

AMERICAN WELDING SOCIETY CERTIFIED WELDING ENGINEER

AWS - CWEng
Part # 3 & 4



AN ISO 9001 : 2015

BETZ ENGINEERING & TECHNOLOGY ZONE

Educational & Research Division



TC - 12622

Certification Program for the Year - 2024

**BETZ is the only Accredited Test Facility in India
for American Welding Society, USA.**

**BETZ is also an International Agency for AWS to conduct
Seminars and Certification Exams.**

www.welding-certification.com

About Us

BETZ Engineering & Technology Zone is an accredited International Agency for American Welding Society, Florida, U.S.A., to conduct Seminars and Certification Programs for AWS in India and Worldwide. BETZ is an ISO 9001:2015 company, also BETZ is the Only 'ATF – Accredited Test Facility' of AWS to evaluate and certify welders in India.

Individuals with AWS Certified Welding Engineer certification have demonstrated their skills for preparing or reviewing written instructions for the production of welded joints. They are thoroughly familiar with various codes, specifications, standards and other aspects of fabrication and assembly. The CWEng often prepares and produces reports, which accurately reflect professional judgment and is able to work with management representatives, inspection personnel, welders and support crafts, understanding the integrated role of each in the development of weldments

BETZ has been assessed and accredited by NABL in accordance with the standard ISO/IEC/17025 in the field of Testing, Non-Destructive Testing & Mechanical Testing Certificate

AWS-CWEng Part# 3 & 4 SCHEDULE-2024

Month	SITE CODE	AWS-CWEng Part # 3 & 4 (Evening & Holidays Class)	Online Exam (Based on Availability from Prometric Centre)
February	IN63724	20 to 28	February 29, 2024
March	IN66024	22 to 30	March 31, 2024
April	IN69024	21 to 29	April 30, 2024
May	IN71324	22 to 30	May 31, 2024
June	IN73324	21 to 29	June 30, 2024
July	IN75624	22 to 30	July 31, 2024
August	IN77724	22 to 30	August 31, 2024
September	IN79824	21 to 29	September 30, 2024
October	IN82124	22 to 30	October 31, 2024
November	IN84624	21 to 29	November 30, 2024
December	IN87224	21 to 29	December 30, 2024

Application must be emailed to BETZ no later than (5) weeks before the test date

Eligibility

- Having Bachelor of Engineering (B.E) degree and a minimum of one (1) year relevant experience.
- Having Bachelor of Technology (B.Tech.) degree and a minimum of two (2) years relevant experience.
- Having other related Bachelor of Science (B.Sc.) degrees and a minimum of five (5) years of relevant experience.
- Having an Associate in Applied Science (A.A.Sc.) degree and a minimum of ten (10) years of relevant experience.
- who have successfully completed high school or an equivalent program and a minimum of fifteen (15) years relevant experience.

Exam pattern

The AWS Certified Welding Engineer (CWEng.) examination consists of four parts. Parts 1 and 2 must be successfully completed in order to take Parts 3 and 4. The first two parts (1 and 2) of the exam are closed book Online Exam and covers fundamentals of basic science and applied science. Exam will be of two hours for each part with multiple-choice questions Each examination is Two hours in length, Part 1 consists of 35 questions of multiple choices Question and Part 2 has 25 questions of multiple choice Questions. Successful candidates must correctly answer 60% of the questions to pass the examination.

Examinations for Parts 3 and 4 are open book examinations on welding related disciplines and practical welding and related applications. Each examination is 2 hours in length (Duration). Part 3 has 60 questions of multiple-choice questions Part 4 has 40 questions of multiple choice type. Candidates that successfully pass Parts 1 and 2 will be invited to sit for Part 3 and Part 4 examinations and a separate application must be submitted to AWS.

Candidates must pass each of the four examinations with an individual score of not less than 60% and attain a minimum weighted percentage of 70% for all 4 parts.

Seminar Pattern - Part #3 & 4

These Seven days course focuses on the knowledge in welding related disciplines and practical welding related applications.

Part 3 – Welding Related Disciplines (Essay Exam)

3 days seminar will be conducted to cover the NDE/Weld Discontinuities, Welding Heat Sources and Arc Physics, Welding Processes and Controls, Welding and Joining Metallurgy, Weld Design, Brazing and Soldering.

Part 4 – Practical Welding and Related Applications

3 days seminar will be conducted to cover the Welding safety, weldment design, welding metallurgy, materials, welding process selection, NDE including visual weld inspection, quality assurance, quality control in accordance with codes, specifications, other standards, and/or drawings.

- 1 day will be totally dedicated to discussion & review of parts – 3 and 4.

Part #3 – Welding Related Disciplines (Essay Exam)

NDE/Weld Discontinuities: ▪ NDE processes (radiographic, ultrasonic, magnetic particle, liquid penetrant, Eddy Current, etc.—characteristics, advantages and limitations) ▪ NDE symbols

Welding Heat Sources and Arc Physics: ▪ Power Source Static and Dynamic Characteristics (open circuit voltage and short circuiting current, slope) ▪ Differences Between CC And CV Designs (principle of self- adjusting) ▪ Welding Arc Characteristics (current and voltage relationship, arc length effect) ▪ Electron Emission (ionization potential, work function, electrode material, shielding gas and arc stability) ▪ Arc Temperature and Degree of Ionization (shielding gas influence) ▪ Magnetic Arc Blow (work lead location and condition) ▪ Lorentz Force (effect on droplet detachment and on adjacent power cables) ▪ Shielding Gas Drag Force (effect on droplet detachment and metal transfer mode) weld penetration and width for different shielding gases.

Welding Processes and Controls: ▪ Arc Welding Processes (SMAW, GMAW, FCAW, GTAW, SAW, PAW) ▪ Resistance Welding Processes (RW, high frequency RW), high energy density welding processes (LBW, EBW) ▪ Cutting Processes (OFC, CAC, and PAC) ▪ Surfacing Processing (SW, THSP) ▪ Solid-State Welding Processes (FRW, FW)

Welding and Joining Metallurgy: ▪ Crystal Structure of Metals (FCC, BCC, HCP, unit cells, lattice parameter, c/a ratio, atom positions, interstitial positions) ▪ Melting and Solidification, Phase Transformations and Phase Diagrams (eutectic, eutectoid, peritectic and monotectic, lever rule calculation) metallurgy and weldability of typical engineering materials (low carbon structural steels, cast irons, stainless steels, nickel alloys, aluminum alloys, titanium alloys, etc.) microstructure (e.g., ferrous alloys—grain boundary ferrite, acicular ferrite, bainite, martensite, austenite, delta ferrite, etc.) and mechanical properties ▪ Carbon Equivalent (CEIIW, Pcm, expressions, alloying content and carbon content effect) ▪ Hydrogen Assisted Cracking (heat-affected zone cracking, cold cracking) base metal matching (e.g., electrodes with high strength steels) ▪ Solidification cracking (segregation of impurity atoms, shrinkage cracking, lamellar tearing) ▪ Delta Ferrite in Stainless Consumables, Specifications for Consumables (categories; all position, rutile, basic) ▪ Flux metal Reactions (oxygen and sulfur control in weld pool) ▪ Typical Temperature Range of a Heat Source ▪ Temperature Distribution in a Weldment ▪ HAZ Formation ▪ Multi pass Thermal Experience, Reheated Weld Metal Properties ▪ Weld Macro and Micro-Graph Interpretation ▪ Solidification Profile and Preferred Grain Orientation (epitaxial growth) ▪ Origin of Weld Ripples ▪ Special Attributes of Base Metal (as-cast structure, deformation texture and oxide on flame cut surfaces) ▪ Thermal Treatments (preheat, post heat, inter pass influence on weld cooling rate and residual stress distribution) ▪ Solid-State Transformations in Welds (different forms of ferrite, bainite, and martensite, sigma phase in stainless steels, Guinier-Preston type precipitates zones and ageing in aluminum alloys) ▪ Corrosion (sensitization in stainless steel welds and stress corrosion cracking in welds)

Weld Design: ▪ Structural fabrication requirements, sectional properties and stress gradient ▪ Stress triaxiality, weld symbols, hardness and microhardness (e.g., across a weld cross section) ▪ Tensile properties, ductility, toughness, fillet break test (influence of second phase and porosity), ductile fracture, brittle fracture, fatigue (initiation, propagation, failure, high-cycle, low-cycle), temperature and strain rate effect.

Brazing and Soldering: ▪ Characteristics of Brazing and Soldering ▪ Fluxes and Substrates ▪ Capillary Action ▪ Wetting and Spreading ▪ Contact Angle ▪ Joint Clearance ▪ Viscosity ▪ Liquidus and Solidus ▪ Flow of Molten Filler in Horizontal and Vertical Joints (Maximum Penetration and Rate) ▪ Filler Metal Systems (Sn-Pb solders, Ni and Cu based alloys, Ag-Cu based brazing alloys) ▪ Intermetallic Compound Formation

Safety: ▪ Recognize health hazards relating to welding (fumes, toxic gases, noise and radiation) ▪ Recognize safety hazards (electric shock, compressed gases, fire, welding in a confined space, welding on Containers, piping and moving equipment) ▪ Recognize precautions to avoid injury ▪ Possess a working knowledge of safety and fire codes

Part #4 – Practical Welding and Related Applications

Exam using references on the application of welding engineering concepts in the areas of:

Welding safety, Weldment design, Welding Metallurgy, Materials, Welding Process Selection, NDE including Visual Weld Inspection, Quality Assurance, Quality Control in Accordance With Codes, Specifications, other Standards, and /or Drawings.

Exam Pattern

Examination	Number of Questions	Duration	Min % to Pass	Exam Pattern Multiple Choice
Online Prometric Exam				
Part 3-Welding Related Disciplines (Essay Exam)	45	3 Hrs	60 %	Closed Book
Part 4- Practical Welding and Related Applications	39	3 Hrs	60 %	Closed Book

Minimum Weighted Percentage for all Four Parts

Registration Process

All the registrations are to be completed preferably Five (5) weeks prior to the commencement of seminar with full payment to avoid disappointment. For more information call us on 9840175179 / 9551665683.

E-mail: registration@welding-certification.com / rg_ganesan@yahoo.com Upon completion of registration process, candidates can collect their Hard copy of study materials and AWS QC1:2016 Specification for AWS Certification of Welding Inspectors. This will help candidates to start their preparations immediate

Mode of Payment

Seminar Fee : Rs.45,000/- wire transfer to the following account.

Name : BETZ Educational & Research Division
 Bank : KARUR VYSYA BANK LTD Branch : ALANDUR
 Account Number : 1104115000021458 IFSC : KVBL0001104

Exam Fee : USD1285 wire transfer to the following account

Company Name : Betz Engineering Inc.
 Bank Name : JP Morgan Chase Account No : 833239152
 Routing Number : 322271627 Swift Code : CHASUS33
 Bank Address : JP Morgan Chase, 334 S Diamond Bar Blvd
 Diamond Bar, CA 91765, USA

USD120 for Prometric Sitting also transfer to the above account.



Appropriate Course Materials will be provided well-in advance during registration, to help you prepare for the exam. Seminar kit will be provided during the first day of seminar.

Lunch and Refreshments will be provided during the seminar and exam



After completion of the seminar and 40 hours Training, Course completion certificate will be provided.

A/C Accommodation will be provided during the seminar on first come first serve basis (4 Rooms / 10 Bed only)



Traning Venue :

BETZ ENGINEERING & TECHNOLOGY ZONE

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