

Beal College

Welding Technology



Weld Test Center

Applicant Test Package

Jesse Crosby, CWI/CWE/CW
99 Farm Road
Bangor, ME 04401
www.bealcollege.edu
P: 207-947-4591
F: 207-947-0208
jcrosby@bealcollege.edu

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99 Farm Road • Bangor, ME 04401
207-947-4591 • 207-947-0208 (Fax)
www.bealcollege.edu

Testing Supervisor
Jesse Crosby, CWI/CWE/CW
CWI # 13090641
AWS Certified since 2005
jcrosby@bealcollege.edu

Technical Manager/Quality Assurance Manager
Jesse Crosby, CWI/CWE
CWI # 13090641
AWS Certified since 2005
jcrosby@bealcollege.edu

Administrator/Facility Representative
Corey L. Leighton, Campus Director
207-947-4591
cleighton@bealcollege.edu

Beal College Weld Test Center

AWS Certification Tests

1G FCAW limited thickness D1.1 AWS certification test.
2G FCAW limited thickness D1.1 AWS certification test.
3G FCAW limited thickness D1.1 AWS certification test.
4G FCAW limited thickness D1.1 AWS certification test.
3G & 4G all position limited thickness D1.1 AWS certification test.

1G SMAW limited thickness D1.1 AWS certification test.
2G SMAW limited thickness D1.1 AWS certification test.
3G SMAW limited thickness D1.1 AWS certification test.
4G SMAW limited thickness D1.1 AWS certification test.
3G & 4G SMAW all position limited thickness D1.1 AWS certification test.

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1G SMAW unlimited thickness D1.1 AWS certification test.
2G SMAW unlimited thickness D1.1 AWS certification test.
3G SMAW unlimited thickness D1.1 AWS certification test.
4G SMAW unlimited thickness D1.1 AWS certification test.
3G & 4G all position unlimited thickness D1.1 AWS certification test.

SMAW Pipe ASME Section 9 E6018 & E7018
SMAW Pipe ASME Section 9 ER70S-2 & E7018

REQUIRED ON TEST DAY:

1. Completed AWS Application.
2. Completed AWS Visual Acuity Form.
3. Check made payable to: Beal College.
4. Picture Identification
5. Personal Welding Equipment including:
 - Helmet
 - Safety Glasses
 - Welding Gloves
 - Work Boots & Cloths
 - Pliers/Wire Cutters
 - Measuring and Marking Tools
6. Some practice is allowed, however you are expected to be able to adjust the settings, assemble the test weldment, and have the skill to weld the tests.

TESTING PROCEDURES:

1. Prepare pre-beveled plates for welding (where required).
 - a. Grind or file to desired condition, staying within D1.1 tolerance
2. Assemble joint to proper dimensions and configuration
 - a. Tack Weld according to specifications or direction
3. **Inspection** or fit-up, configuration and dimensions
 - a. Test Supervisor stamps identification number onto weldment.
4. Preparing to weld/setting up station
 - a. Some practice is permitted to allow adjusting machine settings and familiarization of equipment.
 - b. Tack Weld Test into correct welding position.
5. **Inspection** of correct position(s), polarity, machine settings, electrode type and size by the Test Supervisor
6. Begin Welding
 - a. **Inspection** steps will vary on the different test. Be sure to write the specific interpass inspection directions down for the test(s) you are taking.
 - b. Technical Manager and/or Test Supervisor will list inspection steps, explain what is required during the test, and answer all your questions.
7. **Visual Weld Inspection** by the Test Supervisor (AWS-CWI) will determine pass or fail of the weld appearance. In accordance with prescribed codes or standards.
 - a. If a bend test is not required, this inspection would determine test results.
 - b. If a bend test is required, the weld test must pass the visual inspection to be prepared and bent.
8. Test Supervisor prepares weld test for destructive testing.
 - a. Cuts and prepares tests coupons
 - b. Transfers Identification Number onto each test coupon piece.
 - c. Performs bend test.
9. **Final Inspection and evaluation** Test coupons will be evaluated by the Test Supervisor in accordance with prescribed codes or standards.
 - a. Test coupons will be tacked together and stored for 30 days.
 - b. The technical Manager or the Test Supervisor will contact you with your test results.
10. Retests
 - a. Immediate Retest may be made consisting of two welds of each type and position that the welder failed. All retest specimens shall meet all of the specified test requirements and acceptance criteria as the original test weld.
 - b. Retest after further test or practice may be made, provided there is documented evidence that the welder has had further training or practice. A complete retest of the types and positions failed shall be made.
11. Results will be registered with the American Welding Society in Miami, Florida.
 - a. Welder Performance Qualification Records
 - b. Application for AWS Certified Welder
 - c. Visual Acuity Record

You will be placed on AWS's national wire for welders and will receive from AWS your official **AWS Welder Certification Card**. (For more information, call 1.800.443.9353)

SHOP SAFETY

Welder's Responsibility

1. Long sleeve shirt
 - a. Free from holes and fringes
 - b. Cotton preferred
 - c. Darker color
2. Pants
 - a. Jeans or regular work pants (no cuffs, tears, or fringes)
3. Shoes
 - a. Work shoe type, metal tip preferred (no open toe, canvas, or athletic shoes)
 - b. High top boots or shoes preferred
4. Welding cap
 - a. Cotton or leather preferred
5. Safety glasses
 - a. Worn at all times
6. Welding gloves
 - a. Worn while handling hot, warm, or cold metal
7. Pliers
 - a. Used in handling hot metal to reduce chance of burns and extend life of gloves.
 - b. Should include wire cutters for GMAW
8. Measuring and marking equipment
 - a. Tape measure / 6" scale
 - b. Silver pencil and/or scribe

SAFETY IN ARC WELDING

- § A welding machine should have a power disconnect conveniently located near it for emergency shut-off.
- § Repairs to welding equipment should be made only with the power off.
- § Welding machines should be properly grounded.
- § Avoid using electrode holders with defective jaws, poor insulation and with loose cable connections.
- § Do not weld in damp areas and keep hands and clothing dry at all times.
- § Do not weld around flammable liquids or materials without taking the proper precautions.
- § Always have proper ventilation.
- § Have proper fire protection available at all times, such-as a fire extinguisher, or even a fire watch standing by.
- § Wear proper clothing, keeping all parts of the body covered at all times.
- § Wear a welding helmet that is in good condition.
- § Be sure dark lens in welding helmet is not cracked.
- § Wear safety glasses when chipping slag.
- § Never look at a welding arc.
- § Always keep welding curtains in welding booth closed so that no one will receive a welding flash.
- § If welding outside a permanent welding booth, use screens so the arc will not harm anyone's eyes that may be nearby.
- § Keep welding cables in an orderly manner to prevent them from becoming a stumbling hazard. Fasten cables overhead whenever possible.
- § Always turn off the machine when leaving the work.
- § Be careful when striking a welding arc with people around.
- § Be sure tanks, drums, or pipelines are completely cleaned of flammable liquids before welding.
- § Keep all tools and equipment in good repair.
- § Avoid horseplay at all times around any welding area.

WELDING SAFETY CHECKLIST:

Hazard	Factors to Consider	Precaution Summary
Electric Shock can Kill	<ul style="list-style-type: none"> Wetness Welder in or on work piece Confined space Electrode holder and cable insulation 	<ul style="list-style-type: none"> Insulate welder from work piece and ground using dry insulation, rubber mat or dry wood. Wear dry, hole-free gloves (change as necessary to keep dry) Do not touch electrically "hot" parts or electrode with bare skin or wet clothing. In damp locations or while wearing wet clothing: on metal structures such as floors, gratings or scaffolds: when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the work piece or ground, use the following equipment: <ul style="list-style-type: none"> Semi Automatic DC Constant Voltage Welder DC Manual (stick) Welder AC Welder with Reduced Voltage Control Keep electrode holder and cable insulation in good condition. Do not use if insulation is damaged or missing.
Fumes and Gases can be Dangerous	<ul style="list-style-type: none"> Confined Area Positioning of welder's head Lack of general ventilation Electrode types i.e. manganese, chromium, etc See MSDS Base metal, coatings, galvanize, paint 	<ul style="list-style-type: none"> Use ventilation or exhaust to keep air breathing zone clear, comfortable. Use helmet and position of head to minimize fumes in the breathing zone Read warnings on electrode container and Material Data Safety Data Sheet (MSDS) for electrode Provide additional ventilation/exhaust where special ventilation requirements exist Use special care when welding in a confined area Do not weld unless ventilation is adequate
Welding sparks can cause fire or explosion	<ul style="list-style-type: none"> Containers which have held combustibles Flammable materials 	<ul style="list-style-type: none"> Do not weld containers that have held combustible materials (unless strict AWS F4.1 procedures are followed). Check before welding. Remove flammable materials from welding area or shield from sparks, heat. Keep a fire watch in area during and after welding. Keep a fire extinguisher in the welding area. Wear fire retardant clothing and hat. Use earplugs when welding overhead.
Arc rays can burn eyes, skin	<ul style="list-style-type: none"> Process: gas-shielded arc most severe 	<ul style="list-style-type: none"> Select a filter lens which is comfortable for you while welding Always use a helmet while welding Provide non-flammable sheathing to protect others. Wear clothing that protects skin while welding.
Confined Space	<ul style="list-style-type: none"> Metal enclosure Wetness Restricted entry Heavier-than-air-gas Welder inside or on work piece 	<ul style="list-style-type: none"> Carefully evaluate adequacy of ventilation especially where electrode requires special ventilation or where gas may displace breathing air. In damp locations or while wearing wet clothing on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the work piece or ground, use the following equipment: <ul style="list-style-type: none"> Semiautomatic DC Constraint Voltage Meter DC Manual (Stick) Welder AC Welder with Reduced Voltage Control Provide welder helper and method of welder retrieval from outside the enclosure.
General work area hazards	<ul style="list-style-type: none"> Cluttered area Indirect work (welding ground) connection Electrical equipment Engine-driven equipment Gas Cylinders 	<ul style="list-style-type: none"> Keep cables, materials, tools neatly organized. Connect work cable as close as possible to area where welding is being performed. Do not allow alternate circuits through scaffold cables, hoist chains, ground leads. Use only double insulated or properly grounded equipment. Always disconnect power to equipment before servicing. Use only in open, well ventilated areas. Keep enclosure complete and guards in place. See Lincoln service shop if guards are missing Refuel with engine off. If using auxiliary power. OSHA may require GFI protection or assured grounding program (or isolated windings if less than 5KW) Never touch cylinder with electrode. Never lift a machine with cylinder attached. Keep cylinder upright and chained to support.

Sample Pre-Qualified Test Assembly

See Notes on Page 72

Single-V-groove weld (2) Butt joint (B)		Tolerances						
		As Detailed (see 3.13.1)	As Fit-Up (see 3.13.1)					
		$R = +1/16, -0$	$+1/4, -1/16$					
		$\alpha = +10^\circ, -0^\circ$	$+10^\circ, -5^\circ$					
Welding Process	Joint Designation	Base Metal Thickness (U = unlimited)		Groove Preparation		Allowed Welding Positions	Gas Shielding for FCAW	Notes
		T ₁	T ₂	Root Opening	Groove Angle			
SMAW	B-U2a	U	—	R = 1/4	$\alpha = 45^\circ$	All	—	5, 10
				R = 3/8	$\alpha = 30^\circ$	F, V, OH	—	5, 10
				R = 1/2	$\alpha = 20^\circ$	F, V, OH	—	5, 10
GMAW FCAW	B-U2a-GF	U	—	R = 3/16	$\alpha = 30^\circ$	F, V, OH	Required	1, 10
				R = 3/8	$\alpha = 30^\circ$	F, V, OH	Not req.	1, 10
				R = 1/4	$\alpha = 45^\circ$	F, V, OH	Not req.	1, 10
SAW	B-L2a-S	2 max	—	R = 1/4	$\alpha = 30^\circ$	F	—	10
SAW	B-U2-S	U	—	R = 5/8	$\alpha = 20^\circ$	F	—	10

Figure 3.4 (Continued) (Inches)

Sample Pre-Qualified Test Assembly

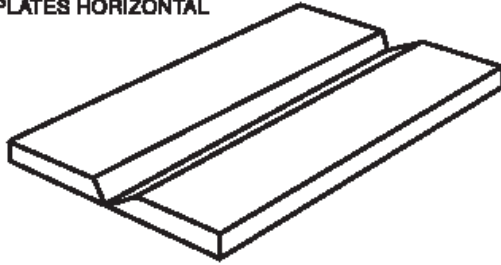
See Notes on Page 72

Single-V-groove weld (2) Butt joint (B)									
Welding Process	Joint Designation	Base Metal Thickness (U = unlimited)		Groove Preparation			Allowed Welding Positions	Gas Shielding for FCAW	Notes
		T ₁	T ₂	Root Opening Root Face Groove Angle	Tolerances				
					As Detailed (see 3.13.1)	As Fit-Up (see 3.13.1)			
SMAW	B-U2	U	—	R = 0 to 1/8 f = 0 to 1/8 $\alpha = 60^\circ$	+1/16, -0 +1/16, -0 +10°, -0°	+1/16, -1/8 Not limited +10°, -5°	All	—	4, 5, 10
GMAW FCAW	B-U2-GF	U	—	R = 0 to 1/8 f = 0 to 1/8 $\alpha = 60^\circ$	+1/16, -0 +1/16, -0 +10°, -0°	+1/16, -1/8 Not limited +10°, -5°	All	Not required	1, 4, 10
SAW	B-L2c-S	Over 1/2 to 1	—	R = 0 f = 1/4 max $\alpha = 60^\circ$	R = ± 0 f = +0, -f $\alpha = +10^\circ, -0^\circ$	+1/16, -0 $\pm 1/16$ +10°, -5°	F	—	4, 10
		Over 1 to 1-1/2	—	R = 0 f = 1/2 max $\alpha = 60^\circ$					
		Over 1-1/2 to 2	—	R = 0 f = 5/8 max $\alpha = 60^\circ$					

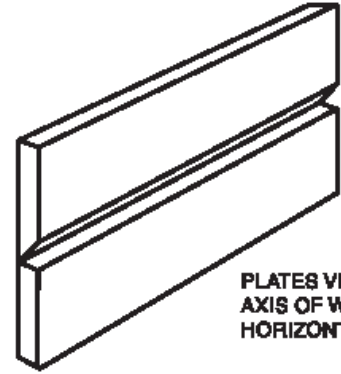
Figure 3.4 (Continued) (Inches)

Test Plate Positions

PLATES HORIZONTAL



(A) FLAT WELDING TEST POSITION 1G



PLATES VERTICAL;
AXIS OF WELD
HORIZONTAL

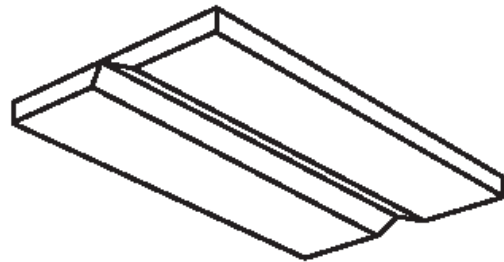
(B) HORIZONTAL WELDING TEST POSITION 2G



PLATES VERTICAL;
AXIS OF WELD
VERTICAL

(C) VERTICAL WELDING TEST POSITION 3G

PLATES HORIZONTAL



(D) OVERHEAD WELDING TEST POSITION 4G

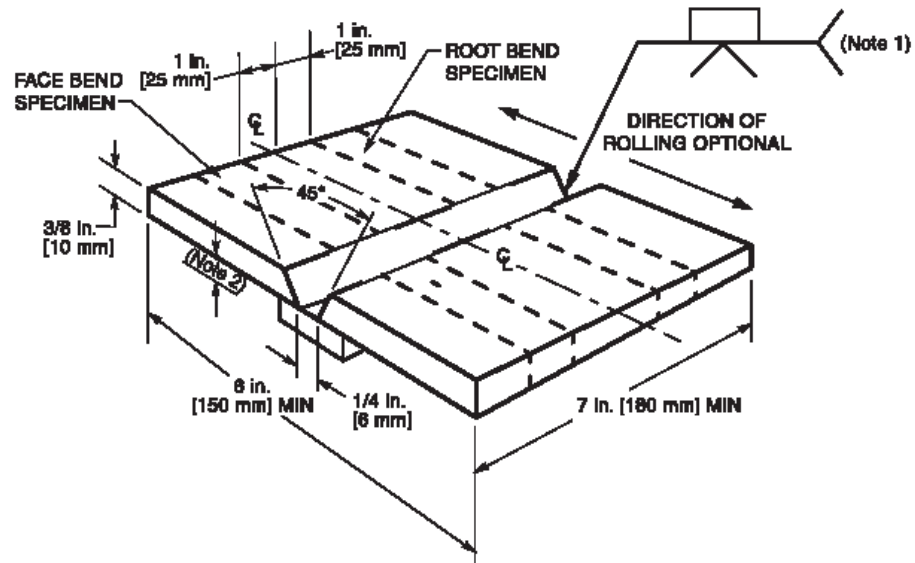
Figure 4.3—Positions of Test Plates for Groove Welds (see 4.2.4)

Visual Inspection Test Assembly Acceptance Criteria

For acceptable qualification welds shall meet the following requirements:

1. The weld shall be free of all cracks.
2. All craters shall be filled to the full cross-section of the weld.
3. The face of the weld shall be flush with the surface of the base metal, and the weld shall merge smoothly with the base metal, in accordance with AWS D1.1 Structural Welding Code 5.24 acceptable weld profiles.
4. Weld reinforcement shall not exceed 1/8 in. (3 mm). The weld profile shall conform to AWS D1.1 Structural Welding Code Figure 5.4 and shall have complete fusion.
5. Undercut shall not exceed 1/32 in. (1 mm).
6. The weld root for CJP grooves shall be inspected, and shall not have any cracks, incomplete fusion, or inadequate joint penetration.
7. For CJP grooves welded from one side without backing, root concavity or melt thru shall conform to the following:
 - a. The maximum root surface concavity shall be 1/16 in. (2 mm), provided the total weld thickness is equal to or greater than that of the base metal.
 - b. The maximum melt-through shall not exceed 1/8 in. (3 mm).
 - c. The maximum melt-through shall be 1/8" (3mm) except for tubular T-, Y, and K- connections, where melt through is not limited.

Test Specimens Removal Procedure for Limited Thickness Welder Qualification

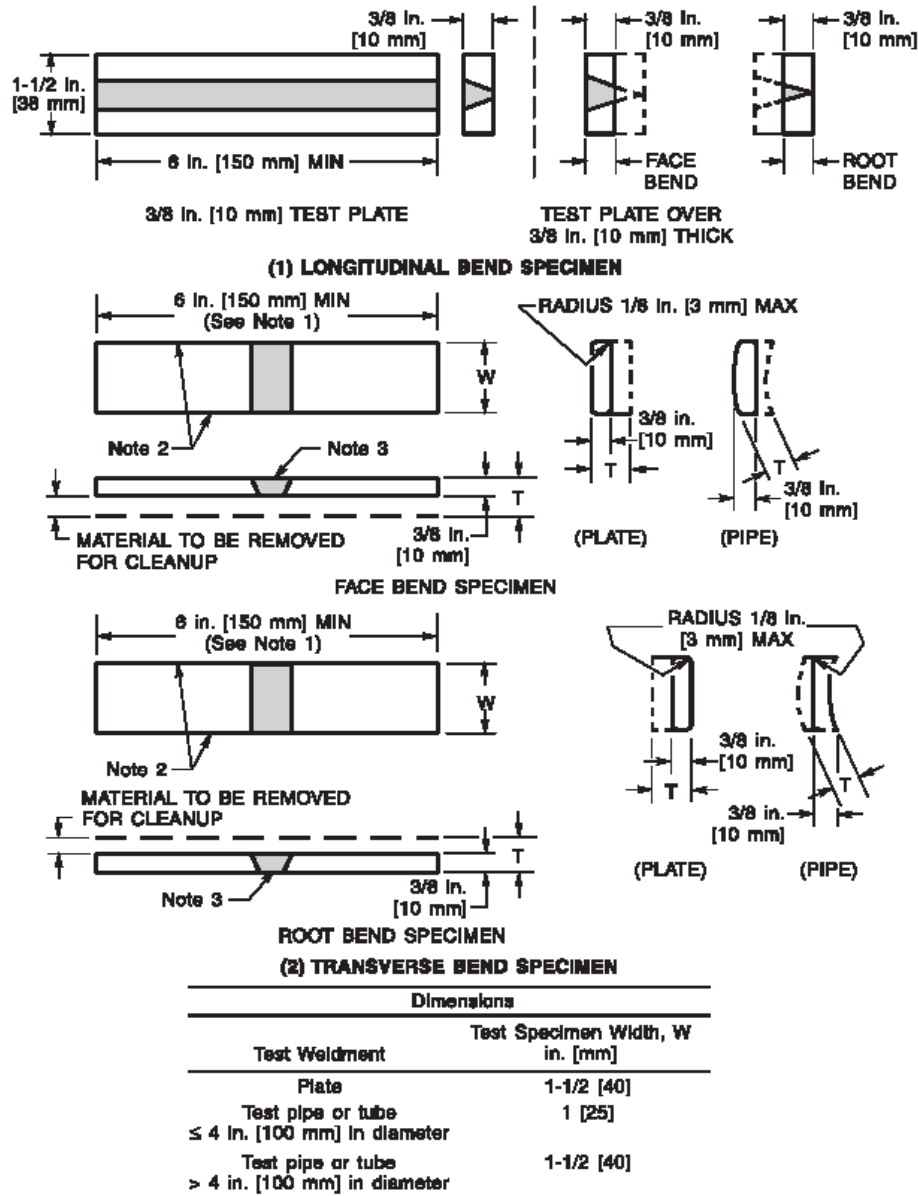


Notes:

1. When RT is used, no tack welds shall be in test area.
2. The backing thickness shall be 1/4 in. [6 mm] min to 3/8 in. [10 mm] max; backing width shall be 3 in. [75 mm] min when not removed for RT, otherwise 1 in. [25 mm] min.

**Figure 4.30—Test Plate for Limited Thickness—All Positions—
Welder Qualification (see 4.23.1)**

Face and Root Bend Specimens Preparation



General Notes:

- T = plate or pipe thickness.
- When the thickness of the test plate is less than 3/8 in. [10 mm], the nominal thickness shall be used for face and root bends.

Notes:

1. A longer specimen length may be necessary when using a wraparound type bending fixture or when testing steel with a yield strength of 90 ksi [620 MPa] or more.
2. These edges may be thermal-cut and may or may not be machined.
3. The weld reinforcement and backing, if any, shall be removed flush with the surface of the specimen (see 5.24.4.1 and 5.24.4.2). If a recessed backing is used, this surface may be machined to a depth not exceeding the depth of the recess to remove the backing; in such a case, the thickness of the finished specimen shall be that specified above. Cut surfaces shall be smooth and parallel.

Figure 4.12—Face and Root Bend Specimens (see 4.8.3.1)

Acceptance Criteria for Bend Tests

The convex surface of the bend test specimen shall be visually examined for surface discontinuities. For acceptance, the convex surface shall be limited to the following:

1. 1/8 in. (3 mm) measured in any direction on the surface.
2. 3/8 in. (10 mm)-the sum of the greatest dimensions of all discontinuities exceeding 1/32 in. (1 mm), but less than or equal to 1/8 in. (3 mm).
3. 1/4 in. (6 mm)-the maximum corner crack, except when that corner crack resulted from visible slag inclusion or other fusion type discontinuities, then the 1/8 in. (3 mm) maximum shall apply.
4. Specimens with corner cracks exceeding ¼ in. (6 mm) with no evidence of slag inclusions or other fusion type discontinuities shall be disregarded, and a replacement test specimen from the original test plate shall be tested.