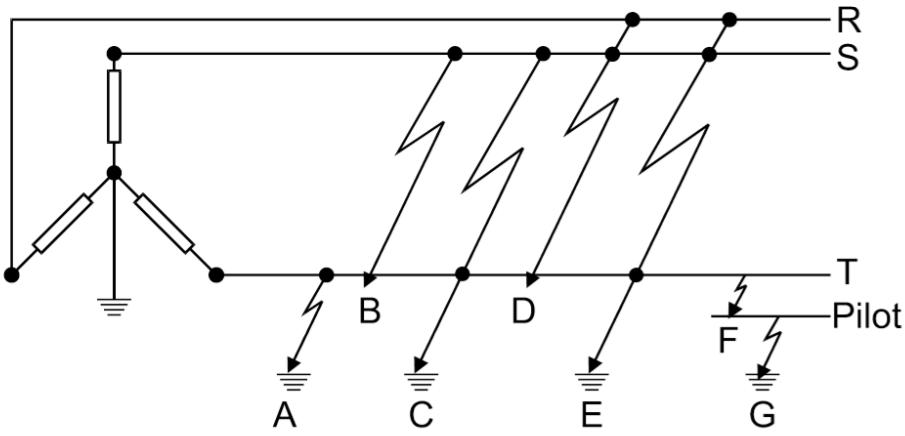
IDC TECHNOLOGIES

Technology Training that Works

Practical Power System Protection



4 hour live, practical online course

YOU WILL LEARN HOW TO:

- Describe the fundamentals of electrical power protection
- Identify and understand the different fault types
- Perform simple fault and design calculations
- Basically specify and use protection system components – CTs, VTs, CBs, fuses and relays
- Apply relay settings; check, test and assess current transformers
- Demonstrate a fundamental knowledge of different applications in protection

WHAT'S INCLUDED?

- Four 50 minute live, practical sessions with your instructor and attendees
- The full technical eBook manual for "Practical Power System Protection" which includes course slides, cases studies, calculations and practical exercises
- Four hours of additional in-depth video sessions covering many additional areas – yours to keep and watch at your convenience

THE COURSE

This workshop has been designed to give plant operators, electricians, field technicians and engineers a better appreciation of the role played by power system protection systems. An understanding of power systems along with correct management will increase your plant efficiency and performance as well as increasing safety for all concerned.

The workshop is designed to provide excellent understanding on both a theoretical and practical level. Starting at a basic level and then moving onto more detailed applications, it features an introduction covering the need for protection, fault types and their effects, simple calculations of short circuit currents and system earthing. This workshop includes some practical work, simple fault calculations, relay settings and the checking of a current transformer magnetisation curve.

THE INSTRUCTOR

Behrouz Ghorbanian
BSc, MSc, MIEAust

Behrouz has completed degree courses in Telecommunications and Electrical Engineering overseas. He also completed his studies in Electrical Utility Engineering at Curtin University in 2004.

Behrouz started his career in the oil and gas industry where his role got him involved in the maintenance and repair of electronic and navigational marine equipment (VHF and SSB radios, Sat Nav, engine control panels etc). He then moved to the power industry and was involved in the design, installation, and commissioning of substations mainly for consultancies and utilities. He has also established a good reputation for teaching power system protection over his long term services lecturing at Curtin University, and also over the period he worked as a Protection Engineer in New Zealand.

Over the past years, Behrouz has been involved in many major projects across Australia. His most recent experience is related to cost estimation and risk assessment of major substation projects with a special focus on the secondary systems (Protection, COMMS, SCADA). He has also worked as an Engineering Manager and Senior Project Engineer on major copper mine projects overseas.

Behrouz has also gained good knowledge in substation design, HV cables sizing and installation, transmission system design, earthing system design and applications, and power system protection design and applications.

WHO SHOULD ATTEND?

- Design engineers
- Electrical engineers
- Electrical technicians
- Electricians
- Field technicians
- Instrumentation and design engineers
- Plant operators
- Project engineers

PRE-REQUISITES:

Fundamental knowledge of electrical engineering.

Technology Training that Works

CONTENT SUMMARY

INTRODUCTION

*This is an intensive four (4) hour presentation; we will be emphasising sections marked in **BOLD** below. Full recordings will be provided for the lower intensity sessions (another four hours of video as detailed below) to review after the course.*

LIVE SESSIONS

Session one

RELAYS

- Inverse, Definite Minimum Time (IDMT) relay – construction principles and setting
- Calculation of settings – practical examples
- New era – modern numerical relays and future trends

Session two

FEEDER PROTECTION

- Cables
- Pilot wire differential
- Overhead lines
- Distance protection (basic principles, characteristics, various schemes)

Session three

TRANSFORMER PROTECTION

- Phase shift, magnetising in-rush, inter-turn, core and tank faults
- Differential and restricted earth fault schemes
- Buchholz relay, oil and winding temperature
- Oil – testing and gas analysis

Session four

SWITCHGEAR (BUSBAR) PROTECTION

- Requirements, zones, types
- Frame leakage, high, medium and low impedance schemes, reverse blocking

RECORDED SESSIONS

Recording one

NEED FOR PROTECTION

- Selectivity, stability, sensitivity, speed
- Reliability, dependability, security

FAULT TYPES AND THEIR EFFECTS

- Active, incipient, passive, transient, asymmetrical etc
- Phase and earth faults

SIMPLE CALCULATION OF SHORT CIRCUIT CURRENTS

- Revision of simple formulae
- Calculation of short circuit MVA and fault currents
- Worked examples

SYSTEM EARTHING

- Solid, impedance, touch potentials etc
- Effect of electric shock on human beings
- Earth leakage protection

Recording two

PROTECTION SYSTEM COMPONENTS INCLUDING FUSES

- History, construction, characteristics
- Energy, let-through, application

INSTRUMENT TRANSFORMERS

- Current transformers: construction, performance, specification, magnetisation, curves etc
- Voltage transformers: types, accuracy, connections

CIRCUIT BREAKERS

- Purpose and duty, clearance times, types etc

TRIPPING BATTERIES

- Battery types, chargers, maintenance, D.C. circuitry

Recording three

PRACTICAL DEMONSTRATION SESSION

- Including simple fault calculations, relay settings and checking a current transformer, magnetising curve etc.

APPLICATIONS CO-ORDINATED BY TIME GRADING

- Problems in applying IDMT relays

UNDERGROUND MINE DISTRIBUTION PROTECTION

- Earth leakage protection, pilot wire monitor, earth fault lockout, neutral earth resistor monitor
- Selective co-ordination by current grading

PRINCIPLES OF UNIT PROTECTION

- Differential protection – basic principles

Recording four

MOTOR PROTECTION

- Thermal overload, time constants, early relays
- Starting and stalling conditions
- Unbalanced supply voltages, negative sequence currents, de-rating factors
- Phase-phase faults
- Earth faults – core balance, residual stabilising resistors

GENERATOR PROTECTION

- Stator and rotor faults
- Overload and over-voltage
- Reverse power/unbalanced loading
- Loss of excitation and synchronism
- Typical protection scheme for industrial generators

MANAGEMENT OF PROTECTION

- Routine testing, annual testing, investigation and performance assessment, up-grading
- Organisation, training, records, access planning

SUMMARY, OPEN FORUM

CLOSING