piping and instrumentation extract, an instrument index and a loop drawing. Participants read the drawings, find gaps, hold a mock review and defend their decisions to peers acting as a project board.

- Suggested activity: Checking a load list against a single-line diagram to find missing loads.
- Suggested activity: Tracing one control loop from sensor to valve across three documents.
- Suggested activity: Running a review gate and recording decisions and open points.

Capstone Output

Each participant completes a design review file for one plant area. It holds a design basis check, a load list and diagram review, an instrument and loop review, an interface register and a gate decision record. At work it goes to the project board and becomes the checklist for later design packages.

Frequently Asked Questions

Is power and control systems design suitable for managers who are not electrical or instrument engineers?

Yes. Power and control systems design is taught from first principles with a prepared design package. You need responsibility for a project, engineering or operations role that touches electrical and instrumentation design, but no earlier design experience.

Which methods does power and control systems design rest on in this training?

Power and control systems design here rests on single-line diagram conventions, piping and instrumentation diagram reading, hazardous area classification principles and stage-gate design review, applied to one prepared package.

How is the review file from power and control systems design training used at work?

You present the design review file to your project board, use its interface register to chase open points, and keep its checklist for later design packages.

How does power and control systems design differ from a programme on mechanical and piping design?

Power and control systems design concentrates on electrical supply, instruments and control loops, while a programme on mechanical and piping design concentrates on equipment, pipework and layouts.