



COURSE OVERVIEW EE0904

Medium-Voltage Switchgear focused on Marine 6.6 kV Systems

Course Title

Medium-Voltage Switchgear focused on Marine 6.6 kV Systems

Course Date/Venue

December 01-05, 2025/Ajman Meeting Room,
Khalidia Palace Hotel Dubai by Mourouj Gloria,
Dubai, UAE

Course Reference

EE0904

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

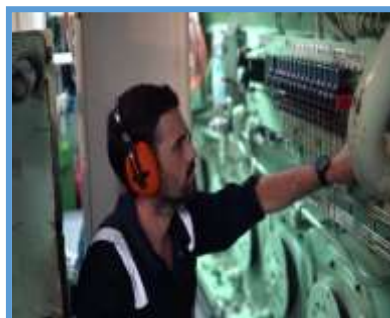


Course Description



This practical and highly-interactive course includes various practical sessions where participants will be engaged in HV power switching and other working practices.

This course is designed to provide participants with a detailed and up-to-date overview of Medium-Voltage Switchgear focused on Marine 6.6 kV Systems. It covers the marine electrical distribution architecture, medium-voltage switchgear fundamentals and system components and layout; the power flow and load distribution analysis, classification society and safety requirements and control and monitoring interfaces; the protection system, protection relays and settings and control and interlocking systems; the marine-specific redundancy and blackout prevention; and the communication, automation integration and operation of 6.6 kV switchgear.



Further, the course will also discuss the routine and preventive maintenance, safety and permit-to-work procedures and condition-based maintenance and diagnostics; the environmental challenges in marine installations, failure reporting and documentation and vacuum circuit breaker (VCB) principles; the testing and inspection procedures, commissioning and functional verification, troubleshooting VCBs and control circuits as well as relay and breaker interface testing; and the system reliability and redundancy concepts, power quality and harmonic control and classification and regulatory compliance.





During this interactive course, participants will learn the digital relays and self-diagnostic features and predictive maintenance using IoT sensors; the data analytics for switchgear health monitoring and integration into digital twins and remote dashboards; the arc-flash containment and post-incident recovery, emergency switching and isolation; the restoration sequences, load prioritization, black-start operation and synchronization; and the marine – specific protection schemes.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on medium-voltage switchgear focusing on marine 6.6 kV systems
- Discuss marine electrical distribution architecture, medium-voltage switchgear fundamentals and system components and layout
- Carryout power flow and load distribution analysis, classification society and safety requirements and control and monitoring interfaces
- Recognize protection system, protection relays and settings and control and interlocking systems
- Apply marine-specific redundancy and blackout prevention, communication and automation integration and operation of 6.6 kV switchgear
- Employ routine and preventive maintenance, safety and permit-to-work procedures and condition-based maintenance and diagnostics
- Review environmental challenges in marine installations, failure reporting and documentation and vacuum circuit breaker (VCB) principles
- Apply testing and inspection procedures, commissioning and functional verification, troubleshooting VCBs and control circuits as well as relay and breaker interface testing
- Explain system reliability and redundancy concepts, power quality and harmonic control and classification and regulatory compliance
- Identify digital relays and self-diagnostic features and apply predictive maintenance using IoT sensors, data analytics for switchgear health monitoring and integration into digital twins and remote dashboards
- Carryout arc-flash containment and post-incident recovery, emergency switching and isolation, restoration sequences and load prioritization and black-start operation and synchronization
- Discuss marine – specific protection schemes

Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of medium-voltage switchgear focused on marine 6.6 kV systems for marine electrical engineers, shipboard electricians and technicians, marine superintendents and technical managers, electrical design engineers, maintenance engineers and supervisors, shipyard and dockyard personnel, classification society inspectors and surveyors and naval architects and marine consultants.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

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The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.



Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Ahmed Abozeid is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of **Onshore & Offshore** experience within the **Oil & Gas** and **Power** industries. His wide expertise covers **HV Cable Design, Cable Splicing & Termination, Cable Jointing Techniques, High Voltage Electrical Safety, HV/MV Cable Splicing, High Voltage Circuit Breaker Inspection & Repair, High Voltage Power System Safe Operation, High Voltage Safety, High Voltage Transformers, Safe Operation of High Voltage & Low Voltage Power Systems, Electric Distribution System Equipment, ABB 11KV Distribution Switchgear, Rotork Operation & Maintenance, Power System Protection and Relaying, Electrical Motors & Variable Speed Drives, Motor Speed Control, Power Electronic Converters, Control Valve, Flowmetering & Custody Transfer, Meters Calibration, Installation & Inspection, Crude Metering & Measurement Systems, Flow Meter Maintenance Troubleshooting, AC Converters Section, Electromagnetic Compatibility (EMC), Motor Failure Analysis & Testing, Machinery Fault Diagnosis, Bearing Failure Analysis Process Control & Instrumentation, Process Control Measurements, Control System Commissioning & Start-Up, Control System & Monitoring, Power Station Control System, Instrumentation Devices, Process Control & Automation, PID Controller, Distributed Control Systems (DCS), Programmable Logic Controllers (PLC), ABB PLC & DCS System, Gas Analyzers, Simulation Testing, Load Flow, Short Circuit, Smart Grid, Vibration Sensors, Cable Installation & Commissioning, Calibration Commissioning and Site Filter Controller. Further, he is also well-versed in Fundamentals of Electricity, Electrical Standards, Electrical Power, PLC, Electrical Wiring, Machines, Transformers, Motors, Power Stations, Electro-Mechanical Systems, Automation & Control Systems, Voltage Distribution, Power Distribution, Filters, Automation System, Electrical Variable Speed Drives, Power Systems, Power Generation, Power Transformers, Diesel Generators, Power Stations, Uninterruptible Power Systems (UPS), Battery Chargers and AC & DC Transmission. He is currently the **Project Manager** wherein he manages, plans and implements projects across different lines of business.**

Mr. Ahmed worked as the **Electrical Manager, Electrical Power & Machine Expert, Electrical Process Leader, Team Leader, Electrical Team Leader, Technical Instructor, and Instructor/Trainer** from various companies such as the Lafarge Nigeria, Egyptian Cement Company, ECC Training Center, Alrajhi Construction & Building Company and Ameria Cement Company, just to name a few.

Mr. Ahmed has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer, Certified TQUK Level 3 Vocational Achievement (RQF) Assessor** and has delivered numerous trainings, seminars, courses, workshops and conferences internationally.



Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Monday, 01st of December 2025

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Marine Electrical Distribution Architecture Main and Emergency Switchboards Configuration • Power Generation and Distribution Hierarchy (Main, Emergency, Essential) • Ring Main and Radial Feeder Arrangements in Vessels • Typical Single-Line Diagrams for 6.6 kV Systems
0930 – 0945	Break
0945 – 1030	Medium-Voltage Switchgear Fundamentals Role and Function in Marine Electrical Systems • 6.6 kV Voltage Level Selection and Rating Criteria • Differences Between Shore and Marine Switchgear Design • Standards and Classification References (IEC 60092, ABS, DNV, Lloyd's)
1030 – 1130	System Components & Layout Busbars, Circuit Breakers, Contactors, Instrument Transformers • Compartmentalization and Segregation (Form 3b/Form 4a) • Cable Terminations, Gland Plates and Space Optimization • Marine Switchroom Environmental Conditions (Humidity, Vibration)
1130 – 1215	Power Flow & Load Distribution Analysis Load Balance Between Generators and Propulsion Motors • Parallel Operation and Synchronization • Redundancy and Power Continuity Concepts (N+1, Split Bus) • Fault Current Paths and Coordination
1215 – 1230	Break



1230 – 1330	Classification Society & Safety Requirements DNV, ABS, and Lloyd's Register Switchgear Approval Criteria • IP Ratings, Shock Protection and Arc Containment • Short-Circuit Withstand and Temperature Rise Testing • Earthing Philosophy for Marine Installations
1330 – 1420	Control & Monitoring Interfaces Mimic Diagrams and HMI Integration • Remote Control and Indication Features • Integration with Ship Automation and PMS • Alarm and Event Logging
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2: Tuesday, 02nd of December 2025

0730 – 0830	Protection System Overview Protection Objectives in Shipboard Networks • Overcurrent, Short-Circuit, and Earth-Fault Protection Principles • Zone Discrimination and Selectivity • Arc-Flash Protection Schemes
0830 – 0930	Protection Relays & Settings Numerical Relay Types for 6.6 kV (Generator, Feeder, Motor, Transformer) • CT/VT Selection and Burden Considerations • Relay Coordination Curves and Grading Margins • Parameterization and Configuration Examples
0930 – 0945	Break
0945 – 1100	Control & Interlocking Systems Manual, Electrical, and Mechanical Interlocks • Dead-Bus and Live-Bus Transfer Logic • Synchronizing Check Relays and Intertripping Schemes • Preventing Backfeed and Islanding
1100 – 1215	Marine-Specific Redundancy & Blackout Prevention Split Bus Operation and Bus Tie Interlocks • Automatic Load Shedding Systems • Emergency Switchboard Interconnection • Black-Start Procedures and Control Logic
1215 – 1230	Break
1230 – 1330	Communication & Automation Integration Interface with PMS, SCADA, and ECR Systems • Data Exchange Protocols (Modbus, IEC 61850, CANbus) • Event Recording and Fault Analysis • Remote Diagnostic Access and Cyber Security Aspects
1330 – 1420	Case Studies: Protection & Control Failures Analysis of Past Marine Switchgear Incidents • Lessons Learned on Protection Coordination • Best Practices for Reliability and Safety Improvement • Hands-On Review of Relay Event Records
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two



Day 3: Wednesday, 03rd of December 2025

0730 – 0830	Operation of 6.6 kV Switchgear Normal Switching, Transfer, and Isolation Procedures • Generator Paralleling and Load Transfer Sequences • Interlocking Verification Before Switching • Safe Energization and De-Energization Protocols
0830 – 0930	Routine & Preventive Maintenance Periodic Inspection Schedules (Daily, Monthly, Annual) • Cleaning, Lubrication, and Torque Checking • Contact Wear Measurement and Replacement Intervals • Infrared and Partial Discharge Monitoring
0930 – 0945	Break
0945 – 1100	Safety & Permit-to-Work Procedures Electrical Isolation, Tagging and Locking • HV Switching and Live Working Restrictions • Arc-Flash Risk Assessment and PPE Requirements • Marine Confined-Space and Environmental Safety
1100 – 1215	Condition-Based Maintenance & Diagnostics Partial Discharge Detection and Interpretation • Online Monitoring Sensors (Temperature, Humidity, Vibration) • CBM Data Trending and Analysis • Integration with Asset Management Systems
1215 – 1230	Break
1230 – 1330	Environmental Challenges in Marine Installations Salt Corrosion and Condensation Effects • Vibration and Mechanical Shock Mitigation • Space Constraint Management and Modular Design • Fire Detection and Suppression Within Switchboards
1330 – 1420	Failure Reporting & Documentation Maintenance Records and Class Audit Requirements • Fault Incident Logging and Corrective Actions • Root Cause Analysis Procedures • Integration of Reports into PMS
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4: Thursday, 04th of December 2025

0730 – 0830	Vacuum Circuit Breaker (VCB) Principles Design and Construction of Marine-Rated VCBs • Vacuum Interrupter Characteristics and Arc Quenching • Contact Erosion Limits and Monitoring • Comparison with SF ₆ and Air Circuit Breakers
0830 – 0930	Testing & Inspection Procedures Visual Inspection and Mechanical Operation Tests • Contact Resistance and Insulation Resistance Tests • Hi-Pot and Dielectric Withstand Testing • Timing and Travel Curve Analysis
0930 – 0945	Break
0945 – 1100	Commissioning & Functional Verification Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) • Interlock Checks and Operational Simulations • Protection Relay Coordination Verification • Integration with PMS/SCADA



1100 – 1215	Troubleshooting VCBs & Control Circuits Common Trip Faults and Failure Modes • Secondary Circuit and Control Wiring Checks • Undervoltage and Shunt Trip Malfunctions • Fault Isolation Through Diagnostic Tools
1215 – 1230	Break
1230 – 1330	Relay & Breaker Interface Testing Secondary Injection and Trip Testing • Primary Injection Current Tests • Simulation of Protection Operations • Testing Under Marine Environmental Stress Conditions
1330 – 1420	Hands-On Practical Session / Case Exercises Use of Relay Testing Kits (Omicron/ISA) • VCB Dismantling and Contact Examination • Interpretation of Test Reports • Class Verification Documentation Practices
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5: Friday, 05th of December 2025

0730 – 0830	System Reliability & Redundancy Concepts N+1 Design Principle and Dual Bus Systems • Failure Mode and Effect Analysis (FMEA) • Blackout Recovery and Redundancy Management • Reliability-Centered Maintenance (RCM)
0830 – 0930	Power Quality & Harmonic Control Harmonics Due to Variable Frequency Drives (VFDs) • Power Factor Correction and Reactive Power Management • Harmonic Filters and Active Compensators • Marine EMC/EMI Standards Compliance
0930 – 0945	Break
0945 – 1100	Classification & Regulatory Compliance DNV/ABS Inspection and Test Protocols • SOLAS and IMO Electrical Requirements • Documentation for Class Surveyors • Change Management and Modification Approvals
1100 – 1215	Digitalization & Smart Switchgear Trends Digital Relays and Self-Diagnostic Features • Predictive Maintenance Using IoT Sensors • Data Analytics for Switchgear Health Monitoring • Integration into Digital Twins and Remote Dashboards
1215 – 1230	Break
1230 – 1300	Emergency Scenarios & Fault Management Arc-Flash Containment and Post-Incident Recovery • Emergency Switching and Isolation • Restoration Sequences and Load Prioritization • Black-Start Operation and Synchronization
1300 – 1345	Marine – Specific Protection Schemes (e.g., PMS, Blackout Recovery)
1345 – 1400	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Practical Sessions

This practical and highly-interactive course includes the following practical sessions using Haward's HV Switchgears:-



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|-----------------------------------|--|
| (1) Switching Programs | (6) Lock-Out & Tag-Out |
| (2) Isolation Certificates | (7) Safe Key Systems |
| (3) Electrical Permit to Work | (8) Electrical Safety Systems-Interlocks-
Earthing-Isolation & Access Control |
| (4) Danger Notices & Pre-Cautions | (9) Fault Reports |
| (5) Sanction for Test | |



Switchgear



Switchgear



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Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org