

WELDING INSPECTION TECHNOLOGY WORKBOOK

FIFTH EDITION

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WELDING INSPECTION TECHNOLOGY WORKBOOK

CHAPTER 1

WELDING INSPECTION AND CERTIFICATION

Welding Inspection Technology
Chapter 1—Welding Inspection and Certification

- Q1-1** Why is there an increasing need for weld quality?
- a. safety
 - b. economics
 - c. less conservative design
 - d. government regulations
 - e. all of the above
- Q1-2** What AWS document describes the rules for the CWI certification program?
- a. AWS 5.5
 - b. AWS D1.1
 - c. AWS QC1
 - d. AWS 5.1
 - e. AWS 14.1
- Q1-3** Weld quality control should begin after welding has been initiated.
- a. true
 - b. false
- Q1-4** What are the three welding inspector certifications covered in AWS QC1?
- a. CAWI, CWI, BWI
 - b. CWI, CAWI, SCWI
 - c. SCWI, CWI, ACWI
 - d. Levels I, II, and III
 - e. None of the above
- Q1-5** What is generally considered to be the most important quality of a welding inspector?
- a. graduation from a welding vocational program
 - b. an engineering degree
 - c. an associates' degree
 - d. professional attitude
 - e. hold a certified welder certificate
- Q1-6** The vision requirements for a CWI are near vision acuity on:
- a. Jaeger J1 at not less than 24 in
 - b. Jaeger J2 at not less than 12 in
 - c. Jaeger J2 at not less than 12 in, with or without corrective lenses
 - d. the inspector cannot wear glasses
 - e. 20/20 vision
- Q1-7** The acronym KASH stands for:
- a. knowledge, attitude, skills, and habits
 - b. knowledge, application, skills, and habits
 - c. knowledge, attitude, skills, and honesty
 - d. knowledge, application, skills, and honesty
 - e. knowledge, attitude, sincerity, and honesty

- Q1-8** The welding inspector should have a basic understanding of:
- a. welding processes
 - b. nondestructive testing methods
 - c. a and b above
 - d. codes and standards
 - e. all of the above
- Q1-9** The term used to describe a delay in the production schedule to permit inspection is:
- a. NDE
 - b. hold point
 - c. preinspection
 - d. reference point
 - e. arc strike
- Q1-10** Inspection report corrections should be made by:
- a. rewriting the entire report
 - b. reporting the correction to the welding foreman
 - c. telling the welder what was done
 - d. ignoring the original error
 - e. single-line out the error, correct the error, date, and initial
- Q1-11** A definition of ethics is:
- a. using common sense and honesty
 - b. living by the rules
 - c. being fair and impartial
 - d. basing decisions on facts
 - e. all of the above
- Q1-12** For communications to be effective, it should form a “continuous loop.”
- a. true
 - b. false
- Q1-13** The welding inspector must often communicate with:
- a. welders
 - b. supervisors
 - c. welding engineers
 - d. members of management
 - e. all of the above
- Q1-14** NDE personnel (other than CWIs) are typically certified to what document?
- a. AWS QC1
 - b. AWS D1.1
 - c. API 1104
 - d. ASNT SNT-TC-1A
 - e. certification is not needed

Welding Inspection Technology
Chapter 1—Welding Inspection and Certification

- Q1-15** You must have a high school diploma to become a CWI.
- a. true
 - b. false
- Q1-16** The CWI exam has several parts; these are:
- a. fundamentals, practical, code
 - b. fundamentals, basic, code
 - c. basic, vision test, fundamental
 - d. code, vision test, practical
 - e. none of the above
- Q1-17** The CWI exam requires that the AWS D1.1 Code be used for the open book code test.
- a. true
 - b. false
- Q1-18** The CWI exam contains three parts.
- a. true
 - b. false
- Q1-19** The title of the AWS standard A3.0 is:
- a. Filler Metal Specifications
 - b. Standard Welding Terms and Definitions
 - c. Guide to CWI Certification
 - d. Requirements for CWI Certification
 - e. none of the above
- Q1-20** API Standard 1104 covers the fabrication of cross-country bridges.
- a. true
 - b. false
- Q1-21** Some of the approved codes/standards for the open book portion of the CWI exam are AWS D1.1, API 1104, AWS D1.5, and AWS D15.1.
- a. true
 - b. false
- Q1-22** Prior to starting a job assignment, the welding inspector should determine:
- a. what code, standard, or specification applies
 - b. what inspections should be conducted
 - c. when inspections should be conducted
 - d. where records are maintained
 - e. all of the above

ANSWER KEY—CHAPTER 1

Q1-1	e	(pg. 1-2)
Q1-2	c	(pg. 1-2)
Q1-3	b	(pg. 1-2)
Q1-4	b	(pg. 1-8)
Q1-5	d	(pg. 1-3)
Q1-6	c	(pg. 1-4)
Q1-7	a	(pg. 1-4)
Q1-8	e	(pg. 1-5)
Q1-9	b	(pg. 1-5)
Q1-10	e	(pg. 1-6)
Q1-11	e	(pg. 1-6)
Q1-12	a	(pg. 1-6)
Q1-13	e	(pg. 1-6)
Q1-14	d	(pg. 1-8)
Q1-15	b	(pg. 1-8)
Q1-16	a	(pg. 1-10)
Q1-17	b	(pg. 1-10)
Q1-18	a	(pg. 1-10)
Q1-19	b	(pg. 1-11)
Q1-20	b	(pg. 1-10)
Q1-21	a	(pg. 1-10)
Q1-22	e	(pg. 1-2)

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CHAPTER 2

SAFE PRACTICES FOR WELDING INSPECTORS

Welding Inspection Technology
Chapter 2—Safe Practices for Welding Inspectors

- Q2-1** The welding inspector is exposed to which of the following safety hazards:
- a. radiation
 - b. falling objects
 - c. electrical shock
 - d. eye hazards
 - e. all of the above
- Q2-2** A document which covers safety in welding and cutting is:
- a. AWS D1.1
 - b. API 1104
 - c. ANSI Z49.1
 - d. ASME Section VIII
 - e. ASME B31.3
- Q2-3** The most important component of an effective safety and health program is:
- a. safety rules
 - b. safety procedures
 - c. protective equipment
 - d. welding helmet
 - e. management support
- Q2-4** Safety training is mandated under provisions of:
- a. AWS “Safe Practices”
 - b. OSHA
 - c. ASME Code
 - d. Welding Handbook, Volume 2
 - e. none of the above
- Q2-5** The abbreviation ‘MSDS’ means:
- a. Management Support and Daily Safety
 - b. Material Strength and Discontinuity Sheet
 - c. Material Safety Data Sheet
 - d. Material Strength and Data Sheet
 - e. none of the above
- Q2-6** The abbreviation ‘TLV’ means:
- a. Total Linear volume
 - b. Threshold Limit Value
 - c. Tack Length Value
 - d. Threshold Limiting Valve
 - e. none of the above
- Q2-7** Employers must make all applicable MSDS data available to their employees.
- a. true
 - b. false

- Q2-8** Personnel must be trained to recognize safety hazards.
- true
 - false
- Q2-9** A 'Hot Work Permit' is required for:
- all welding operations
 - all cutting operations
 - all preheating operations
 - areas where a fire hazard may occur during a welding, cutting, or preheating operation
 - all of the above
- Q2-10** Eye hazards found in welding operations include:
- flying particles
 - radiation
 - smoke and fumes
 - all of the above
- Q2-11** Protective equipment not suitable for eye protection from welding radiation includes:
- welding helmets with filter plates
 - clear safety goggles
 - safety goggles with filter plates
 - protective screens
 - properly positioned barricades
- Q2-12** Suitable clothing materials for welding and cutting are:
- 65% cotton, 35% polyester
 - wool
 - chemically treated cotton
 - b and c above
 - none of the above
- Q2-13** Before working on equipment where machinery guards have been removed, a 'Lock, Tag, and Try' procedure should be completed.
- true
 - false
- Q2-14** In avoiding fumes during welding, the most important factor is:
- the type of base metal
 - the type of filler metal
 - the type of welding process
 - the position of the welding machine
 - the position of the welder's head
- Q2-15** It is not important to consider ventilation during welding and cutting operations.
- true
 - false

Welding Inspection Technology
Chapter 2—Safe Practices for Welding Inspectors

- Q2-16** When entering confined spaces, a ‘standby’ is not required.
- true
 - false
- Q2-17** Some of the toxic materials the welder may be exposed to are:
- cadmium
 - chromium
 - nickel
 - lead
 - all of the above
- Q2-18** Proper usage and handling of compressed gas cylinders include:
- not welding on cylinders
 - not including the cylinders in the ground or electrical circuit
 - securing them properly
 - identifying the gas prior to use
 - all of the above
- Q2-19** Acetylene becomes unstable above what pressure?
- 5 psi
 - 10 psi
 - 15 psi
 - none of the above
- Q2-20** Oxygen is a flammable gas.
- true
 - false
- Q2-21** Electric currents above approximately 6 milliamperes are considered:
- not harmful
 - primary currents
 - harmful
 - secondary currents
 - b and c above
- Q2-22** When operating gas cylinders, the primary valve should be opened:
- all the way on an acetylene cylinder
 - one turn on an oxygen cylinder
 - one turn or less on an acetylene cylinder
 - all the way on an oxygen cylinder to backseat the valve
 - c and d above

ANSWER KEY—CHAPTER 2

Q2-1	e	(pg. 2-2)
Q2-2	c	(pg. 2-2)
Q2-3	e	(pg. 2-2)
Q2-4	b	(pg. 2-2)
Q2-5	c	(pg. 2-3)
Q2-6	b	(pg. 2-3)
Q2-7	a	(pg. 2-3)
Q2-8	a	(pg. 2-3)
Q2-9	d	(pg. 2-5)
Q2-10	d	(pg. 2-5)
Q2-11	b	(pg. 2-5)
Q2-12	d	(pg. 2-8)
Q2-13	a	(pg. 2-9)
Q2-14	e	(pg. 2-9)
Q2-15	b	(pg. 2-9)
Q2-16	b	(pg. 2-11)
Q2-17	e	(pg. 2-12)
Q2-18	e	(pg. 2-12, 2-13)
Q2-19	c	(pg. 2-16)
Q2-20	b	(pg. 2-15)
Q2-21	e	(pg. 2-17)
Q2-22	e	(pg. 2-14)

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WELDING INSPECTION TECHNOLOGY WORKBOOK

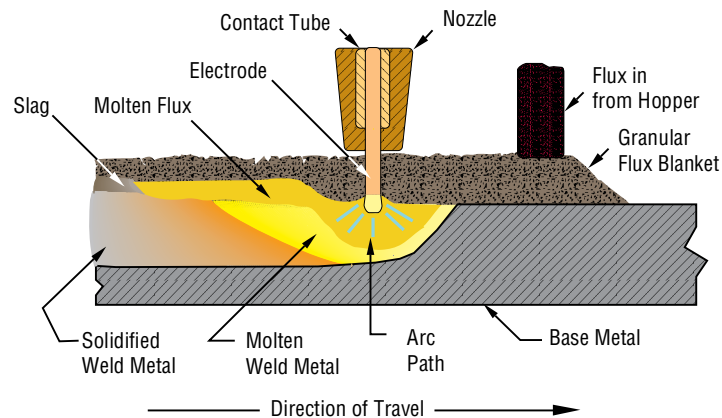
CHAPTER 3

METAL JOINING AND CUTTING PROCESSES

Welding Inspection Technology
Chapter 3—Metal Joining and Cutting Processes

- Q3-1** Which of the following is a function of the flux coating of a SMAW electrode?
- a. insulating
 - b. alloying
 - c. deoxidation
 - d. shielding
 - e. all of the above
- Q3-2** In the AWS system of SMAW electrode designations, the next to the last digit refers to:
- a. impact strength
 - b. electrode coating
 - c. welding position
 - d. strength
 - e. none of the above
- Q3-3** Which of the following is an incorrect statement about a SMAW electrode designated as E7024?
- a. It is a low hydrogen type.
 - b. The weld deposit has a minimum tensile strength of 70 000 psi.
 - c. It is suitable for use in the flat and horizontal fillet positions only.
 - d. It is an electrode for welding carbon steel.
 - e. none of the above
- Q3-4** Of the following which is not an essential part of a typical SMAW system?
- a. constant current power supply
 - b. wire feeder
 - c. covered electrode
 - d. electrode lead
 - e. work lead
- Q3-5** Which of the following welding problems is the result of a distorted magnetic field that deflects the welding arc?
- a. cracks
 - b. short circuiting
 - c. arc blow
 - d. insufficient welding current
 - e. all of the above
- Q3-6** Which of the following is not considered a type of metal transfer for GMAW?
- a. short circuiting
 - b. spray
 - c. globular
 - d. droplet
 - e. pulsed arc

- Q3-7** Which of the following types of metal transfer in GMAW provides the lowest amount of heat to the work piece, and therefore is prone to incomplete fusion?
- short circuiting
 - spray
 - globular
 - droplet
 - pulsed arc
- Q3-8** Which of the following gases can be used as shielding gases for GMAW?
- carbon dioxide
 - argon-oxygen
 - argon-carbon dioxide
 - argon
 - all of the above
- Q3-9** What type of welding process is pictured below?
- SMAW
 - GMAW
 - FCAW
 - SAW
 - ESW



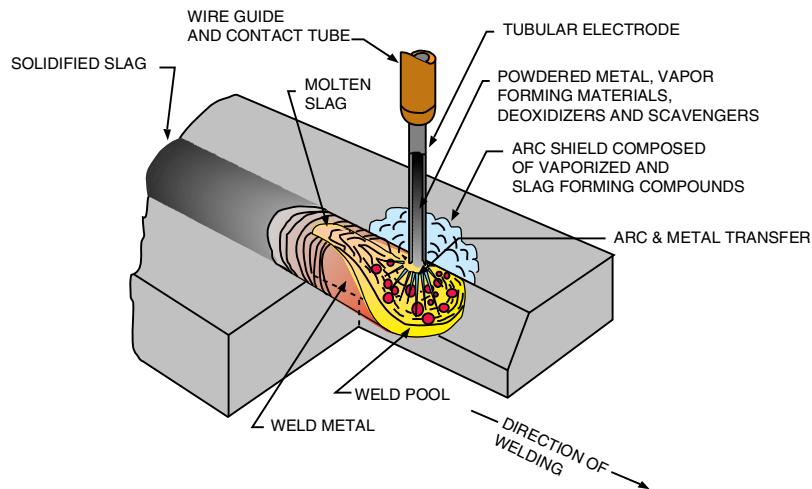
- Q3-10** Which of the following is not considered an arc welding process?
- SMAW
 - GMAW
 - FCAW
 - ESW
 - none of the above

Welding Inspection Technology
Chapter 3—Metal Joining and Cutting Processes

- Q3-11** In the electrode designation system for FCAW, the second digit (1) in an electrode marked (E71T-5) refers to:
- strength
 - welding position
 - chemical composition
 - usability
 - none of the above
- Q3-12** Which of the following is not always an essential element of an FCAW system?
- constant voltage power supply
 - tubular electrode
 - wire feeder
 - external shielding gas
 - work lead
- Q3-13** What aspect of the GTAW and PAW processes makes them different from the other arc welding processes?
- nonconsumable electrode
 - power supply
 - shielding
 - all of the above
 - none of the above
- Q3-14** Shielding for the GTAW and PAW processes is primarily accomplished through the use of:
- granular flux
 - slag
 - inert gas
 - oxygen
 - none of the above
- Q3-15** A green stripe on a tungsten electrode designates:
- pure tungsten
 - 1% thoriated tungsten
 - 2% thoriated tungsten
 - zirconiated tungsten
 - none of the above
- Q3-16** When welding aluminum with the GTAW process, what type of welding current is most commonly used?
- DCEP
 - DCEN
 - AC
 - a and b above
 - b and c above

- Q3-17** SAW and ESW processes are similar in that:
- both are an arc welding process
 - both use shielding gases
 - both use a granular flux, which becomes molten
 - a and b above
 - a and c above

- Q3-18** The diagram below depicts what welding process?
- SMAW
 - ESW
 - FCAW
 - SAW
 - GMAW



- Q3-19** Solidification cracking due to improper width-to-depth ratio of the weld bead is a serious problem primarily with which welding process?
- SMAW
 - OFC
 - SAW
 - all of the above
 - none of the above
- Q3-20** Which one of the following processes is typically used in the flat position unless special apparatus is employed?
- GMAW
 - SAW
 - FCAW
 - SMAW
 - GTAW

Welding Inspection Technology
Chapter 3—Metal Joining and Cutting Processes

- Q3-21** Which of the following are not common to both GTAW and PAW?
- a. nonconsumable tungsten electrode
 - b. constricting orifice
 - c. shielding gas nozzle
 - d. externally applied filler metal
 - e. none of the above
- Q3-22** What technique is employed with PAW to produce full penetration welds without a bevel edge preparation?
- a. stringer beads
 - b. weave beads
 - c. keyhole
 - d. back-step
 - e. none of the above
- Q3-23** What welding process produces welds in a single pass, with the progression uphill along the joint?
- a. SAW
 - b. ESW
 - c. FCAW
 - d. a and b above
 - e. b and c above
- Q3-24** Which of the following is not an advantage of the ESW process?
- a. high deposition rate
 - b. ease of setup
 - c. capable of joining thick sections
 - d. no tendency for angular distortion
 - e. none of the above
- Q3-25** Which welding process is considered to be a chemical welding process?
- a. SMAW
 - b. ESW
 - c. SAW
 - d. OAW
 - e. none of the above
- Q3-26** Which arc welding process provides a very efficient means of joining attachments to some planar surfaces?
- a. OAW
 - b. SW
 - c. GMAW
 - d. GTAW
 - e. SMAW

- Q3-27** Brazing differs from welding in that:
- a. no filler metal is used
 - b. an oxyfuel flame is used
 - c. the base metal is not melted
 - d. all of the above
 - e. none of the above
- Q3-28** For satisfactory results, a braze joint should have:
- a. clean joint surfaces
 - b. a small clearance between pieces to be joined
 - c. a large surface area for the joint area
 - d. heat source
 - e. all of the above
- Q3-29** Which of the following is an advantage of brazing?
- a. ease of joining thick sections
 - b. ability to join dissimilar metals
 - c. ability to join thin sections
 - d. a and b above
 - e. b and c above
- Q3-30** Of the following metals, which cannot be efficiently cut using OFC?
- a. high-carbon steel
 - b. low-carbon steel
 - c. medium-carbon steel
 - d. austenitic stainless steel
 - e. none of the above
- Q3-31** Which of the following gases can be used to perform OFC?
- a. methylacetylene-propadiene (MPS)
 - b. propane
 - c. acetylene
 - d. methane (natural gas)
 - e. all of the above
- Q3-32** Which of the following cutting processes can cut any metal?
- a. OFC
 - b. CAC-A
 - c. PAC
 - d. a and b above
 - e. b and c above

Welding Inspection Technology
Chapter 3—Metal Joining and Cutting Processes

Q3-33 The width of a cut is referred to as the:

- a. gap
- b. dross
- c. kerf
- d. drag
- e. none of the above

Q3-34 The SMAW power source can be:

- a. DCEN
- b. AC
- c. DCEP
- d. all of the above
- e. a and c above

Q3-35 Of the following, which is a noncontact welding process, requires no electrodes, and is not influenced by the presence of magnetic fields?

- a. ESW
- b. PAW
- c. LBW
- d. a and b above
- e. none of the above

Q3-36 Which of the following uses a focused beam of electrons as a heat source for fusion welding?

- a. EBW
- b. ESW
- c. EGW
- d. a and c above
- e. none of the above

ANSWER KEY—CHAPTER 3

Q3-1	e	(pg. 3-5)
Q3-2	c	(pg. 3-5)
Q3-3	a	(pg. 3-6)
Q3-4	b	(pg. 3-6)
Q3-5	c	(pg. 3-8, 3-9)
Q3-6	d	(pg. 3-11, 3-13, Figure 3.14)
Q3-7	a	(pg. 3-13)
Q3-8	e	(pg. 3-11, 3-12)
Q3-9	d	(pg. 3-20)
Q3-10	d	(pg. 3-26)
Q3-11	b	(pg. 3-15)
Q3-12	d	(pg. 3-14, 3-15)
Q3-13	a	(pg. 3-17, 3-23, Figure 3.28)
Q3-14	c	(pg. 3-18, 3-24, Figure 3.31)
Q3-15	a	(pg. 3-18)
Q3-16	c	(pg. 3-18)
Q3-17	c	(pg. 3-20, 3-26)
Q3-18	c	(pg. 3-14)
Q3-19	c	(pg. 3-22)
Q3-20	b	(pg. 3-22)
Q3-21	b	(pg. 3-23, 3-24, Figure 3.31)
Q3-22	c	(pg. 3-25)
Q3-23	b	(pg. 3-26)
Q3-24	b	(pg. 3-27)
Q3-25	d	(pg. 3-27)
Q3-26	b	(pg. 3-28, 3-29)
Q3-27	c	(pg. 3-36)
Q3-28	e	(pg. 3-36)
Q3-29	e	(pg. 3-38)
Q3-30	d	(pg. 3-40)
Q3-31	e	(pg. 3-39)
Q3-32	e	(pg. 3-41, 3-44)
Q3-33	c	(pg. 3-40)
Q3-34	d	(pg. 3-5)
Q3-35	c	(pg. 3-31)
Q3-36	a	(pg. 3-33)

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CHAPTER 4

WELD JOINT GEOMETRY AND WELDING SYMBOLS