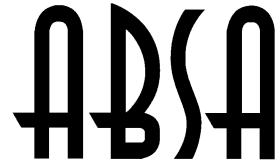




**Safety
Codes
Council**



the pressure equipment safety authority

REFERENCE SYLLABUS

for

**WELDING EXAMINER
& WELDING EXAMINER IN TRAINING**

CERTIFICATES OF COMPETENCY EXAMINATIONS

AB-94

Edition 2, Revision 1, 2021-01-07



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**REFERENCE SYLLABUS
for
WELDING EXAMINER AND
WELDING EXAMINER IN TRAINING
CERTIFICATE OF COMPETENCY
EXAMINATION**

GENERAL INFORMATION

INTRODUCTION:

This Syllabus is intended to assist candidates in preparing for the Welding Examiner and Welding Examiner in Training Certificate of Competency examination(s) in accordance with the Pressure Welders Regulation (A/R 169/2014).

ELIGIBILITY:

To qualify to take the Welding Examiner and Welding Examiner in Training Certificate of Competency examination, a candidate must satisfy at least one of the following eligibility requirements.

CERTIFICATIONS/DESIGNATIONS:

Eligibility: Certifications/Designations	1 Welding Processes and Filler Metals	2 Metallurgy and Materials	3 Quality Control and Weld Evaluation	4 Regulations and Codes
EIT or P.Eng. B.Sc. in Materials or Metallurgical Engineering	x	exempt	x	x
EIT or P.Eng. B.Sc. in Mechanical Engineering	x	x	x	x
EIT or P.Eng. degree in Welding Engineering	exempt	exempt	x	x
First Class Power Engineer's Certificate of Competency	x	x	x	x
Diploma in Materials Engineering Technology	x	exempt	x	x
Diploma in Mechanical Engineering Technology	x	x	x	x
Diploma in Welding Engineering Technology	exempt	exempt	x	x
Grade "B" Pressure Welder	exempt	x	x	x
CSA W178.2 Welding Inspector Level 2 or Level 3; or AWS QC1 CWI or SCWI	exempt	exempt	x	x
Safety Codes Officer – Boiler Discipline	x	x	x	x
Other Equivalent Qualifications (See Note1)	TBD	TBD	x	x

x – must write the exam

TBD – to be determined, see Note 1

Note 1: Other qualifications may be considered under provisions that allow the Administrator to accept equivalencies. The candidate must have relevant experience, which would include involvement in the pressure equipment industry related to fabrication, inspection, repair, welding, design, quality control or operation. The candidate would also have suitable academic qualifications in recognized courses in welding, materials, ASME Codes and NDE.



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EXAMINATION INSTRUCTIONS

Overview:

To obtain a Welding Examiner Certificate of Competency the candidate must pass examinations which consist of four (4) papers, these papers are described in the following pages of this syllabus. The examinations are closed book except for the unmarked publications as provided for in Rule No. 2 and are composed of multiple choice and short answer questions.

To obtain a Welding Examiner in Training Certificate of Competency the candidate must pass an examination on paper three (3) only, this paper is described in the following pages of this syllabus. The examination is closed book except for the unmarked publications as provided for in Rule No. 2 and is composed of multiple choice and short answer questions.

Application to Undertake Examination:

The candidate shall make application on the form established by the Administrator. The application and the prescribed fee must be submitted to the Administrator at least **21 days** prior to the examination date.

Rules:

1. The candidate must show picture I.D. at the examination.
2. Candidates will be allowed to bring the following items for the examination:
 - a. ASME Codes
 - b. Safety Codes Act and Regulations
 - c. CSA B51 Boiler, Pressure Vessel and Pressure Piping Code
 - d. National Board Inspection Code
 - e. Non-programmable Calculator
 - f. Drawing Instruments

Note:

1. All reference items are the responsibility of the candidate and must be shown to the ABSA Examiner for review.
2. Codes and standards referenced in this syllabus will be the edition in-force at the time of the examination.
3. The time allowed for completing each paper is three and a half (3.5) hours
4. To pass the examination, a candidate must obtain at least 70% of the allotted marks for each paper.

Cancellation:

If a candidate does not attend, or fails to cancel at least five (5) business days prior to, the examination, the examination fee will be forfeited. However, in situations such as medical emergencies or deaths in immediate family and provided the candidate provides evidence acceptable to the Administrator, the fee will be credited to a future examination date.



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Failure:

If a candidate fails any paper of the examination, the candidate may be disqualified by the Administrator from writing any other examination paper for a period up to 3 months. If a candidate fails any paper twice in any period of time, the candidate may be required to provide relevant educational upgrading acceptable to the Administrator before being permitted to write that particular examination paper.



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CERTIFICATE ISSUANCE

Welding Examiner in Training

After a Welding Examiner in Training candidate has successfully completed paper three, satisfactory eye examination results (20/30 correctable vision) must be submitted to the Administrator before a Welding Examiner in Training certificate of competency will be issued. The candidate's eye examination results shall be determined by an ophthalmologist, optometrist, or other recognized professional and the eye examination conducted within a period of one (1) year of submission to the Administrator.

Welding Examiner

After a Welding Examiner candidate has successfully completed the four (4) examination papers, satisfactory eye examination results (20/30 correctable vision) must be submitted to the Administrator before a Welding Examiner certificate of competency will be issued. The candidate's eye examination results shall be determined by an ophthalmologist, optometrist, or other recognized professional and the eye examination conducted within a period of one (1) year of submission to the Administrator.

The Welding Examiner in Training certificate has a three year expiry date and is a non-renewable certificate.



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Welding Processes and Filler Metals
First Paper
3.5 Hours

1. Welding Processes (Weighting 65%)

Principles of operation, applicable equipment, relevant process variables (such as gases, power sources, techniques, joint designs, welding symbols, etc.), and common weld discontinuities (causes and corrective actions) of the following arc welding processes:

- a. Shielded metal arc welding (SMAW)
- b. Gas metal arc welding (GMAW manual and mechanized)
- c. Flux cored arc welding (FCAW)
- d. Gas tungsten arc welding (GTAW manual and mechanized-orbital)
- e. Submerged arc welding (SAW)

2. Filler Metals (Weighting 35%)

The nomenclature, classification, manufacture, properties, applications, composition, grouping and designations of electrodes, welding wires and fluxes. The welding processes would be those listed in the above paragraph. The filler metals would be as referenced in ASME Section II-Part C and include the following:

- a. Carbon steel electrodes
- b. Low alloy steel electrodes, rods and fluxes
- c. Stainless steel covered and bare electrodes
- d. Nickel and nickel alloy covered and bare electrodes
- e. Tungsten electrodes

3. Reference Material

- a. AWS Handbook Volume 2 (8th Edition) or (9th Edition – Part 1)
- b. ASME Section II-Part C



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**Metallurgy and Materials
Second Paper
3.5 Hours**

1. Properties and Structure of Metals (Weighting 20%)

- a. Mechanical properties: yield strength, tensile strength, ductility, hardness and toughness, as described in an ASTM standard and used in a material test report (MTR)
- b. Structure of metals: grain size, as described in referenced ASTM/ASME A/SA standards and used in a material test report (MTR)
- c. Steel toughness and impact testing: as described in referenced ASTM/ASME A/SA standards

2. Non-Destructive Examination (Weighting 35%)

The applications, examination processes, requirements, uses, benefits, limitations, personnel qualifications, physical weld defects, and acceptance criteria of the following NDE methods as detailed in ASME Section V:

- a. Visual examination
- b. Radiographic examination
- c. Ultrasonic examination

3. Basic Welding Metallurgy (Weighting 35%)

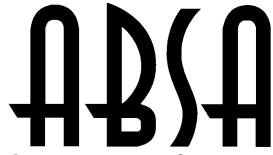
- a. Weld Metal
 - i. Solidification (principles, modes, and conditions affecting modes)
 - ii. Zones (Weld metal, unmixed, partially melted, HAZ, and unaffected base metal)
 - iii. Microstructure and grain size changes
- b. Temperature
 - ii. Peak, pre-weld, cooling end points, and time at temperature
 - iii. Cooling rate
 - iv. Post weld heat treatment effects
- c. Weldability of Steels
 - i. Factors affecting weldability

4. Material Specifications (Weighting 10%)

- a. ASME and ASTM standards
- b. Chemical and physical properties for commonly used construction materials
- c. Carbon steel, low alloy steels, and stainless steels
- d. ASME and ASTM Specifications: SA/A106, SA/A333, SA/A312, SA/A387, and SA/A516

5. Reference Material

- a. Welding Metallurgy (Linnert Volume I)
- b. ASME Section II-Part A
- ASME Specifications: SA-106, SA-333, SA-312, SA-387, and SA-516
- c. ASME Section V



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Quality Control and Weld Evaluation
Third Paper
3.5 Hours

1. Pressure Welders Regulation (Weighting 15%)

Requirements, responsibilities, qualifications, performance qualification cards and certification with respect to the Pressure Welders and Welding Examiners.

2. Quality Control (Weighting 30%)

- a. Concepts, goals, purpose, scope
- b. Roles and responsibilities/duties of personnel
- c. Elements of a Quality Control manual (Performance Qualification Testing of Pressure Welders)
- d. Relationship to Codes and Regulations
- e. Accredited Organizations
- f. Testing standards and procedures

3. Weld Examination (Weighting 35%)*

Candidates will examine and assess physical coupons for weld defects and acceptability standards referenced in ASME Section IX and B 31.3. These samples may include: guided bend test specimens and weld specimens.

Candidates will be examined to ensure that RT or UT reports have been reviewed and interpreted as to contain all the required information for welder qualification when RT or UT is performed in lieu of mechanical testing.

4. AB-76A and AB-76B Forms, and PQ Cards (Weighting 20%)

Completing WPQ AB-76A and AB-76B Forms, and PQ Cards

5. Reference Material

- a. ABSA Sample Quality Control Manual for the Performance Qualification Testing of Pressure Welders
- b. ASME Section IX
- c. ASME Section V
- d. ASME B31.3 Chapter VI



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Regulations and Codes
Fourth Paper
3.5 Hours

1. Pressure Equipment Safety Regulation, Safety Codes Act and CSA B51 (Weighting 10%)*

- a. Scope, purpose, responsibilities, requirements
- b. Registration of welding procedures
- c. Relationship to ASME Codes

2. ASME Section IX-Part QW Welding (Weighting 65%)*

- a. Section IX
 - i. Organization, testing, acceptance criteria, variables, forms, welding data
 - ii. Introduction, Articles I, II, III, IV and Appendices
- b. Preparation and evaluation of welding procedures
 - i. Welding procedure specification (WPS)
 - ii. Procedure qualification record (PQR)
 - iii. Welding processes to include: SMAW, GMAW, FCAW, GTAW and SAW
- c. Performance qualification testing
 - i. Welder performance variables
 - ii. Welding processes to include: SMAW, GMAW, FCAW, GTAW and SAW
 - iii. Performance qualification tests, examinations and performance limitations

3. ASME Sections I and VIII-1, B31.1, B31.3, and National Board Inspection Code (Weighting 25%)

Referenced sections in these construction codes pertaining to welding requirements:

- a. ASME Section I – Part PW
- b. ASME Section VIII Division I-Parts UG, UW, UCS, UHA, UHT
- c. ASME B31.1-Chapter V
- d. ASME B31.3-Chapter V
- e. National Board Inspection Code – Part 3 (section 2 only)