

## COURSE OVERVIEW FE0862 AWS-CWEng Certified Welding Engineer Part 1 & 2

### Course Title

AWS-CWEng Certified Welding Engineer  
Part 1 & 2

### Course Date/Venue

February 26-March 01, 2024/Nakheel  
Meeting Room, Royal Rose Hotel, Abu  
Dhabi, UAE

### Course/Exam Date/Venue

Exam Date : TBA  
Exam Venue : TBA  
Registration Closing Date: 8 weeks before  
the course date



### Course Duration/Credits

Five days/4.0 CEUs/40 PDHs

### Course Reference

FE0862

### Course Description



***This practical and highly-interactive course includes practical sessions and exercises where participants carryout welding inspection. Theory learnt in the class will be applied using the “AWS Tool Kit” and “Structural Weld Replica Kit” suitable for in-class training: -***



This course covers the qualification requirements for Welding Engineers. It describes how qualifications are determined, and the practice by which qualification may be attained and maintained.



The course will evaluate the qualifications of each individual, and provide examinations to test the individual's knowledge in engineering skills and knowledge as well as their ability to apply the principles of welding engineering.

The course is intended to supplement the minimum requirements of employers, codes, other standards, or documents and shall not be construed as a preemption of the employer's responsibility for the work or for the performance of the work. It shall be the responsibility of employers to determine that their employee, who, having qualified as a Welding Engineer, is capable of performing the specific duties involved in their career assignments.



Moreover, a person with the demonstrated education, experience, and knowledge as defined by this information and who successfully passes the required examinations is considered qualified as an AWS Certified Welding Engineer (CWEEng).

### **Course Objectives**

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

- Get prepared for the AWS welding engineering exam and have enough knowledge and skills to pass such exam in order to get the AWS Welding Engineer Certification
- Discuss the basic science fundamentals covering mathematics, physics and chemistry
- Analyse simple calculations, special and trigonometric functions, algebraic equation, graphs and equations, geometry, hyperbola, parabola, complex numbers, calculus, statistics and simple correlation
- Recognize unit conversion, mass, weight, volume and density, force, energy, work done, power, stress and strain
- Employ Hooke's Law and differentiate moment and momentum
- Measure temperature, heat, thermocouples and pyrometers and classify thermal properties of material
- Describe various chemistry symbols, molecular weight and stoichiometry, acid and bases and balance chemical equations
- Evaluate gas combustion reactions and oxidation-reduction reactions as well as recognize the ideal gas law including mass balance, bulk and chemical analysis methodologies and reactivity, toxicity, environmental effect and disposal
- Recognize applied science fundamentals including strength of materials, heat transfer, fluid mechanics and electricity
- Discuss electricity comprising of current, voltage, resistance, impedance and circuits
- Differentiate Ohm's Law and Kirchoff's Law and analyse resistance loss and current rectification
- Perform proper handling of power generation, AC/DC and polarity
- Identify power factor, electromagnetic properties, right-hand rule, devices and principles of current and voltage measurements

### **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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

**Who Should Attend**

This course provides a wide understanding and deeper appreciation of welding engineering for inspection, piping and welding engineers who are seeking AWS CWEng certification. Other engineers, managers and technical staffs who are dealing with welding and fabrication will also benefit from this course.

**AWS Certification**

Delegates will be certified by AWS based on their exam scoring as per the following:-

- CWI : Completion of Parts A, B and C with a minimum score of 72% in each part.
- CAWI : Completion of Parts A, B and C with a minimum score of 60% in each part.
- CWE : Completion of Parts A and B with a minimum score of 60% in each part.

To qualify as a Certified Welding Engineer, you must have a combination of qualifying education and work experience, with supporting documentation and should match at least one of the combinations in any one of the grids below:-

<b>MINIMUM EDUCATION</b>	<b>MINIMUM WORK EXPERIENCE</b>
Bachelor of Science or Higher Degree in Engineering	Minimum of one (1) years welding-based work experience
Bachelor of Science or Higher Degree in Engineering Technology	Minimum of two (2) years welding-based work experience
Other Related Bachelor of Science Degree	Minimum of five (5) years welding-based work experience
Associate in Applied Science (A.A.S.) degree	Minimum of ten (10) years welding-based work experience
High School Diploma or Approved High School Equivalent Program	Minimum of fifteen (15) years welding-based work experience

**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.

**Training Fee**

**US\$ 6,000** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

**Exam Fees**

**US\$ 1,000** per Delegate + **VAT**.



### Required Codes & Standards

Listed below are the effective editions of the publications required for the current Welding Engineer Certification Examination. **Each student must purchase these documents separately and have them available for use during the class as their cost is not included in the course fees:-**

Reference Title	Author	Publisher
ANSI Z49.1 Safety in Welding, Cutting and Allied Processes		AWS
Applied Fluid Mechanics, 4th Ed.	Mott	Merrill Publishing Company
ASM Handbook Vol. 17, NDE		ASM
ASM Handbook Vol. 6 Welding/ Brazing 10th Ed.		ASM
AWS D1.1 Structural Welding Code—Steel		AWS
Design of Weldments	Omer W. Blodgett	The James F. Lincoln Arc Welding Foundation
Engineer in Training Manual		
Essentials of Engineering Economics, 2nd Ed.	Riggs & West	McGraw Hill
Fracture & Fatigue Control in Structures, Application of Fracture Mechanics	John M. Barson & Stanley T. Rolfe	Prentice Hall Second Edition, 1987
Fundamentals of Engineering: The Most Effective FE/EIT Review	Merle C. Potter	Great Lakes Press
Fundamentals of Welding Technology, Modules 1 - 19		Gooderham Centre for Industrial Learning
Handbook of Arc Welding		James F. Lincoln Arc Welding Foundation
Introduction to the Practice of Statistics ISBN 0 7167 2250 X	Moore & McCabe	Freeman
Introductory Physical Metallurgy of Welding	Easterling	Butterworths
Introductory Welding Metallurgy		AWS
Manufacturing, Engineering & Technology ISBN 0 201 538460	Serope and Kalpakjian	Addison Wesley
Mark's Standard Handbook for Mechanical Engineers	Avallone and Baumeister	McGraw Hill
Mechanical Metallurgy	G. Dieter	McGraw Hill
Metals and How to Weld Them		James F. Lincoln Arc Welding Foundation, Second Edition, 1990
Modern Welding Technology, 4 <sup>th</sup> Ed.	H.Cary	Prentice Hall
NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work		National Fire Protection Association
Occupational Safety and Health Administration (OSHA), Code of Federal Regulations, Title 29 Labor, Part 1910 Subpart Q – Welding, Cutting, and Brazing		U.S. Government Printing Office
Occupational Safety and Health Administration (OSHA), Code of Federal Regulations, Title 29 Labor, Part 1910.1200 – Hazard Communication		U.S. Government Printing Office



Occupational Safety and Health Administration (OSHA), Code of Federal Regulations, Title 29 Labor, Part 1926 Subpart J– Welding and Cutting		U.S. Government Printing Office
Physics of Arc Welding	J. Lancaster	Pergamon
Product Design for Manufacture and Assembly ISBN 0 8247 9176 2	Boothroyd, Dewhurst & Knight	Marcel Dekker
Quality Control, 5th Ed.	Besterfield	Prentice Hall
Robots & Manufacturing Automation	Asfahl	John Wiley
Stainless Steel	R.A. Lula	ASM International, 1986
Statics & Strength of Materials, 3rd Edition, ISBN: 0-13-453201-5	Morrow	Prentice Hall
Statics & Strength of Materials: A Parallel Approach to Understanding Structures	Lawrence J. Wolf	Merrill Publishing Company
Welt IT CD, Computer Influence for Welding Personnel		Gooderham Centre for Industrial Learning
Weldability of Steels, 4th Edition, ISBN: 1-58145-430-9	R.D Stout	Welding Research Council
Welding Aluminum: Theory & Practice		The Aluminum Association, Second Edition, June 1991
Welding Design, Modules 30-39		Gooderham Centre for Industrial Learning
Welding Encyclopedia	Jefferson	AWS
Welding Handbook Vols. 1,2,3,4,8 <sup>th</sup> Ed.		AWS
Welding Metallurgy	Sindo Kou	John Wiley & Sons
Welding Metallurgy	Linnert	AWS
Welding Metallurgy	J.Lancaster	Pergamon
Welding Metallurgy, Modules 8,9,12,20-23		Gooderham Centre for Industrial Learning

AWS publications may be ordered directly through **Haward Publications** at +971-2-596-9400. Orders may also be faxed to +971-2-596-9401, or e-mail [info@haward.cc](mailto:info@haward.cc). More information is available at [www.haward.cc](http://www.haward.cc). When calling to order, please identify yourself as an exam candidate and/or AWS member.

### **Accommodation**

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

### **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.


### Course Accreditations

Haward Technology is accredited by the following international accreditation organizations:-

- 
American Welding Society (AWS)

Haward Technology is the **International Agent** of the **American Welding Society (AWS)** and the Authorized Provider of AWS international certification examinations outside the USA. Haward Technology exhibits compliance and adherence to **AWS Quality Control Standards** in the development, conduct and delivery of certification courses and exams for welding and inspection professionals on behalf of the American Welding Society.


The American Welding Society's certification programs are internationally recognized and are used as a benchmark of quality workmanship and skills within the welding industry around the world.

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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 **4.0 CEUs** (Continuing Education Units) or **40 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.

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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**. 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.

### 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. Peter McAlpine**, MSc, CSWIP, Eur Ing, CEng, is a **Senior Welding & Inspection Engineer** with over **35 years** of extensive **onshore** and **offshore** experience within the **Oil & Gas, Refinery, Petrochemical, Refining** and **Energy** industries. His wide expertise covers **Welding Technology, Fabrication & Inspection, Welding Engineering, Welding Inspection & Metallurgy, Welding Techniques & Failure, Welding Safety, Welding Process** (GTAW, SMAW, FCAW, GMAW, SAW & PA), **Weld Fails & Default Analysis, Arc Welding Equipment, Butt Fusion & Electrofusion Welding of Pipe, Welding & Quality, Process Piping & Pressure Vessel Fabrication, Weld-Overlay in CRA Pipeline & Valves, Welding in Steam Systems, Welding Procedure Qualification Record (WPQR), Preliminary (pWPS) & Welding Procedure Specification (WPS), Welding Performance Qualification (WPQ), Corrosion Resistant Alloy (CRA) Pipeline, Raw Gas Injection (RGI) Fabrication, Installation & Commissioning, Repair Weld Procedures, Mechanical Testing & Problem Solving, Piping Inspection, Corrosion & Materials Inspection, Risk Based Inspection, Aboveground Storage Tank Inspection, Pressure Vessel Inspection, Turnaround Inspection, Platform Structures & Pressure System Equipment Inspection, Static Equipment Inspection, Pressure Relief Valves Inspection & Testing, Risk Based Assessment, Pipeline Defect Assessment, Non-Destructive Testing (MT, PT, UT, RT), NDT & Corrosion Monitoring, Radiography & Vibration, Piping & Storage Tanks, Heat Exchangers, Process Side Vessels & Piping, Integrity Management System, Corrosion Management, Steel Structure Welding, Steel Jackets Inspection** and knowledgeable with the international industry standards such as AWS, ASME, API, TEMA, BS/EN, ANSI, DNV & EEMUA.

During his career life, Mr. McAlpine has gained his practical and field experience through his various significant positions and dedication as the **QA/QC Manager, Site QA Manager, Senior Welding Engineer, Material Engineer/Welding Specialist, Lead QC Welding Engineer, Lead Welding Engineer, Welding Engineer, Welding/Operations Engineer, SME Project Welding Engineer, Project Welding Engineer, Site Welding Engineer, Site Quality Surveillance Engineer, Multi-coded Welder** and **Senior Instructor/Trainer** from the MWSpecialists Ltd., UK, Aker Solutions, UK, WSP, Quality & Inspection Services Ltd., UK, Saipem Intermare Sarda Yard, Arbatrax, Sardinia, Italy, KSM Zeman Ltd., UK, New Build "Energy from Waste", UK, ISKER Consortium, Republic of Kazakhstan (RoK) - Offshore Caspian Sea Ad-Hoc, Hinkley Power Station (HPC), Somerset, UK, Denholm Zholdas, Wood Group PSN KazStroy, North Caspian Operating Company N.V. (NCOC), AGIP KCO, Cimolai Yard, Italy, **BP, Chevron, ConocoPhillips, Eni, Equinor, ExxonMobil, Petrobras, Petronas, Saudi Aramco, Shell, Total** and **Energies & Woodside Energy**.

Mr. McAlpine has a **Higher National Diploma (HND) in Manufacturing Engineering** and a **Diploma in Welding Technology** from **The Welding Institute (TWI)**. Further, he is a **Certified Welding Inspector** from the Certification Scheme for Welding Inspection Personnel (**CSWIP**), a **Certified International Welding Technologist** from the International Institute of Welding (**IIW**), a **Certified European Welding Technologist** from the European Federation for Welding, Joining & Cutting (**EFW**) and a **Certified European Engineer (Eur Ing)** from the European Federation of National Engineering Associations (**FEANI**). Moreover, he holds a **Certificate in Welding Engineering (CWE)**, a **Chartered Engineer** of the **Engineering Council, UK** and a **Member of The Welding Institute, UK** and has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.

### Course Program

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

#### **Day 1: Monday, 26<sup>th</sup> of February 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 1000	<b>Part 1 – Basic Sciences Fundamentals: Mathematics</b> Simple Calculations (Multiple Choice) • Special Functions (Exp, Log) • Trigonometric Functions (Sin, Cos, Tan, Cot, Sec, Csc, Degrees, Radians) • Algebraic Equations (Linear, Quadratic, Polynomial)
1000 – 1015	Break
1015 – 1200	<b>Part 1 – Basic Sciences Fundamentals: Mathematics (cont'd)</b> Graphs & Equations (Slope, Intercept, Roots, Derivatives, Minimum, Maximum, Interpolation & Extrapolation) • Geometry (Common Geometric Shapes)
1200 – 1300	Lunch
1300 – 1500	<b>Part 1 – Basic Sciences Fundamentals: Mathematics (cont'd)</b> Hyperbola & Parabola • Complex Numbers • Calculus (Fundamentals of Differential Equations)
1500 – 1515	Break
1515 – 1630	<b>Part 1 – Basic Sciences Fundamentals: Mathematics (cont'd)</b> Statistics (Population & Samples: Normal Distribution, Mean, Standard Deviation, Variance) • Simple Correlation: Linear Regression Via Least Squares Method, $r^2$ Correlation)
1630 – 1730	<b>Distribute Homework &amp; Recap</b>
1730	End of Day One

#### **Day 2: Tuesday, 27<sup>th</sup> of February 2024**

0730 – 0830	Homework Review
0830 – 1000	<b>Part 1 – Basic Sciences Fundamentals: Physics</b> Unit Conversion (Dimension, Mass, Temperature, Time, Energy, Power) • Mass, Weight, Volume, Density; Force, Energy, Work Done & Power • Stress, Strain & Hooke's Law (Elasticity)
1000 – 1015	Break
1015 – 1200	<b>Part 1 – Basic Sciences Fundamentals: Physics (cont'd)</b> Moment & Momentum • Temperature, Heat, Temperature Measurement, Thermocouples & Pyrometers • Thermal Properties of Materials (Thermal Conductivity, Thermal Expansion, Thermal Stress & Strain)
1200 – 1300	Lunch
1300 – 1500	<b>Part 1 – Basic Sciences Fundamentals: Chemistry</b> Symbols (Elements & Inorganic Compounds – Gases, Fluxes, Etc.) • Molecular Weight & Stoichiometry • Acids & Bases • Balance Chemical Equations • Gas Combustion Reactions (Chemical Heat Generation) & Oxidation-Reduction Reactions



1500 - 1515	Break
1515 - 1630	<b>Part 1 – Basic Sciences Fundamentals: Chemistry (cont'd)</b> Ideal Gas Law (Pressure, Volume, Temperature) • Mass Balance (As in E7018 Coating Decomposition to Gas, Slag & Metal) • Bulk & Chemical Analysis Methodologies) • Reactivity, Toxicity, Environmental Effect & Disposal
1630 - 1730	<b>Distribute Homework &amp; Recap</b>
1730	End of Day Two

**Day 3: Wednesday, 28<sup>th</sup> of February 2024**

0730 - 0830	Homework Review
0830 - 1000	<b>Part 2 – Applied Sciences Fundamentals: Strength of Materials</b> Load, Deformation (Elastic & Plastic, Buckling), Stress-Strain, Young's Modulus, Shear Modulus, Stress-Strain Curve (Yield Stress, Ultimate Tensile Stress, Elongation), Tensile Stress & Shear Stress Computation
1000 - 1015	Break
1015 - 1200	<b>Part 2 – Applied Sciences Fundamentals: Strength of Materials (cont'd)</b> Welded Member Cross-Section Effect • Mechanical Testing (Tensile, Bend, Fracture Toughness, Hardness, Creep & Fatigue) & Data Interpretation
1200 - 1300	Lunch
1300 - 1500	<b>Part 2 – Applied Sciences Fundamentals: Strength of Materials (cont'd)</b> Law of Conservation of Energy/Momentum • Stress Analysis
1500 - 1515	Break
1515 - 1630	<b>Part 2 – Applied Sciences Fundamentals: Strength of Materials (cont'd)</b> Typical Engineering Material Properties
1630 - 1730	<b>Distribute Homework &amp; Recap</b>
1730	End of Day Three

**Day 4: Thursday, 29<sup>th</sup> of February 2024**

0730 - 0830	Homework Review
0830 - 1000	<b>Part 2 – Applied Sciences Fundamentals: Heat Transfer &amp; Fluid Mechanics</b> Heat Conduction, Convection & Radiation, Thermal Conductivity & Diffusivity, Heat Transfer Coefficients of Engineering Materials, Fourier's Law
1000 - 1015	Break
1015 - 1200	<b>Part 2 – Applied Sciences Fundamentals: Heat Transfer &amp; Fluid Mechanics (cont'd)</b> Heating Rate & Cooling Rate • Industrial Heating Methods, Power Consumption, Gas Flow Rates
1200 - 1300	Lunch
1300 - 1500	<b>Part 2 – Applied Sciences Fundamentals: Heat Transfer &amp; Fluid Mechanics (cont'd)</b> Laminar & Turbulent Flow (Reynold's Number), Dew Point & Relative Humidity, Pressure & Regulators • Venturi Effect & Gas Velocity Calculation

1500 - 1515	Break
1515 - 1630	<b>Part 2 - Applied Sciences Fundamentals: Heat Transfer &amp; Fluid Mechanics (cont'd)</b> Atmospheric Pressure & Hyperbaric Conditions • Vacuum Equipment & Measurements
1630 - 1730	<b>Distribute Homework &amp; Recap</b>
1730	End of Day Four

**Day 5: Friday, 01<sup>st</sup> of March 2024**

0730 - 0830	Homework Review
0830 - 1000	<b>Part 2 - Applied Sciences Fundamentals: Electricity</b> Current, Voltage, Resistance, Impedance & Circuits • Ohm's Law • Kirchoff's Law
1000 - 1015	Break
1015 - 1200	<b>Part 2 - Applied Sciences Fundamentals: Electricity (cont'd)</b> Resistance Loss & Current Rectification • Power Generation • AC/DC & Polarity
1200 - 1300	Lunch
1300 - 1500	<b>Part 2 - Applied Sciences Fundamentals: Electricity (cont'd)</b> Power Factor • Electromagnetic Properties
1500 - 1515	Break
1515 - 1645	<b>Part 2 - Applied Sciences Fundamentals: Electricity (cont'd)</b> Right-Hand Rule • Current & Voltage Measurements (Devices & Principles)
1645 - 1700	<b>Course Conclusion</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1700 - 1715	<b>POST-TEST</b>
1715 - 1730	Presentation of Course Certificates
1730	End of Course

**MOCK Exam**

Upon the completion of the course, participants have to sit for a MOCK Examination similar to the exam of the Certification Body through Haward's Portal. Each Participant will be given a username and password to log in Haward's Portal for the Mock exam during the 7 days following the course completion. Each participant has only one trial for the MOCK exam within this 7-day examination window. Hence, you have to prepare yourself very well before starting your MOCK exam as this exam is a simulation to the one of the Certification Body.

### **Simulator (Hands-on 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 various exercises using the state-of-the-art “E-Welding & Fabrication” and “American Welding Society (AWS) Tool Kit and Structural Weld Replica Kit”.

## Welding & Fabrication

### Advanced E-Learning Programme

Aligned to National Occupational Standards



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6: MIG Welding, 3: The Welding Process Page 8 of 10

Menu
Back
Next
Replay
Audio
Transcript
Glossary
Zoom
Help
Quit

**Re-Instate the Work Area**

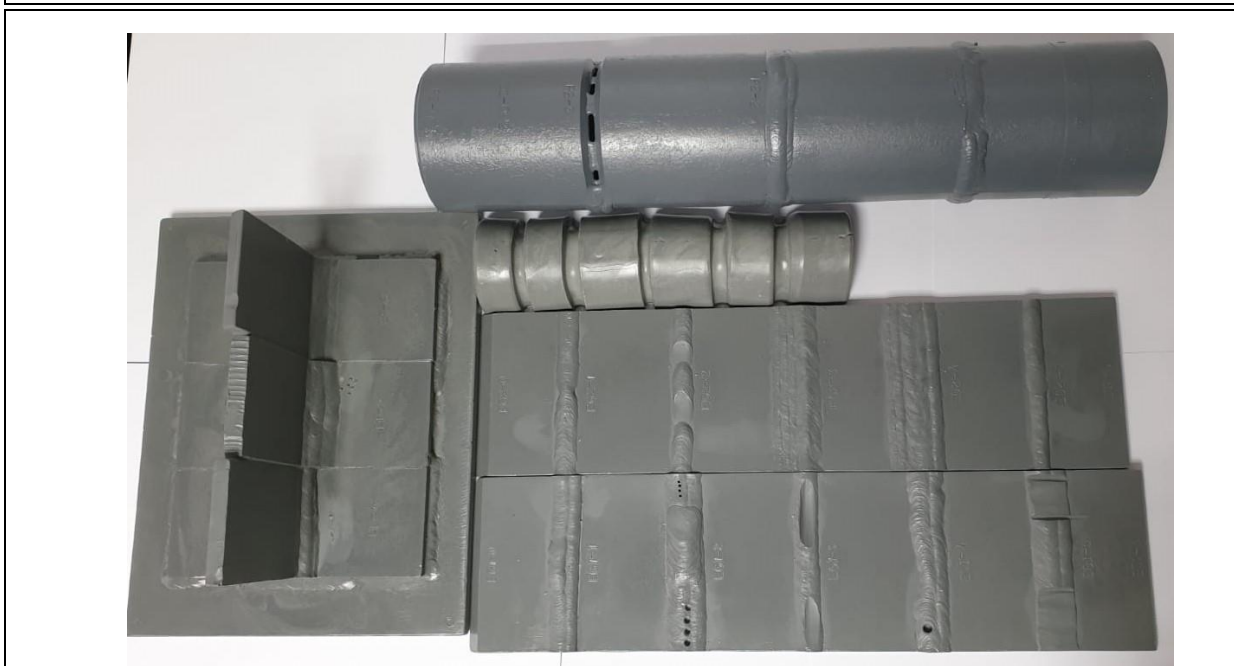
- Equipment is closed down and turned off



**E-Welding & Fabrication**



**AWS Tool Kit**



**Structural Weld Replica Kit**

**Course Coordinator**

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