

pressure may not be less than 1.20 nor more than 1.25 times the maximum allowable working pressure of the piping subassembly system.

(g) *Maximum permissible pneumatic test pressure.* When a system is tested pneumatically, the test pressure may not exceed the maximum test pressure of any component such as vessels, pumps or valves in the system.

(h) *Pneumatic test pressure holding time.* The pneumatic test pressure must be maintained for a minimum total time of 10 minutes and for such additional time as may be necessary to conduct the examination for leakage required in § 56.97-30(d).

[CGD 73-254, 40 FR 40168, Sept. 2, 1975]

§ 56.97-38 Initial service leak test (reproduces 137.7).

(a) An initial service leak test and inspection is acceptable when other types of test are not practical or when leak tightness is conveniently demonstrable due to the nature of the service. One example is turbine extraction piping where shut-off valves are not available for isolating a line and where temporary closures are impractical. Others may be systems for service water, low pressure condensate, plant and instrument air, etc., where checking out of pumps and compressors afford ample opportunity for leak tightness inspection prior to fullscale operation.

(b) The piping system must be gradually brought up to design pressure. After inspection of the piping system has proven that the installation is complete and all joints are leak-tight, the piping has met the requirements of § 56.97-1.

[CGD 73-254, 40 FR 40168, Sept. 2, 1975]

§ 56.97-40 Installation tests.

(a) The following piping systems shall be hydrostatically leak tested in the presence of a marine inspector at a pressure of 1½ times the maximum allowable working pressure of the system:

(1) Class I steam, feedwater, and blowoff piping. Where piping is attached to boilers by welding without practical means of blanking off for testing, the piping shall be subjected to the same hydrostatic pressure to which

the boiler is tested. The maximum allowable working pressures of boiler feedwater and blowoff piping shall be the design pressures specified in §§ 56.50-30(a)(3) and 56.50-40(b), respectively.

(2) Fuel oil discharge piping between the pumps and the burners, but not less than 500 pounds per square inch.

(3) High-pressure piping for tank cleaning operations.

(4) Flammable or corrosive liquids and compressed gas cargo piping, but not less than 150 pounds per square inch.

(5) Any Class I, I-L, II-L piping.

(6) Cargo oil piping.

(7) Firemains, but not less than 150 pounds per square inch.

(8) Fuel oil transfer and filling piping.

(9) Class I compressed air piping.

(10) Fixed oxygen-acetylene system piping.

(b) Installation testing requirements for refrigeration, fluid power, and liquefied petroleum gas cooking and heating systems may be found in part 58 of this subchapter.

(c) Class II piping systems shall be tested under working conditions as specified in the section on initial service leak test, § 56.97-38.

[CGFR 68-82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9980, June 17, 1970; CGD 72-206R, 38 FR 17229, June 29, 1973; CGD 73-254, 40 FR 40168, Sept. 2, 1975; CGD 95-028, 62 FR 51202, Sept. 30, 1997]

PART 57—WELDING AND BRAZING

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Sec.

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- 57.05-2 Transfer of performance qualifications.
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- 57.06-2 Production test plate interval of testing.
- 57.06-3 Method of performing production testing.
- 57.06-4 Production testing specimen requirements.
- 57.06-5 Production toughness testing.

AUTHORITY: 46 U.S.C. 3306, 3703, E.O. 12234, 45 FR 58801, 3 CFR, 1980 Comp., p. 277; 49 CFR 1.46.

SOURCE: CGFR 68-82, 33 FR 18872, Dec. 18, 1968, unless otherwise noted.

Subpart 57.01—Scope

§ 57.01-1 Qualifications and production tests.

(a) (Replaces QW 101 and QB 101.) The regulations in this part shall apply to the qualification of welding procedures, welders, and brazers, and to production tests for all types of manual and machine arc and gas welding and brazing processes.

(b) (Modifies QW 305 and QB 305.) Operators of fully automatic welding and brazing machines are specifically exempt from performance qualification tests.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGD 74-102, 40 FR 27460, June 30, 1975]

Subpart 57.02—General Requirements

§ 57.02-1 Incorporation by reference.

(a) Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a). To enforce any edition other

than that specified in paragraph (b) of this section, the Coast Guard must publish notice of change in the FEDERAL REGISTER and make the material available to the public. All approved material is on file at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC, and at the U.S. Coast Guard, Office of Design and Engineering Standards (G-MSE), 2100 Second Street SW., Washington, DC 20593-0001 and is available from the sources indicated in paragraph (b) of this section.

(b) The material approved for incorporation by reference in this part and the sections affected are:

American Society of Mechanical Engineers (ASME) International

Three Park Avenue, New York, NY 10016-5990

Boiler and Pressure Vessel Code, section IX, Welding and Brazing Qualifications, July 1989 with 1989

addenda.....57.01-1; 57.02-2; 57.02-3; 57.02-4; 57.03-1; 57.04-1; 57.05-1; 57.06-1; 57.06-3; 57.06-4

[CGD 88-032, 56 FR 35823, July 29, 1991, as amended by CGD 95-072, 60 FR 50462, Sept. 29, 1995; 60 FR 54106, Oct. 19, 1995; CGD 96-041, 61 FR 50728, Sept. 27, 1996; USCG-1999-6216, 64 FR 53224, Oct. 1, 1999]

§ 57.02-2 Adoption of section IX of the ASME Code.

(a) The qualifications for all types of welders and brazers, the qualification of welding procedures, and the production tests for all types of manual and machine arc and gas welding and brazing processes shall be in accordance with section IX of the ASME (American Society of Mechanical Engineers) Code, as limited, modified, or replaced by specific requirements in this part. For general information Table 57.02-1(a) lists the various paragraphs in section IX of the ASME Code which are limited, modified, or replaced by regulations in this part.

TABLE 57.02-1(A)—LIMITATIONS AND MODIFICATIONS TO THE ADOPTION OF SECTION IX OF THE ASME CODE

Paragraphs in section IX ASME code, and Disposition	Unit of this part
QW-101 replaced by	57.01-1(a).
QW-103 replaced by	57.02-3(a).
QW-201 modified by	57.03-1(a).
QW-202 modified by	57.04-1

TABLE 57.02-1(A)—LIMITATIONS AND MODIFICATIONS TO THE ADOPTION OF SECTION IX OF THE ASME CODE—Continued

Paragraphs in section IX ASME code, and Disposition	Unit of this part
QW-202.1 modified by	57.03-1(b).
QW-210 modified by	57.04-1.
QW-211 modified by	57.02-4.
QW-253 modified by	57.03-1(g).
QW-254 modified by	57.03-1(g).
QW-255 modified by	57.03-1(g).
QW-305 modified by	57.01-1(b).
QW-451 modified by	57.03-1(b) and 57.04-1.
QB-101 replaced by	57.01-1(a).
QB-103 replaced by	57.02-3(a).
QB-201 modified by	57.03-1(a).
QB-202 modified by	57.04-1.
QB-305 modified by	57.01-1(b).

(1) As stated in §50.15-5 of this subchapter, section IX of the ASME Code is adopted and shall be the governing requirements for the qualification of all types of welders and brazers, the qualification of all types of welding procedures, and the production tests for all types of manual and machine arc and gas welding and brazing processes used in fabricating power boilers, heating boilers, pressure vessels and piping unless specifically limited, modified or replaced by other regulations in this part.

(b) References to the ASME Code, like paragraph QW-131.1 indicate:

Q=Section IX, Welding and Brazing Qualifications, ASME Code.

W=Part containing requirements for welding procedure, welder, and welding operator qualifications.

131=Major division within the part.

131.1=Specific subparagraph within the part.

(c) When a paragraph or a section of the regulations in this part relates to material in section IX of the ASME Code, the relationship with the code will be shown immediately following the heading of the section or at the beginning of the paragraph as follows:

(1) (Modifies Q) This indicates that the material in Q is generally applicable but is being altered, amplified or augmented.

(2) (Replaces Q) This indicates that Q does not apply.

(3) (Reproduces Q) This indicates that Q is being identically

reproduced for convenience, not for emphasis.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9980, June 17, 1970; CGD 74-102, 40 FR 27460, June 30, 1975. Redesignated by CGD 88-032, 56 FR 35823, July 29, 1991; CGD 95-012, 60 FR 48050, Sept. 18, 1995]

§ 57.02-3 Performance qualifications issued by other agencies.

(a) Within the limits of the qualification tests passed, the Officer in Charge, Marine Inspection, may accept welders who have been qualified by other agencies of the Federal Government; by the American Bureau of Shipping; or by the fabricator concerned, provided the fabricator's tests have been certified by an authorized Code inspector as defined in paragraphs PG-91, N-612, HG-515.2, or UG-91 of the ASME Code.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968. Redesignated by CGD 88-032, 56 FR 35832, July 29, 1991]

§ 57.02-4 Fabricator's responsibility.

(a) (Replaces QW 103 and QB 103). Each manufacturer or contractor is responsible for the welding and brazing done by his organization and shall conduct tests required in this part to qualify the welding and brazing procedures used and the performance of welders and brazers who apply these procedures. The manufacturer shall bear the expense of conducting the tests. Each manufacturer shall maintain a record of the test results obtained in welding and brazing procedure and welder and brazer performance qualifications. These required records, together with identification data, shall be maintained by the manufacturer or contractor on the recommended forms illustrated in QW 480 and QB 480 of section IX, ASME Code, or on any other form acceptable to the Officer in Charge, Marine Inspection. Upon request, duplicate forms shall be furnished by the manufacturer or contractor to the marine inspector.

(b) Except as otherwise provided for in §57.02-2, the fabricator shall notify the Officer in Charge, Marine Inspection, prior to conducting performance or procedure qualification tests, and arrange a suitable time and place for

§ 57.02-5

conducting the tests, so that a marine inspector may be present.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGD 74-102, 40 FR 27460, June 30, 1975. Redesignated by CGD 88-032, 56 FR 35823, July 29, 1991]

§ 57.02-5 Filler metals.

(a) Except as provided for in paragraph (b) of this section, when filler metal is used in a welded fabrication that is required to meet the requirements of this part the filler metal must be one that has been approved by the American Bureau of Shipping.

(b) In instances where a fabricator desires to use a filler metal which has not been approved by the American Bureau of Shipping the approval of the filler metal can be made by the Officer in Charge, Marine Inspection on the basis of the fabricator passing the weld procedure qualification tests as outlined in this part. This alternate means of approval applies to wire-gas and wire-flux combinations as well as to stick electrodes. Filler metal approvals given in this manner will extend only to the specific fabricator to whom they are granted.

[CGD 74-102, 40 FR 27460, June 30, 1975. Redesignated by CGD 88-032, 56 FR 35823, July 29, 1991]

Subpart 57.03—Procedure Qualifications

§ 57.03-1 General requirements.

(a) (Modifies QW 201 and QB 201). In order to obtain Coast Guard approval of a weld procedure to be used on welded fabrication that is required to meet the requirements of this part each manufacturer or contractor must do the following:

(1) Each manufacturer or contractor must submit to the cognizant Officer in Charge, Marine Inspection, for approval, a welding or brazing procedure specification for the particular welding or brazing process to be used. The welding or brazing procedure specification must include a sketch showing joint preparation. Suggested forms showing the information which is required in the welding or brazing procedure specification are in QW 480 and QB 480 of section IX of the ASME Code.

(2) Each manufacturer or contractor must submit to the cognizant Officer in Charge, Marine Inspection, for approval, the results of the physical tests required by section IX of the ASME Code.

(b) (Modifies QW 202.1 and QW 451). To obtain approval of the welding procedure, fabricators desiring to use any welding process for applications involving temperatures below -18 °C (approx. 0 deg:F) must conduct a procedure qualification test in accordance with the requirements of paragraph (a) of this section and the following additional requirements:

(1) The test piece must be large enough so that sufficient material is available for the tests prescribed in QW 451 of the ASME Code, plus toughness tests and a macro-etch specimen.

(2) To obtain approval the fabricator must conduct toughness tests and qualify in accordance with § 54.05 of the subchapter. Results of toughness tests must be submitted for approval to the cognizant Officer in Charge, Marine Inspection.

(3) The macro-etch specimen must be submitted with the test results required by paragraph (a) of this section. Macro-etch specimens must not be obtained by flame or arc cutting from the test piece. Weld reinforcement must remain in place unless the production welds are to be machined or ground. Backing rings must also be left in place unless they are to be removed in production.

(4) Low temperature procedure qualification thickness ranges are as indicated in Table 57.03-1(b).

TABLE 57.03-1(B)—LOW TEMPERATURE WELD PROCEDURE QUALIFICATION THICKNESS RANGES

Thickness, "t" of test plate or pipe as welded (inches)	Range of thickness of materials qualified by test plate or pipe (inches)	
	Minimum	Maximum
1/16 to 3/8, inclusive	1/16	3/8
Over 3/8 but less than 3/4	*3/8	3/4
3/4 to 3, inclusive	3/4	**t

*For thicknesses less than 5/8 inch, the thickness of the test plate or pipe is the minimum thickness qualified.

**Where "t" is the thickest material over 3/4 inch to be used in production.

(5) The limits for heat input production, as measured in Joules/inch, must be at or below the maximum heat input

applied to the procedure test plate. The word “maximum” must not be interpreted as either nominal or average.

(c) [Reserved]

(d) For quenched and tempered steels, the Commandant may prescribe special testing to assure that the welding procedure produces weldments which are not prone to low energy fracture through the heat affected zone.

(e) Welding procedures that utilize type E 6012, E 6013, E 6014, E 6024, E 7014, or E 7024 electrode will be approved only for the specific type, size, and brand electrode used. If a different type, size, or brand of electrode is used, a new procedure qualification test must be conducted.

(f) Welding or brazing procedure approvals cannot be transferred from one plant to another plant of the same company or from one company to another.

(g) (Modifies QW 253, QW 254, and QW 255). Item QW 402.4 is an essential variable for all procedure specifications.

[CGD 74-102, 40 FR 27461, June 30, 1975]

Subpart 57.04—Procedure Qualification Range

§ 57.04-1 Test specimen requirements and definition of ranges (modifies QW 202, QW 210, QW 451, and QB 202).

The type and number of specimens that must be tested to qualify an automatic, semiautomatic, or manual procedure specification shall be in accordance with QW 202, QW 210, or QB 202 of the ASME Code as applicable, except as

supplemented by §§ 57.03-1(b) and 57.03-1(d).

[CGD 74-102, 40 FR 27461, June 30, 1975]

Subpart 57.05—Performance Qualifications

§ 57.05-1 General.

(a) This subpart supplements the various paragraphs in section IX of the Code dealing with Performance Qualifications (see § 57.02-2).

[CGFR 69-127, 35 FR 9980, June 17, 1970]

§ 57.05-2 Transfer of performance qualifications.

(a) The performance qualification records of a welder may be transferred from one plant to another of the same company or from one company to another company provided the following requirements are met:

(1) The transfer is authorized by the cognizant Officer in Charge, Marine Inspection;

(2) A copy of the qualification test records of each welder together with employment records and identification data are transferred by the plant or company which qualified the welder to the new plant or company; and,

(3) The new plant or company accepts the welder as qualified.

§ 57.05-3 Limited space qualifications.

When a welder is to be qualified for welding or torch brazing of piping on board ship in a limited or restricted space, the space restrictions shown in connection with Figure 57.05-3(a) or (b) shall be used when welding and brazing the test joint.

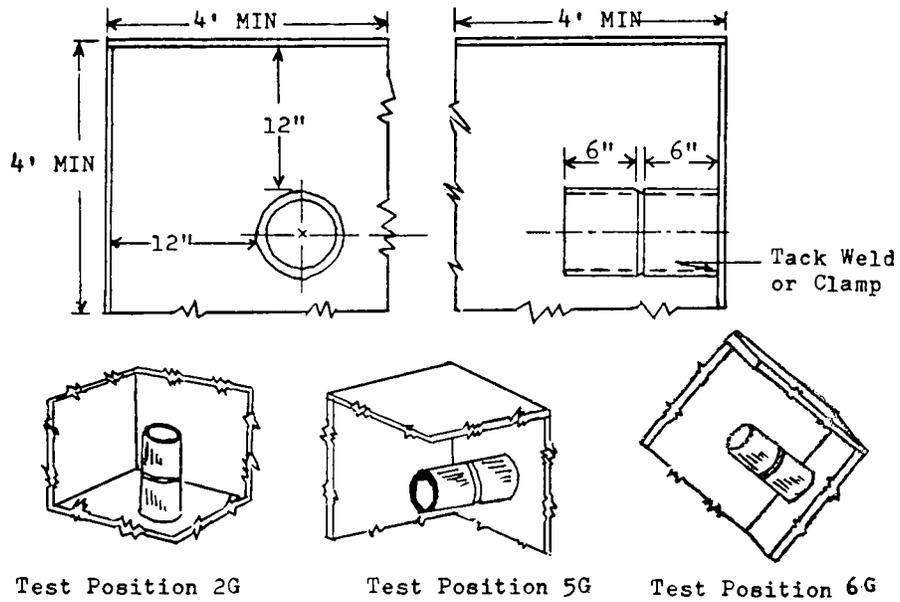


FIGURE 57.05-3(a)—Limited space restriction for pipe welding performance qualification.

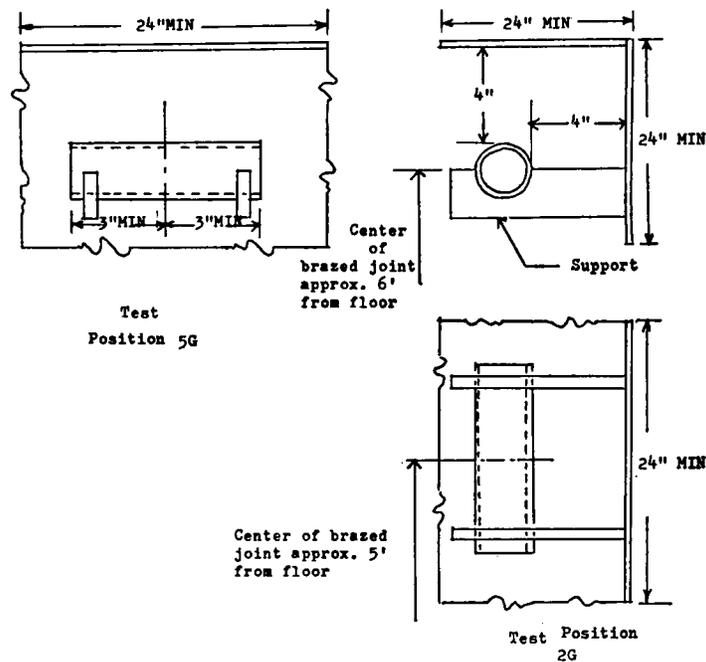


FIGURE 57.05-3(b)—Limited space restriction for pipe brazing performance qualification.
[CGFR 68-82, 33 FR 118872, Dec. 18, 1968, as amended by CGD 74-102, 40 FR 27461, June 30, 1975]

§ 57.05-4 Welder qualification by procedure tests.

Qualification tests of welders may be omitted for welders who weld satisfactory procedure qualification test assemblies as required by subpart 57.03.

§ 57.05-5 Low temperature application.

For low temperature application, each welder shall demonstrate his ability to weld satisfactorily in accordance with procedures qualified in accordance with § 57.03-1(b). Manual welding shall be qualified in the position prescribed by the procedure.

Subpart 57.06—Production Tests

§ 57.06-1 Production test plate requirements.

(a) Production test plates shall be provided for Class I, Class I-L, Class II, and Class II-L pressure vessels are specified in this section.

(b) Main power boilers shall meet the test plate requirements for Class I pressure vessels.

(c) Test plates are not required for heating boilers or Class III pressure vessels. Test plates are not required for main power boilers or pressure vessels constructed of P-1 material as listed in QW 422 of the ASME Code whose welded joints are fully radiographed as required by Part 52 or 54 of this subchapter as applicable except when toughness tests are required in accordance with § 57.06-5. When toughness tests are required all prescribed production tests shall be performed.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9980, June 17, 1970; CGD 72-206R, 38 FR 17229, June 29, 1973; CGD 74-102, 40 FR 27461, June 30, 1975; CGD 95-012, 60 FR 48050, Sept. 18, 1995]

§ 57.06-2

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§ 57.06-2 Production test plate interval of testing.

(a) At least one set of production test plates shall be welded for each Class I or Class I-L pressure vessel except as follows:

(1) When the extent of welding on a single vessel exceeds 50 lineal feet of either or both longitudinal and circumferential joints, at least one set of test plates shall be welded for each 50 feet of joint.

(2) When the extent of welding on vessels welded in succession exceeds 50 lineal feet of either or both longitudinal and circumferential joints, at least one set of test plates shall be welded for each 50 feet of aggregate joint of the same material where the plate thicknesses fall within a range of one-fourth inch. For each 50-foot increment of weld, test plates shall be prepared at the time of fabrication of the first vessel involving that increment.

(b) Production test plates for Class II-L pressure vessels shall be prepared as for Classes I and I-L vessels except that the provisions of paragraphs (a)(1) and (2) of this section are applicable to each 150 lineal feet of welded joint in lieu of each 50 lineal feet.

(c) In the case of Class II pressure vessels no more than one set of production test plates need be prepared for each 300 lineal feet of either or both longitudinal and circumferential joints. In the case of single vessel fabrication a set of test plates is required for each 300 lineal feet of weld or fraction thereof. In the case of multiple vessel fabrication where each increment of 300 lineal feet of weld involves more than one pressure vessel, the set of test plates shall be prepared at the time of fabrication of the first vessel involving that increment.

§ 57.06-3 Method of performing production testing.

(a) Except as otherwise specified in this section a test plate shall be attached to the shell plate on one end of the longitudinal joint of each vessel as shown in Figure 57.06-3, so that the edges of the test plate to be welded are a continuation of and duplication of the corresponding edges of the longitudinal joint. For attached test plates, the weld metal shall be deposited in the test plate welding groove continuously with the weld metal deposited in the groove of the longitudinal joint. As an alternate method, the marine inspector may permit the use of separate test plates, provided the same welding process, procedure, and technique employed in the fabrication of the longitudinal joint are used in welding the test plates.

(b) All test plates, whether attached to the shell or separate in accordance with paragraphs (a) and (d) of this section, shall be prepared from material of the same specification, thickness, and heat treatment and, for Class I-L and Class II-L vessels, the same heat as that of the vessel for which they are required. However, except when required to be from a specific heat, test plates may be prepared from material of a different product form, such as plate in lieu of a forging, provided the chemical composition is within the vessel material specification limits and the melting practice is the same.

(c) Test plates are not required for welded nozzle attachments.

(d) In the case of vessels having no longitudinal welded joints, at least one set of test plates shall be welded for each vessel, using the circumferential joint process, procedure and technique, except that the provisions of § 57.06-2(a) shall also apply for Classes I and I-L vessels, and that the provisions of § 57.06-2 (a) and (c) shall also apply for Classes II and II-L vessels.

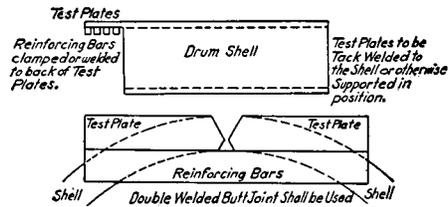


FIGURE 57.06-3.—(PW-53.2) Method of forming longitudinal test plates.

(e) Test plates shall be made by the same welder producing the longitudinal and circumferential joints. If more than one welder is employed in the welding of the pressure vessel(s), the test plates shall be made by the welder designated by the marine inspector. The test plates shall be of the same thickness as the material being welded and shall be of sufficient size to provide two specimens of each type required, except that in the case of pressure vessels having no longitudinal seams, the test plate need be only of sufficient length to provide one set of test specimens, and if a retest is necessary, an additional set of test plates may be welded separately.

§ 57.06-4 Production testing specimen requirements.

(a) For test plates three-fourths inch or less in thickness one reduced section tensile specimen and two free-bend specimens shall be tested. For plates exceeding three-fourths inch in thickness one reduced section tensile specimen, one free-bend specimen and one

guided side bend specimen shall be tested. In addition boiler drums of thickness five-eighths inch or greater shall have a tension test specimen of the weld metal as required by paragraph (f)(2) of this section. Toughness tests are required for Classes I-L and II-L pressure vessels as specified in § 57.06-5.

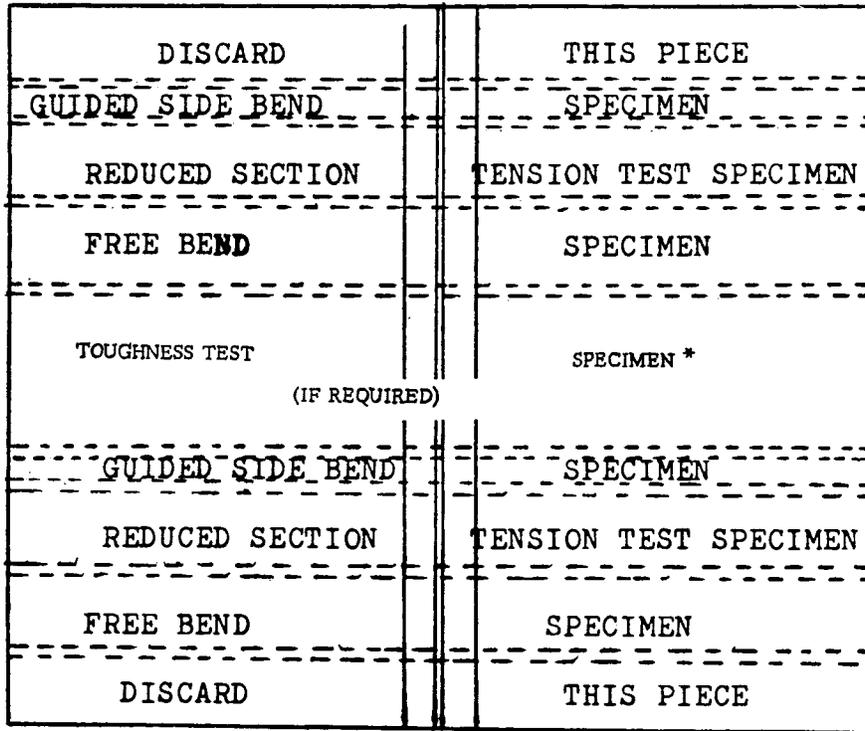
(b) The test plates shall be so supported that the warping due to welding shall not throw the finished test plate out of line by an angle of over 5°.

(c) Where the welding has warped the test plates, the plates shall be straightened before being stress-relieved. The test plates shall be subjected to the same stress-relieving operation as required by this subchapter for the pressure vessel itself. At no time shall the test plates be heated to a temperature higher than that used for stress-relieving the vessel.

(d) The bend specimens shall be taken from opposite sides of the reduced-section tensile specimen in their respective test plates as shown in Figures 57.06-4(d)(1) and 57.06-4(d)(2).

DISCARD		THIS PIECE
FREE BEND		SPECIMEN
REDUCED SECTION		TENSION TEST SPECIMEN
FREE BEND		SPECIMEN
TOUGHNESS TEST OR ALL WELD METAL (IF REQUIRED)		SPECIMEN 1 TENSION SPECIMEN
FREE BEND		SPECIMEN
REDUCED SECTION		TENSION TEST SPECIMEN
FREE BEND		SPECIMEN
DISCARD		THIS PIECE

FIGURE 57.06-4(d)(1).—Workmanship test plates for material three-fourths inch or less in thickness.



***WHEN CHARPY V NOTCH IMPACT SPECIMENS ARE REQUIRED, THE TEST PLATES SHALL BE NO SMALLER THAN TWO FEET ON A SIDE**

FIGURE 57.06-4(d)(2).—Workmanship test plates for material three-fourths inch or less in thickness.

(e) In submitting the samples for test the manufacturer shall state the minimum and maximum tensile range of the base metal.

(f) The external appearances of the welds and the amount of weld reinforcement shall conform to the requirements for fabrication, and the maximum reinforcement for the test plates shall not exceed the maximum permitted for construction.

(1) The tension-test specimen of the joint shall be transverse to the welded joint and shall be of the full thickness of the plate after the weld reinforcement has been machined flush. The form and dimensions shall be as shown

in Figure 57.06-4(f)(1)(i). When the capacity of the available testing machine does not permit testing a specimen of the full thickness of the welded plate, the specimen may be cut with a thin saw into as many portions of the thickness as necessary, as shown in Figure 57.06-4(f)(1)(ii) each of which shall meet the requirements. The tensile strength of the joint specimen when it breaks in the weld shall not be less than the minimum of the specified tensile range of the plate used. If the specimen breaks in the plate at not less than 95 percent of the minimum specified tensile range of the plate and the weld shows no sign

of weakness, the test is considered acceptable.

(2) Boiler drums fabricated of plate of thicknesses of five-eighths inch or greater shall have a tension-test specimen of the weld metal machined to form as shown in Figure 57.06-4(f)(2)

taken entirely from the deposited metal. The all-weld tension test specimen shall have a tensile strength of not less than the minimum of the range of the plate which is welded and shall have a minimum elongation in 2 inches of not less than 20 percent.

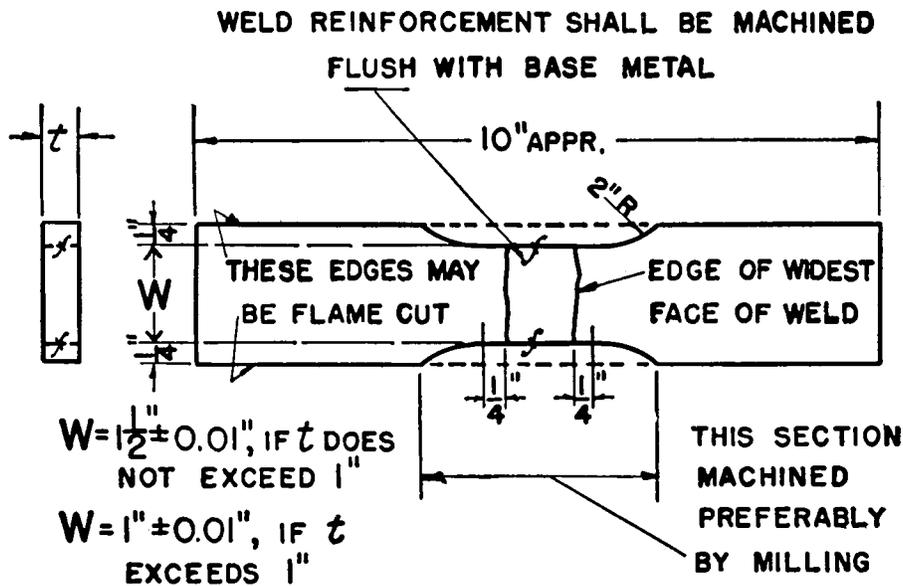


FIGURE 57.06-4(f)(1)(i).—(PW-53.1) Reduced-section test specimen for tension test of welded joint.

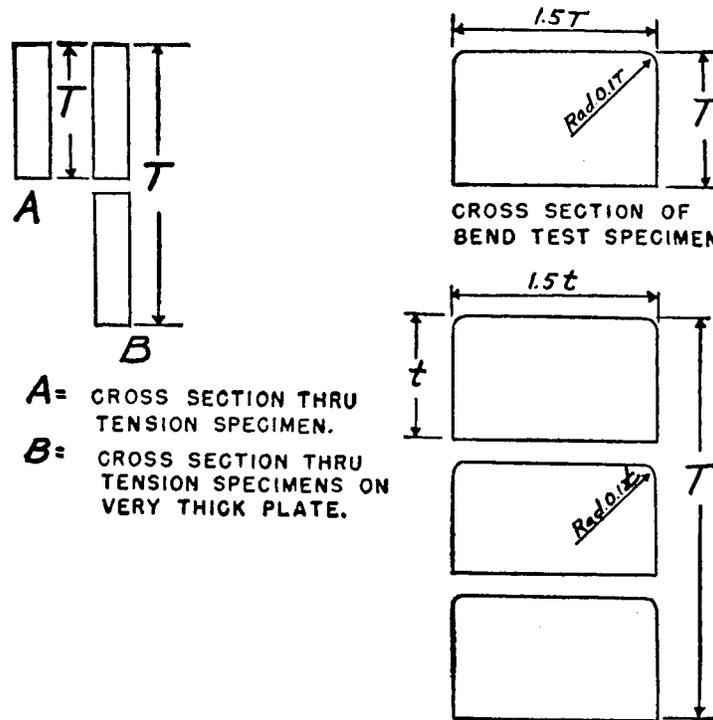


FIGURE 57.06-4(f)(1)(ii).—(PW-53.3) Cross section of bend-test specimens from very thick plate.

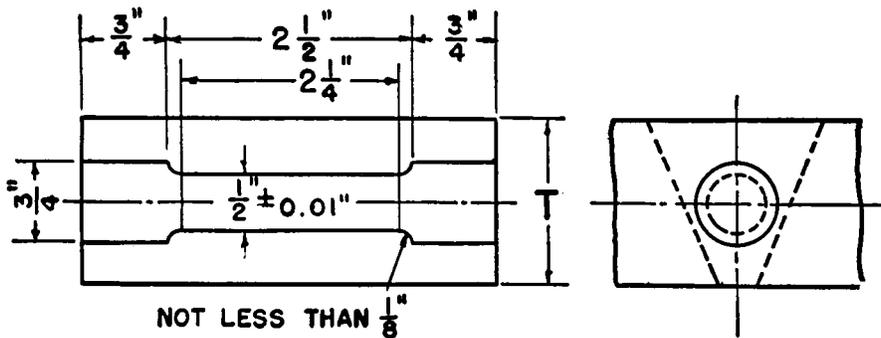
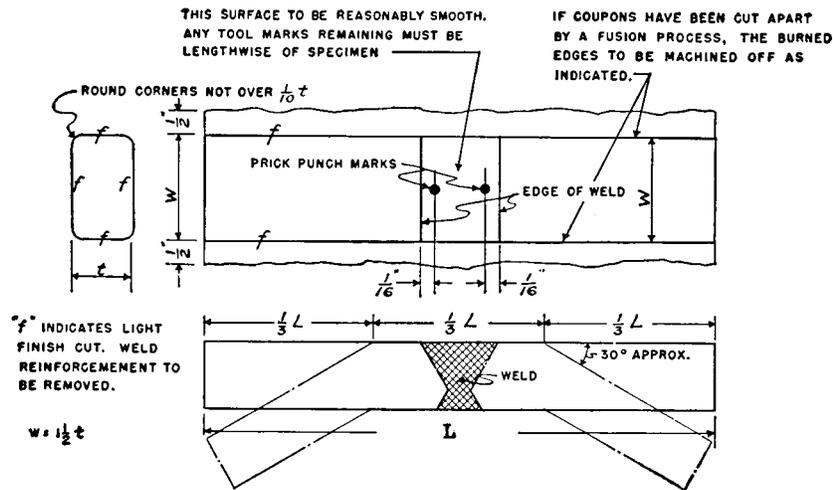


FIGURE 57.06-4(f)(2).—(PW-53.3) All weld metal tension-test specimen.

(g) The freebend specimens shall be of the form and dimensions shown in Figure 57.06-4(g). For plates of three-fourths inch or less in thickness one of the specimens shall be bent with the face of the weld in tension. Each freebend specimen shall be bent cold under freebending conditions until the

elongation measured within or across approximately the entire weld on the outer surface of the bend is at least 30 percent, except that for Class II and Class II-L pressure vessels, the minimum elongation shall be 20 percent. When the capacity of the available testing machine will not permit testing a full thickness specimen, the specimen may be cut with a thin saw into as many portions of the thickness as nec-

essary as shown in Figure 57.06-4(f)(1)(ii), provided each such piece retains the proportion of 1½ to 1, width to thickness, each of which shall meet the requirements. Cracks at the corners of the specimens or small defects in the convex surface, the greatest dimensions of which do not exceed one-sixteenth inch need not be considered as failures.



L (Approximate Minimum) = $3in. + 3V$
 V = Width of the Surface of the Weld

The Length of the Bend Specimen is Immaterial provided the Bend occurs at the Weld. The Minimum Length indicated is only Suggestive and is Not Mandatory.

FIGURE 57.06-4(g).—(PW-53.8) Specimen for free-bend test.

(h) The guided-bend specimen shall be bent with the side of the weld in tension, its width shall be equal to the full thickness of the plate and its thickness, after machining, shall be 0.350 inch to 0.380 inch to permit bending in a jig having the contour of the standard jig as shown in Figure QW 466.1, QW 466.2, or QW 466.3 of the ASME Code. The specimen shall withstand being bent cold to the full capacity of the jig without developing any crack exceeding one-eighth inch in any direction. Where the plate thickness

exceeds two inches, the specimen shall be cut in two so that each portion does not exceed 2 inches in width. Each such portion shall be tested and shall meet the requirements.

(i) One retest shall be made for each of the original specimens which fails to meet the requirements. Should the retests fail to meet the requirements, the welds which they represent shall be

chipped out, rewelded and new test plates provided.

[CGFR 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGFR 69-127R, 35 FR 9980, June 17, 1970; CGD 74-102, 40 FR 27461, June 30, 1975; CGD 80-004, 45 FR 10796, Feb. 19, 1980; CGD 95-012, 60 FR 48050, Sept. 18, 1995]

§57.06-5 Production toughness testing.

(a) In addition to the test specimens required by §57.06-4(a), production toughness test plates shall be prepared for Classes I-L and II-L pressure vessels in accordance with subpart 54.05 of this subchapter.

(b) For nonpressure vessel type cargo tanks and associated secondary barriers as defined in §38.05-4 of subchapter D (Tank Vessels) of this chapter, production toughness test plates shall be prepared in accordance with subpart 54.05 of this subchapter.

[CGD 68-82, 33 FR 18872, Dec. 18, 1968, as amended by CGD 72-206R, 38 FR 17229, June 29, 1973; CGD 95-012, 60 FR 48050, Sept. 18, 1995]

PART 58—MAIN AND AUXILIARY MACHINERY AND RELATED SYSTEMS

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Subpart 58.30—Fluid Power and Control Systems

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