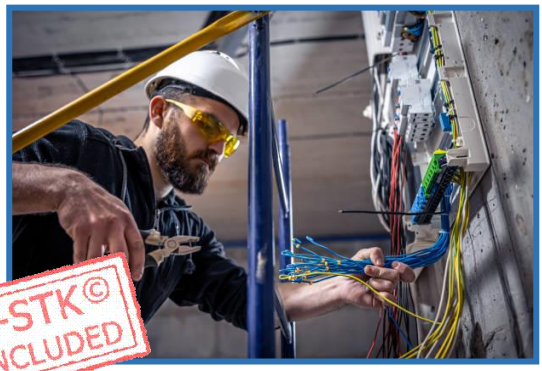
COURSE OVERVIEW EE0860
Wire and Cable Systems

Course Title
Wire and Cable Systems

Course Date/Venue
June 22-26, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE



Course Reference
EE0860

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants carryout HV cable jointing, termination, splicing and testing. Theory learnt in the class will be applied using the latest heat-shrink jointing and termination methods suitable for in-class training.

This course is designed to provide participants with a detailed and up-to-date overview of Wire and Cable Systems. It covers the purpose and applications of wire and cable systems in electrical systems including voltage classifications and industry codes and standards; the types of wires and cables, cable construction and components; the electrical properties of cables and standards and specifications; the cable selection criteria, cable sizing calculations and cable derating and ampacity; and the cable routing and layout design, cable tray, conduit systems and cable pulling techniques.

Further, the course will also discuss the cable termination types covering LV terminations, MV, HV terminations, crimping versus bolted terminations, and phase identification and insulation sealing; the cable jointing and splicing, cable glanding and sealing and grounding and bonding of cable systems; the pre-installation cable testing, post-installation electrical testing, cable fault finding techniques and commissioning procedures; avoiding the common installation issues covering overbending and exceeding pull tensions, improper gland or shield termination, wrong sizing or material selection and improper segregation of power and control.

During this interactive course, participants will learn the specialized cable applications and cable system maintenance; the cable aging, degradation and replacement; the cable schedules and tagging, as-built drawings and routing diagrams, asset tracking via barcodes or RFID and cable data sheets and vendor specs; the lockout, tagout procedures, arc flash awareness and PPE; and working near live circuits and safe cable pulling and termination practices.

Course Objectives

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

- Apply and gain a comprehensive knowledge on wire and cable systems
- Discuss the purpose and applications of wire and cable systems in electrical systems including voltage classifications and industry codes and standards
- Identify the types of wires and cables, cable construction and components, electrical properties of cables and standards and specifications
- Recognize cable selection criteria, cable sizing calculations and cable derating and ampacity
- Illustrate cable routing and layout design, cable tray and conduit systems and cable pulling techniques
- Recognize cable termination types covering LV terminations, MV, HV terminations, crimping versus bolted terminations, and phase identification and insulation sealing
- Carryout cable jointing and splicing, cable glanding and sealing as well as grounding and bonding of cable systems
- Employ pre-installation cable testing, post-installation electrical testing, cable fault finding techniques and commissioning procedures
- Avoid the common installation issues covering overbending and exceeding pull tensions, improper gland or shield termination, wrong sizing or material selection and improper segregation of power and control
- Carryout specialized cable applications and cable system maintenance as well as discuss cable aging, degradation and replacement
- Illustrate cable schedules and tagging, as-built drawings and routing diagrams, asset tracking via barcodes or RFID and cable data sheets and vendor specs
- Apply lockout, tagout procedures, arc flash awareness and PPE, working near live circuits and safe cable pulling and termination practices

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 wire and cable systems for those who are involved in splicing, jointing, termination and testing of power cables. This includes electrical engineers, instrumentation and control engineers, project engineers, maintenance engineers, power system protection and control engineers, building service designers, data systems planners and managers as well as electrical, instrumentation and control technical staff.

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

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. 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.

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

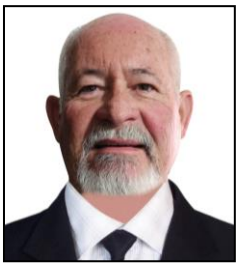
  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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. Ken Steel is a **Senior Electrical & Instrumentation Engineer** with over **45 years** of extensive experience. His expertise widely covers **Electrical Motors Testing**, **Heat Tracing** & Insulation Installation & Testing, **HV Terminations**, **High & Low Voltages** on Overhead Cranes, **HV/MV Cable Splicing**, **Cable & Over Head Power Line**, **HV/MV Switchgear, HV Cable** Design, **Medium & High Voltage** Equipment, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power** System, **HV Equipment** Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, Resin / **Heat Shrink & Cold Shrink** Joints, **HV/LV Equipment**, **LV & HV** Electrical System, **Cable** Splicing & Termination, **High Voltage** Electrical Safety, **LV**, **MV & HV Cable** Installations & Properties, **LV Substation**, **MV & LV Cable**, **UPS Systems**, **MV & LV** Direct on Line Motor Drives, **MV & LV** VSD Motor Drives, **MV & LV** Soft Starter Motor Drives, **LV Two Speed Motor Drives**, Underground **Transformer Oil Containment Tank**, **Electrical & Instrumentation Construction** Installation, 1500KW, 1000KW, 1752KW **Diesel Power Plant Installation**, **110KV Overhead Line**, **110KV Outdoor Switchgear**, 110KV/10KV 6500KVA **Transformer**, **Transformer Substation**, 1600KVA 10KV/0.4KV & 2 Off 1000KVA **Diesel Generators**, 1600KVA 10KV/0.4KV & 1650KVA **Diesel Generator**, **110KV/35KV/10KV Substation**, 110KV/10KV **Transformers**,110KV & 2 Off 6KV **Overhead Lines**, 34.5KV,13.8KV ,4.16KV & 480V **Switchgear**, 4.16KV & 480V MCC, **Transformers & Motor Drives** Substations, **Diesel Driven Generators**, **Overhead Cranes**, **Overhead Cranes & HVAC Units**, **AC & DC Drives**, **Data Logger**, **Electrical, Instrumentation & Mechanical** Installation Maintenance, Slab Mills, Pre Heat Ovens, Hydraulic Shears, Stamping Machine, Gearboxes, Rollers, Pumps, Valves, Electro Magnets & Pump House Operation, Boilers Construction And Commissioning, Valve Calibration & Testing, Level Gauges, Pressure & Flow Transmitters Installation & Calibration, Pressure & Leak Testing of Boilers, Leak Testing, SMP, Elect, I&C, F&G, HVAC & Utility Services, Nitrogen Leak Test Operations, Steam Blowing Activities, SMP, Elect, I&C, F&G, HVAC & Utility Services, PTW Issue (PA/AC), Installation & Mechanical Piping and Hydro Testing & Leak Testing of Lines Installation.

During Mr. Steel's career life, he has gained his practical experience through several significant positions and dedication as the **3GP PBF & Boilers SC Commission Support**, **SC Site Execution Superintendent**, **E&I Construction Superintendent**, **High Voltage Construction Supervisor**, **Control & Power Construction Supervisor**, **Electrical & Instrumentation Supervisor**, **Electrical Technician**, **Construction Support Electrical Engineer**, **E&I Engineer**, **Electrical/Instrumentation Site Supervisor**, **Q.A/Q.C Inspector**, **Electrical/ Instrumentation Technician**, **Maintenance Fitter Instrumentation Technician**, **Millwright**, **Apprentice Millwright** and **Senior Instructor/Lecturer** for Tengiz Chevron Oil Kazakhstan, Al Jubail Saudi Arabia, Escravos Delta state Nigeria, Lurgi S.A, SuD Chemie Sasol Catalysts, J C Groenewalds Construction (LTA), Tycon (Goodyear S.A.), Dragline Construction and Iscor Vanderbijlpark.

Mr. Steel has a **Diploma** in **Electronics Mechanic**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, courses, workshops, seminars and conferences internationally.

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.

Accommodation

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

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.

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: ***Sunday, 22nd of June 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Wire & Cable Systems*** *Purpose and Applications in Electrical Systems • Differences between Wires and Cables • Voltage Classifications (LV, MV, HV) • Industry Codes and Standards (NEC, IEC, BS, IEEE)*
0930 – 0945	*Break*
0945 – 1030	***Types of Wires & Cables*** *Power Cables (XLPE, PVC, Armored) • Control and Instrumentation Cables • Communication and Fiber Optic Cables • Fire-Rated and Low-Smoke Zero Halogen (LSZH) Cables*
1030 – 1130	***Cable Construction & Components*** *Conductors (Copper, Aluminum, Tinned) • Insulation Materials and Properties • Shields, Jackets, and Armor Layers • Cable Core Arrangements (Single, Multi-Core)*
1130 – 1215	***Electrical Properties of Cables*** *Resistance, Capacitance, Inductance • Voltage Drop Calculations • Ampacity and Current Carrying Capacity • Dielectric Strength and Insulation Resistance*
1215 – 1230	*Break*
1230 – 1330	***Standards & Specifications*** *ANSI/ICEA, UL, IEEE, and IEC Standards • Conductor Size Standards (AWG versus mm²) • Marking and Color Coding per NEC • Fire and Smoke Testing Specifications*

1330 – 1420	***Workshop: Identifying Wire & Cable Types*** *Physical Samples and Nameplate Analysis • Identify Insulation, Shielding, and Conductor • Labeling per Standard • Discussion of Typical Applications*
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: Monday, 23rd of June 2025

0730 – 0830	***Cable Selection Criteria*** *Voltage Rating and System Type (AC/DC) • Environmental Conditions (Indoor, Underground, Hazardous) • Load Type and Duty Cycles • Mechanical Protection Needs*
0830 – 0930	***Cable Sizing Calculations*** *Load Current and Demand Factor • Voltage Drop Considerations • Correction Factors: Ambient Temperature, Grouping • Short Circuit Withstand Capacity*
0930 – 0945	*Break*
0945 – 1100	***Cable Derating & Ampacity*** *Thermal Effects and Soil Resistivity • Use of NEC/IEC Ampacity Tables • Multi-Circuit and Enclosed Routing • Air versus Buried versus Conduit Installation*
1100 – 1215	***Cable Routing & Layout Design*** *Cable Tray and Duct Systems • Routing Inside Buildings and Plants • Bending Radius and Spacing • Accessibility and Segregation Requirements*
1215 – 1230	*Break*
1230 – 1330	***Cable Tray & Conduit Systems*** *Tray Types: Ladder, Solid Bottom, Trough • Conduit Types: EMT, PVC, Flexible Metal • Sizing and Fill Ratio Rules • Grounding and Bonding Provisions*
1330 – 1420	***Workshop: Cable Sizing & Routing*** *Perform Load and Voltage Drop Calculations • Choose Suitable Cable Type and Route • Apply Correction Factors • Create a Sample Cable Route Layout*
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: Tuesday, 24th of June 2025

0730 – 0830	***Cable Pulling Techniques*** *Pulling Tension Calculation and Limits • Use of Pulling Grips, Rollers, Lubricants • Cable Lubrication and Protection • Cable Pull Documentation and Logs*
0830 – 0930	***Cable Termination Types*** *LV Terminations: Lugs, Ferrules, Insulation Kits • MV/HV Terminations: Heat Shrink, Cold Shrink • Crimping versus Bolted Terminations • Phase Identification and Insulation Sealing*
0930 – 0945	*Break*
0945 – 1100	***Cable Jointing & Splicing*** *Straight and Transition Joints • Resin Cast, Heat Shrink, Cold Shrink Methods • Jointing for Armored versus Unarmored Cables • Quality Control and Inspection Steps*

1100 – 1215	***Cable Glanding & Sealing*** *Gland Types (Single Compression, Double Compression) • Terminating in Hazardous Zones (Ex-Rated Glands) • Earth Continuity through Gland • Environmental Sealing: IP Ratings*
1215 – 1230	*Break*
1230 – 1330	***Grounding & Bonding of Cable Systems*** *Grounding Conductors and Cable Shields • Earthing of Cable Trays and Armor • Bonding Techniques for Continuity • Lightning and Fault Protection via Bonding*
1330 – 1420	***Workshop: Termination & Glanding Practice*** *Demonstrate LV Cable Termination • Practice Proper Torque and Crimping • Assemble a Gland on Armored Cable • Evaluate a Sample Joint and Identify Errors*
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: ***Wednesday, 25th of June 2025***

0730 – 0830	***Pre-Installation Cable Testing*** *Visual Inspection and Physical Damage Checks • Cable Length and Insulation Resistance Test • Continuity and Phasing Tests • Compliance with Factory Test Reports*
0830 – 0930	***Post-Installation Electrical Testing*** *Megger Insulation Resistance Testing • High Potential (HiPot) Test Procedures • Earth Continuity Testing • Voltage Drop and Load Tests*
0930 – 0945	*Break*
0945 – 1100	***Cable Fault Finding Techniques*** *Types of Cable Faults (Open, Short, Insulation Breakdown) • Time Domain Reflectometry (TDR) • Surge Pulse and Thumper Methods • Loop and Bridge Fault Location Methods*
1100 – 1215	***Commissioning Procedures*** *Test Result Documentation • Energization Checklist • Verifying Cable Phasing and Polarity • Sign-Off and Handover Reports*
1215 – 1230	*Break*
1230 – 1330	***Common Installation Issues*** *Test Result Documentation • Energization Checklist • Verifying Cable Phasing and Polarity • Sign-Off and Handover Reports*
1330 – 1420	***Workshop: Cable Testing & Fault Simulation*** *Perform IR and Continuity Tests • Simulate Common Cable Faults • Practice TDR Testing with Equipment • Generate a Sample Test Report*
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*

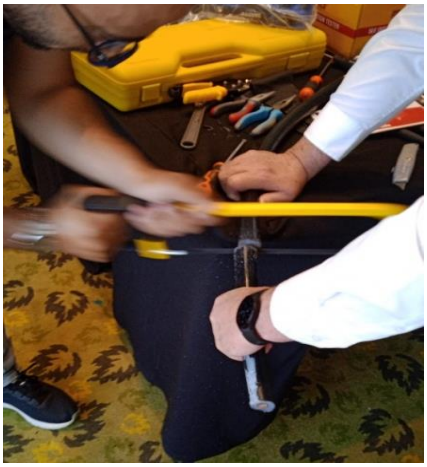
Day 5: Thursday, 26th of June 2025

0730 – 0830	***Specialized Cable Applications*** *Fire Survival and Flame-Retardant Cables • Cables for Hazardous Environments (IECEx/ATEX) • Instrumentation and Signal Cables • Marine and Offshore Cables*
0830 – 0930	***Cable System Maintenance*** *Periodic Inspection Schedules • Retightening Terminations and Gland Checks • Cable Insulation Monitoring over Time • Infrared Scanning for Hotspots*
0930 – 0945	*Break*
0945 – 1040	***Cable Aging, Degradation, & Replacement*** *Thermal Aging and UV Exposure • Water Ingress and Insulation Breakdown • Condition Assessment Tools • End-of-Life Criteria and Replacement Planning*
1040 – 1135	***Documentation & Cable Management*** *Cable Schedules and Tagging • As-Built Drawings and Routing Diagrams • Asset Tracking via Barcodes or RFID • Cable Data Sheets and Vendor Specs*
1135 - 1230	***Electrical Safety in Cable Work*** *Lockout/Tagout Procedures • Arc Flash Awareness and PPE • Working near Live Circuits • Safe Cable Pulling and Termination Practices*
1230 – 1245	*Break*
1245 – 1345	***Capstone Workshop: Full Cable System Planning*** *Design and Size a Full Cable System • Select Routing Method and Protection • Create Installation and Testing Plan • Present System Layout and Documentation Checklist*
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

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout splicing, jointing and termination exercises using heat-shrink kits, suitable for classroom training.






Course Coordinator

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