

Welding of Boilers, Pressure Vessels and Pressure Piping

Repealed

by Chapter B-5.1 Reg 1 (effective January 1, 2007)

Formerly

Saskatchewan Regulation 61/78 (effective May 1, 1978)
as amended by Saskatchewan Regulation 16/79.

NOTE:

This consolidation is not official. Amendments have been incorporated for convenience of reference and the original statutes and regulations should be consulted for all purposes of interpretation and application of the law. In order to preserve the integrity of the original statutes and regulations, errors that may have appeared are reproduced in this consolidation.

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SASKATCHEWAN REGULATION 61/78

The Boiler and Pressure Vessel Act

REGULATIONS RESPECTING THE WELDING OF BOILERS, PRESSURE VESSELS AND PRESSURE PIPING

1 In these regulations, the expression:

- (a) “**Act**” means *The Boiler and Pressure Vessel Act, 1977*;
- (b) “**approved**” means approved by the chief inspector;
- (c) “**authorized**” means with authority recognized by and having the approval of the chief inspector;
- (d) “**A.N.S.I.**” means the American National Standards Institute;
- (e) “**A.P.I.**” means the American Petroleum Institute;
- (f) “**A.S.M.E.**” means the American Society of Mechanical Engineers Construction Codes Section I to XI;
- (g) “**A.S.T.M.**” means the American Society for Testing Materials;
- (h) “**A.W.S.**” means the American Welding Society;
- (i) “**chief inspector**” means the chief inspector appointed under the Act;
- (j) “**C.S.A.**” means the Canadian Standards Association;
- (k) “**department**” means the Department of Labour;
- (l) “**inspector**” means an inspector appointed under the Act;
- (m) “**person**” means the owner, company or engineering agency in charge of construction or fabrication and includes a manufacturer, association, corporation, firm, partnership and syndicate;
- (n) “**pressure piping**” means piping connected or used in connection with any boiler or pressure vessel and includes piping as specified under section 8 of these regulations;
- (o) “**pressure welder**” means a person qualified under Section IX of the A.S.M.E. Code and these regulations;
- (p) “**pressure welder’s certificate**” means the certificate of competency issued by the department to the welder on successful completion of a weld test;
- (q) “**refrigerant**” means any substance used to produce refrigeration by its expansion or vaporization as provided for in C.S.A. B52 code;

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- (r) “**registered**” means registered by the department;
- (s) “**symbol**” means letters or figures or a combination of same issued to a qualified pressure welder;
- (t) “**welding**” means pressure welding as defined in Section IX of the A.S.M.E. Code;
- (u) “**welding procedure**” means a procedure compiled by the manufacturer or his representative outlining in detail the manner in which any welding is to be performed, and approved by the chief inspector and registered;
- (v) “**welding test**” means the test of a welder’s ability to weld according to the procedures as outlined in these regulations and as approved.

23 Mar 78 SR 61/78 s1.

APPLICATION AND SCOPE

2(1) These regulations apply to all welding pertaining to the construction, fabrication, alteration or repair of any boiler, pressure vessel or pressure piping, and all such welding shall conform strictly with the requirements of these regulations and with the A.N.S.I. and A.S.M.E. codes.

(2) All welding will be subject to 100% X-ray, but this amount may be reduced at the discretion of the chief inspector or his representative depending on the consistent good quality of the welding.

23 Mar 78 SR 61/78 s2.

MANUFACTURERS AND CONTRACTORS RESPONSIBILITY

3(1) Every manufacturer, contractor, installer, welding shop operator or other person who welds or employs any person to do any welding upon any boiler, pressure vessel or pressure piping shall:

- (a) be responsible for the quality of the welding done thereon by him or his welders; and,
- (b) formulate a welding procedure and have such procedure registered. This procedure, if formulated in Saskatchewan, shall be tested and approved and if formulated outside the boundaries of this jurisdiction, the procedure must be tested and approved by the jurisdiction concerned and notification of same submitted to this department;
- (c) arrange with the chief inspector for a qualification test of every welder to be employed using an approved procedure and conducted by an authorized inspector;

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- (d) issue to any pressure welder in his employ a symbol for stamping his work and notify the department to whom such symbol is issued.
- (2) The department shall issue symbols to pressure welders who are self employed;
- (3) No welding shall be done upon any boiler, pressure vessel or pressure piping unless the above requirements respecting procedure tests and pressure welder qualification tests, including tests of welding machine procedures and welding machine operators where used, have been complied with and certified data respecting all such tests have been submitted and approved.
- (4) Every manufacturer, contractor, installer, welding shop operator or other person who employs any person to do welding upon any boiler, pressure vessel or pressure piping shall be responsible for the stamping of all such welding by the pressure welder with his allotted symbol in accordance with these regulations.

23 Mar 78 SR 61/78 s3.

WELDER'S RESPONSIBILITY

- 4(1) No person shall weld upon any boiler, pressure vessel or pressure piping within Saskatchewan unless such person is the holder of a valid pressure welder's certificate issued by the department.
- (2) No person shall weld by any procedure or position for which he has not been qualified in accordance with these regulations.
- (3) No person shall make any welded repairs upon any boiler, pressure vessel or pressure piping unless such welding is in accordance with these regulations.
- (4) Every person holding a valid pressure welder's certificate shall apply to the department within twelve months of the issue date thereof for an annual retest.
- (5) Where such application in subsection (4) has been made and the department is unable to administer a retest, the pressure welder, upon receipt in writing from the chief inspector, may continue to do pressure welding until notified of a date for retest. This continuation shall not extend beyond six months of the expiry date of his pressure welder's certificate.

23 Mar 78 SR 61/78 s4.

PRESSURE WELDER'S QUALIFICATION TESTS

- 5(1)(a) Pressure welders basic qualification tests shall be as outlined in these regulations and designated P1-F3 procedures by A.S.M.E. code.
- (b) All other higher level tests shall be conducted as outlined in section IX of the A.S.M.E. code and these regulations, and the pressure welder to be tested must hold a valid P1-F3 basic certificate.
- (2) (a) For an annual retest a welder may be tested P1-F3, P1-F3 and 4 or P1-F4.

- (b) All P1-F3, P1-F4 or P1-F3 and 4 pressure welder's qualification tests shall be made on 6" (15 cm) A-106B schedule 80 pipe or equivalent. Semi and fully automatic welding tests shall be made on plates 24" (0.6 m) long.
- (3) The test nipples needed for tests in subsection (2) will be supplied by the department at cost, if required.
- (4) (a) Where a person fails a coupon in his first qualification test to become a pressure welder it will be considered a complete failure and he will have to wait one month before a retest.
- (b) On an annual retest if a pressure welder fails one coupon in one position an extra coupon shall be cut in the position failed and if it passes, the pressure welder's certificate will be renewed.
- (c) Where a pressure welder fails the extra coupon a complete retest will be required at a time set by the inspector.
- (5) The pressure welder's certificate issued as a result of successfully passing the test will be valid for twelve months subject to section 4(5) and subsection (6) hereof.
- (6) A welder may be requested at any time to take a test if he is suspected of losing his proficiency.
- (7) Persons testing for semi or fully automatic welding will not be required to hold a Saskatchewan pressure welder's certificate. Upon successful completion of the test they will be issued a certificate specifying the kind of welding they are authorized to perform.
- (8) Every application for a pressure welder's qualification test shall be subject to the approval of the inspector or chief inspector. The basis on which such approval will be granted shall be:
- (a) the possession of a valid journeyman welder's certificate; or
- (b) three years experience as a welder and this experience to be verified by letters or affidavits on official stationery or in a manner acceptable to the inspector or chief inspector.
- (9) Inspection of test welds will be by face and root bending and by visual examination as follows:
- (a) the root pass shall not have excess penetration or burn through;
- (b) the finish pass shall be neat and uniform in width without undercut or excessive overhang.
- (10) Out of province welders upon submission of proof of holding a valid pressure welder's certificate or a valid journeyman welder's certificate as referred to in clause (a) of subsection (8) hereof shall be considered eligible for a basic P1-F3, test. This test will be passed successfully before being allowed to test at a higher level.
- (11) (a) Notwithstanding subsection (10) above, out of province welders who hold valid pressure welder certificates issued by another province and who are coming to Saskatchewan to work on large special projects may qualify for a restricted certificate by taking employer procedure test(s) only and on successful completion of these tests the welder will be issued a special restricted certificate which will allow him to weld that procedure for that employer only.

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(b) The limitations of this special restricted certificate shall be annotated thereon.

(c) This special restricted certificate will expire on the termination of the project or twelve months, whichever occurs first, and the holder of such a certificate shall requalify by retesting or the chief inspector, may, in his discretion, reissue the certificate based on x-ray examination of his welds.

23 Mar 78 SR 61/78 s5; 26 Jan 79 SR 16/79 s1
and s2.

STAMPING OF WORK

6(1) Every welder qualified under these regulations shall stamp his symbol upon all work done by him in the following manner:

(a) on new work including pressure piping, at three foot (1 m) intervals along all seams and joints and on each separate weld;

(b) on repair work at twelve inch (0.3 m) intervals along all seams and joints and on each separate weld. On boiler tubes and special jobs where symbols cannot be used a record of welders doing such welding shall be kept and submitted to the department.

(2) No work is to be covered or insulated until inspected by an inspector and the above stamping shall be readily visible.

(3) Where for any reason a pressure welder's certificate is cancelled or has expired, no further use shall be made by the welder or his employer of his assigned symbol or pressure welder's certificate. The pressure welder's certificate and his assigned symbol shall be surrendered forthwith to an inspector or be forwarded to the department.

(4) Where a welder qualified outside the province welds on boilers, pressure vessels or pressure piping for use in the province the use of his assigned symbols and the stamping of his work shall meet the requirements of this section.

(5) A person's pressure welder's certificate shall be cancelled if he:

(a) fails to stamp his work with the symbols assigned him;

(b) stamps work not performed by him;

(c) allows another person to use his assigned symbols;

(d) consistently does poor pressure welding.

23 Mar 78 SR 61/78 s6.

REPAIRS TO BOILERS, PRESSURE VESSELS AND PRESSURE PIPING

7(1) No welded repairs shall be made upon any boiler, pressure vessel or pressure piping unless:

(a) the welder is the holder of a valid all position pressure welder's certificate signed by the chief inspector;

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- (b) permission is first obtained for the repair from the chief inspector or his representative;
 - (c) upon completion of the repair the department shall be notified and an inspection made before the repaired unit is returned to service.
- (2) No welded repair shall be made upon any boiler, pressure vessel or pressure piping where such welding is required by the A.S.M.E. code to be stress relieved and x-rayed except it be done in accordance with an approved procedure and under such conditions as meet all A.S.M.E. code requirements and are satisfactory to the chief inspector.
- (3) No welded repair shall be made on any boiler, pressure vessel or pressure piping by other than electric arc process and under no circumstances shall any welding be done on any boiler, pressure vessel or pressure piping which is under pressure.

23 Mar 78 SR 61/78 s7.

CLASSIFICATION OF PRESSURE PIPING

8 The following piping shall be considered pressure piping subject to all the requirements of these regulations:

- (a) steam piping of any size or pressure;
- (b) water piping to carry hot water at more than 150°F (66°C);
- (c) piping to carry refrigerants, anhydrous ammonia, propane or similar gases;
- (d) air piping larger than 1 inch (2.5 cm) nominal pipe size;
- (e) oil piping larger than 1 inch (2.5 cm) nominal pipe size to carry hot oil at more than 150°F (66°C);
- (f) pipe headers and other piping used directly in connection with any oil field vessel;
- (g) any other piping used in connection with or as a part of, a boiler, pressure vessel or pressure piping installation and classified as pressure piping by the chief inspector.

23 Mar 78 SR 61/78 s8.

WELDING OF PRESSURE PIPING

9(1) Any welding of pressure piping shall conform to these regulations and the inspector shall satisfy himself that:

- (a) the welder holds a valid pressure welder's certificate for the procedure used;
- (b) the procedure to be used has been properly established and registered;

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- (c) any test witnessed by him is acceptable for proving both the qualification of the welder and correctness of the procedure; or
 - (d) where separate tests are necessary to establish welder qualification and procedure correctness, especially where piping or weld metal is of alloyed material, that these separate tests are performed.
- (2) All pressure piping shall, if three inch (7.6 cm) or larger nominal pipe size, be welded by the electric arc process.
- (3) Where steel pipe lighter than schedule 40 is used as pressure piping it shall be of welded fabrication with no threaded joints used and in no case shall a working pressure of less than 100 p.s.i.g. (690 kPa) be used in calculating its required thickness by the applicable A.N.S.I. code formula.
- (4) Where steel piping lighter than schedule 80 is used for steam above 200 p.s.i.g. (1380 kPa) or for water having a temperature of 220°F (104°C) or more and above 100 p.s.i.g. (690 kPa) such piping shall be of welded fabrication with no threaded joints used. Schedule 40 pipe having threaded joints may be used for steam up to 200 p.s.i.g. (1380 kPa).
- (5) Seal welding of threaded joints may be used when approved by the inspector but shall not be considered as contributing to the strength of the joints.
- (6) Thickness of pipe to be used in any installation shall be determined by the applicable formula of the A.N.S.I. Pressure Piping Code and electrodes or filler metal shall conform to the requirements of Section IX of the A.S.M.E. code and have an acceptable A.W.S.–A.S.T.M. designation approved by the American Welding Society for the class of work to be performed.
- (7) Welding of branch connections, fittings and flanges shall meet all the requirements of the A.N.S.I. Pressure Piping Code and these regulations.
- (8) Where backing rings are used they shall be thoroughly fused with the pipe while welding and shall be of a material similar to the pipe being welded. In no case shall backing rings have a sulphur content in excess of 0.05 percent.
- (9) Ends of all piping to be welded shall be bevelled to an angle of approximately 37.5° and shall be thoroughly cleaned of all rust, grease, paint, scale, slag or other foreign materials.
- (10) Visual inspection of welds shall comply with the following:
- (a) root pass shall not have excess penetration or burn through;
 - (b) the finished weld shall be neat and uniform in width without undercut or excessive overhang.
- (11) No two beads shall be started at the same location and extreme care shall be taken to obtain full root penetration with the first bead with a minimum of weld material projecting within the pipe.
- (12) Piping before being welded shall be carefully aligned so that no part is offset with respect to an adjacent part after welding by more than 0.2 of the pipe thickness and, the finished weld shall have a reinforcement of not less than 1/16 inch (1.6 mm) nor more than 1/8 inch (3.2 mm) the width of the weld with no undercuts at the edges of the weld.

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(13) When tack welds are used they shall be made by an authorized pressure welder in accordance with the approved procedure or shall be removed during the welding operation.

(14) Preheating and stress relieving shall be done in accordance with procedures outlined in the A.S.M.E. codes.

(15) No welding shall be performed when the metal temperature is below 0°F (-18°C) and when the metal temperature is between 0°F (-18°C) and 32°F (0°C) the area adjacent to the required weld shall be heated to approximately 70°F (21°C) before welding. No piping shall be welded during rain, snow or high wind unless the work and the welder are protected therefrom.

23 Mar 78 SR 61/78 s9.

INSPECTION OF PRESSURE PIPING

10(1) All pipe welds, unless otherwise approved by an inspector shall be hydrostatically tested to one and one half times the working pressure in accordance with the A.N.S.I. and A.S.M.E. codes.

(2) All pipe welds shall be subject to examination by x-ray.

(3) Testing methods shall be in accordance with the A.N.S.I. Pressure Piping Code and the A.S.M.E. Code.

23 Mar 78 SR 61/78 s10.

INSPECTION GENERAL

11(1) For the purpose of these regulations an inspector may:

(a) exercise any powers authorized by Section 7, Section 24 or any other applicable section of the Act where deemed necessary;

(b) inspect or re-inspect any boiler, pressure vessel or pressure piping which is being constructed, altered or being repaired by welding or subject it or require it to be subjected to any hydrostatic test, x-ray examination, or any other test which in his opinion is necessary to determine the safety thereof;

(c) require any welding removed which in his opinion does not meet all the requirements of these regulations;

(d) seal any boiler, pressure vessel or pressure piping welded by a welder not holding a valid pressure welder's authorization meeting the requirements of these regulations or welded contrary to an approved procedure or without an approved procedure or which in any other manner violates the requirements of these regulations or the Act.

23 Mar 78 SR 61/78 s11.

WELDING OF PIPE-LINES

12 The testing of welders and of procedures by department inspectors for the welding of pipelines not subject to the requirements of *The Boiler and Pressure Vessel Act, 1977*, may be arranged with the chief inspector who together with the contractor, engineering agency or other body responsible for the pipe-line construction shall specify the standard to be used for such tests which as far as is practicable shall be in accordance with A.N.S.I. Code B31 series. In such tests the contractor, engineering agency or other body shall supply all test materials.

23 Mar 78 SR 61/78 s12.

13 The appendices hereto numbered 1 to 4 shall be deemed to form part of these regulations.

23 Mar 78 SR 61/78 s13.

APPENDIX I

INFORMATION RESPECTING WELDERS QUALIFICATION TESTS

1 A welder must be tested in all methods and types of welding and for every position in which he will be required to weld, provided that if a welder successfully passes a butt weld test an inspector may in his discretion waive the requirements for a fillet weld test for the same position.

2 A welder must qualify for all positions before an authorization can be issued him for welding pressure piping in fixed position.

3 Test welds upon 3/8 inch (9.5 mm) thick material qualifies a welder to weld material to 3/4 in (19 mm) thickness by the electric arc process. Test welds for qualifying a welder to weld material thicker than 3/4 inch (19 mm) shall be upon material of the maximum thickness to be welded except that no test weld need exceed 1 inch (2.5 cm) in thickness. For gas welding this maximum thickness for which a welder is qualified shall be that of the test coupons.

4 Every test shall be witnessed by an authorized inspector who shall stamp each coupon to denote the test position. All stamping shall be done upon the face side and a punch mark shall be stamped on the ground edge of each coupon to denote the centre of the weld.

5 The various welding positions for test specimens and the procedure for cutting coupons from same are shown in the A.S.M.E. Welding Code.

NOTE: Total length of welded test specimens should not exceed 8 1/2 inches (21.6 cm).

6 Weld test specimens are to be flame cut to coupons 1 inch (2.5 cm) wide and all excess weld material must be ground off by the welder. Care should be taken that coupons are not ground excessively so as to reduce their thickness.

- 7** Successive layers deposited during weld test may be chipped or otherwise cleaned. Defects made during weld test may be removed by chipping, grinding or any other approved manner provided such corrections are made from the face side only of the test specimen. Stops and starts are not considered to be defects but they may be ground on stainless steel tests only.
- 8** Test coupons will be given root bend, face bend, elongation and nick break tests by the department.
- 9** Bend tests which show any crack, opening, or other defect exceeding 1/8 inch (3.2 mm) measured in any direction, shall be considered as having failed, provided that small cracks (not slag or gas pockets) occurring on the corners of test coupons shall not be considered.
- 10** Nick break tests shall show complete penetration and absence of slag inclusions, gas pockets, unwelded metal or crystallization.
- 11** A registered welder if changing his place of employment, should notify the department before undertaking any pressure welding for his new employer. The department will then determine whether he shall or shall not be required to undergo a retest and whether he may use the symbol previously allotted or if he shall be issued a new symbol.
- 12** A welder's certificate expires one year from date of issue at which time he shall apply to the department for an annual retest.

23 Mar 78 SR 61/78 app.1.

APPENDIX 2

SUGGESTIONS, ETC., TO PRESSURE WELDERS

- 1** Always use electrodes of the same classification as was used during qualification test such as E-6010 or E-6011 and preferably the same make of electrode.
- NOTE:** If necessary to use electrodes of a different classification contact the department as a retest may be required.
- 2** Make a study of the metals used in the construction of boilers, pressure vessels and pressure piping and the best procedure to follow in order to make sound welds with a minimum of residual or locked in stresses.
- 3** Learn the proper definitions as used in the codes relating to pressure welding so that when working from blueprints or specification sheets the correct procedure will be followed.
- 4** Remember that all pressure welds should be as good as the welds made at the time of qualification test. If they are not, you immediately become subject to retest, which you may fail if you have become careless or neglectful in your work, or to cancellation of your registration.

5 A welder should make full use of every facility provided by his employer or other person having authority, to make all pressure welds as good as the welds made by him at the time of his welding test. Where he is unfairly handicapped in this respect by not being furnished with proper material, equipment, scaffolding or help where necessary, he should report such conditions to an inspector or the department.

23 Mar 78 SR 61/78 app. 2.

APPENDIX 3

POINTS ON WELDING PROCEDURE

The following points are listed as being very important in the process of pressure welding.

- 1** See that joint preparation is correct as to bevel and depth of groove also that plate edges to be welded are clean of all oil, grease, scale or rust.
- 2** Make sure electrode is of correct AWS-ASTM specification and that correct polarity is used.
- 3** Where a procedure has been established, the welding technique, electrode sizes, mean voltage and currents used, should be substantially the same as the determined procedure.
- 4** Before proceeding with the first pass on butt joints ascertain if it is to be a single-welded, or double-welded joint. If single-welded, full penetration with slight build-up upon reverse side must be obtained with first pass.
- 5** On double-welded butt joints the underside of the welding groove must be chipped out to sound metal before proceeding with reverse side weld which must penetrate the weld metal previously deposited from face side. Use a round nose tool for chipping.
- 6** Butt type joints must be built up at the centre of the weld on each side of the plate by at least 1/16 inch (1.6 mm) except for plates 1/4 inch (6.4 mm) or less which require to have a build-up of not more than 25 per cent of the plate thickness. There shall be no valley, groove or undercutting along the edge of the weld.
- 7** Particular care should be taken where fillet welds are used to secure complete fusion at the root of the fillet and proper penetration of the parent metal.
- 8** Don't weld over tack welds, chip them out.
- 9** When starting or breaking arc see that gas pockets or flux are not trapped in the weld. If in doubt chip out a little at the starting and finishing point to assure thorough fusion with the weld metal previously deposited.
- 10** Clean each bead before depositing the next one by chipping and brushing.
- 11** Remove all defects that appear on the surface of any bead by chipping out, melting out, by grinding or flame gouging. Do not cover them up or remove them by peening. Peening is permissible but its purpose is to relieve residual stresses, not to remove defects.

12 Allow a reasonable interval of time between depositing successive beads to avoid the formation of gas pockets and excessive residual stress.

13 Preheat metals exposed to freezing temperatures before welding and learn the technique of proper local stress relieving so that when necessary, residual or locked-in stresses can be removed and not simply transferred from one point to another.

14 Stamp all welds with allotted symbol in accordance with the regulations.

23 Mar 78 SR 61/78 app. 3.

APPENDIX 4

PIPE-LINE WELD TESTS

GENERAL

1(1) Welders tests for the welding of pipe-lines as provided for in the Regulations Respecting the Welding of Boilers, Pressure Vessels and Pressure Piping shall be as agreed upon between the chief inspector and the company's representative, or engineering agency and shall be substantially in accordance with the requirements of A.N.S.I. Code B31 and A.P.I. Standard.

(2) Welders to be qualified shall be required to make a position weld using pipe nipples of the same diameter group, wall thickness group and specification as the pipe used in the line, using electrodes having an AWS-ASTM designation of the same type and size proven by procedure tests.

(3) The welder when undergoing a weld test, in addition to being supplied the correct pipe specimens, electrodes, etc., shall use essentially the same welding technique and approximately the same welding speed and machine setting as he will be required to use in his work.

(4) Where a welder is to be used as a utility welder for fabrication of pipes in various positions he shall in addition to the above test be tested in the horizontal position and may be required to further demonstrate his ability by fabricating a tee or other structure if believed necessary by the inspector or the company's representative.

(5) Where a welder will be employed on compressor station or pump station piping he shall be tested for all positions in accordance with the regular test requirements of these regulations.

COUPONS

2(1) Coupons may be flame cut from weld test specimens and shall have an approximate and minimum width of 1 inch (2.5 cm). They shall be taken from equidistant spacing around the pipe. The number of coupons shall depend upon the size of the pipe in accordance with the following:

For pipe 4 1/2 inch (11.5 cm) outside diameter	4 coupons
For pipe 6 5/8 inch (16.8 cm) to 12 3/4 inch (32.4 cm) inclusive	8 coupons
For pipe 14 inch (35.5 cm) and larger	12 coupons

(2) The coupons shall be subjected to a Tensile Test, a Nick-Break Test and a Bend Test in accordance with the following table, provided that where the inspector and the company's representative are agreed either the Tensile Test or the Bend Test may be waived in special cases. Bend Test coupons after bending may also be used for Nick-Break Tests if desired.

<i>Number of Coupons</i>	<i>Tensile</i>	<i>Nick-Break</i>	<i>Root Bend</i>	<i>Face Bend</i>
4	2	2		
8	2	2	2	2
12	4	4	2	2

NOTE: For 8 inch (20.3 cm) pipe where the thickness of the pipe does not fit the guided bend test jig nick-break coupons may be increased and bend test coupons reduced.

NOTE: Some high tensile pipe such as A.P.I. 5LX may not bend 180° because of insufficient ductibility.

3(1) Coupons shall be prepared by grinding or machining so that they are free from notches or other unevenness which may effect their point of rupture. The weld reinforcement need not be removed.

(2) If two or more of the coupons tested break in the weld, or at the junction of the weld and the parent metal, and also fail to develop the minimum specified tensile strength of the pipe metal the welder shall be deemed to have failed the test.

NICK-BREAK TEST

4(1) Nick-Break Test coupons shall be cut from weld test specimens as specified in 2(1) and no grinding or other preparation is necessary unless the coupons are also used for Bend Tests. They shall be notched with a hacksaw on both edges at the centre of the weld and after fracture shall have an approximate width of 1 inch (2.5 cm). They may be broken by any convenient method.

(2) The Nick-Break tests shall show complete penetration and fusion throughout the entire thickness of the weld coupon when broken and the welder shall be disqualified if defects in the exposed surface are in excess of the following:

- (a) six gas pockets per square inch (6.45 cm²) having a dimension not exceeding 1/16 inch (1.6 mm);
- (b) slag inclusions not exceeding 1/8 inch (3.2 mm) in width or 1/32 inch (0.8 mm) in depth and separated by at least 1/2 inch (12.7 mm) sound weld metal.

BEND TESTS

5(1) Coupons shall be cut from weld test specimens as specified in 2(1) and shall be ground smooth and flush with the base pipe metal on all sides. They shall be prick-punch marked on one edge to indicate the centre of the weld before bending also stamped when necessary to indicate their original position in the pipe weld. One half of bend test coupons shall be given a root bend test and one half a face bend test as specified in 2(2).

(2) If a crack or other defect exceeding 1/8 inch (3.2 mm) in any direction occurs in the weld metal or between the weld and the parent metal of any coupon during bending of 180°, the welder shall be deemed to have failed the test provided that cracks occurring along the edges of the coupon of less than 1/4 inch (6.4 mm) shall not be considered.

(3) In cases of high tensile pipe (API Standard 5LX) which may not bend to a full 180° because of lack of ductility and coupons fracture, the welder shall not be considered to have failed if the weld shows complete penetration and fusion throughout the entire thickness of the coupon and flaws in the weld do not exceed those allowed in a Nick-Break test as specified in 4(2).

VISUAL QUALIFICATION

6 A welders test shall be substantially free of cracks, inadequate penetration, burn through and other defects and it shall present a neat workmanlike appearance. An inspector may fail a welder whose weld test does not meet these requirements.

RETESTS

7 If in the mutual opinion of the inspector and the company's authorized representative, failure of a welder to qualify was because of unavoidable conditions or conditions beyond his control, such welder may be given a second opportunity to qualify. No further retest shall be permitted until such time has elapsed as the inspector believes necessary to enable the welder to obtain the required additional experience.

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