INTERNATIONAL STANDARD

ISO 7539-8

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Corrosion of metals and alloys — Stress corrosion testing —

Part 8: Preparation and use of specimens to evaluate weldments

Corrosion des métaux et alliages — Essais de corrosion sous contrainte —

Partie 8: Préparation et utilisation des éprouvettes pour évaluer les assemblages soudés

Reference number
ISO 7539-8:2000(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 7539 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 7539-8 was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*.

ISO 7539 consists of the following parts, under the general title *Corrosion of metals and alloys — Stress corrosion testing*:

— *Part 1: General guidance on testing procedures*

— *Part 2: Preparation and use of bent-beam specimens*

— *Part 3: Preparation and use of U-bend specimens*

— *Part 4: Preparation and use of uniaxially loaded tension specimens*

— *Part 5: Preparation and use of C-ring specimens*

— *Part 6: Preparation and use of pre-cracked specimens*

— *Part 7: Slow strain rate testing*

— *Part 8: Preparation and use of specimens to evaluate weldments*

— *Part 9: Preparation and use of pre-cracked specimens for tests under rising load or rising displacement*

Annex A of this part of ISO 7539 is for information only.

Corrosion of metals and alloys — Stress corrosion testing —

Part 8:
Preparation and use of specimens to evaluate weldments

1 Scope

This part of ISO 7539 covers the procedures available for stress corrosion testing of welded specimens and examines the additional factors which must be taken into account when conducting tests on welded specimens. In particular this part of ISO 7539 gives recommendations for the choice of specimens and test procedures to determine the resistance of a metal to stress corrosion when it is welded.

The term “metal”, as used in this part of ISO 7539, includes alloys.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 7539. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 7539 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 857-1:1998, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes.*

ISO 7539-2:1989, *Corrosion of metals and alloys — Stress corrosion testing — Part 2: Preparation and use of bent-beam specimens.*

ISO 7539-3:1989, *Corrosion of metals and alloys — Stress corrosion testing — Part 3: Preparation and use of U-bend specimens.*

ISO 7539-4:1989, *Corrosion of metals and alloys — Stress corrosion testing — Part 4: Preparation and use of uniaxially loaded tension specimens.*

ISO 7539-5:1989, *Corrosion of metals and alloys — Stress corrosion testing — Part 5: Preparation and use of C-ring specimens.*

ISO 7539-6:—[1], *Corrosion of metals and alloys — Stress corrosion testing — Part 6: Preparation and use of pre-cracked specimens.*

ISO 7539-7:1989, *Corrosion of metals and alloys — Stress corrosion testing — Part 7: Slow strain rate testing.*

IEC 60050-851 (1991-08), *International Electrotechnical Vocabulary — Chapter 851: Electric Welding.*

1) To be published. (Revision of ISO 7539-6:1989)

3 Terms and definitions

For the purposes of this part of ISO 7539 the following terms and definitions apply.

3.1
welding
operation which unites materials by means of heat or pressure, or both, in such a way that there is continuity in the nature of the materials which have been joined and in which filler metal, the melting temperature of which is of the same order as that of the parent metal(s), may or may not be used

NOTE This definition also includes surfacing.

[ISO 857-1]

3.1.1
fusion welding
welding involving localized melting without the application of force and with or without the addition of filler metal

[ISO 857-1]

3.1.2
arc welding
fusion welding in which heat for welding is obtained from an electric arc or arcs

[ISO 857-1; IEC 60050-851]

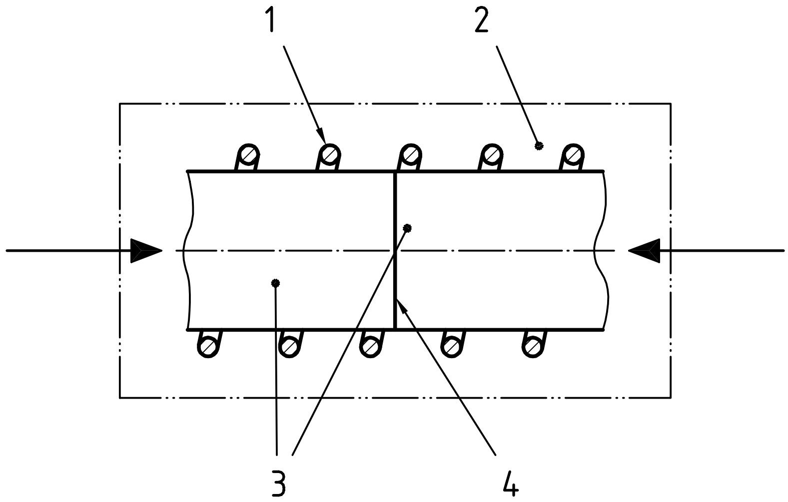
3.1.3
diffusion welding
pressure welding in which the workpieces are kept in contact under a specified continual pressure and are heated, either on their faying surfaces or in their entirety, at a defined temperature for a controlled time

NOTE 1 This process results in local plastic deformation and also, owing to the very close contact between the surfaces, the diffusion of the atoms through the interface. The end result is thus complete continuity of the material.

NOTE 2 The operation may take place in a vacuum, under a gas shield or in a fluid, preferably without the addition of a filler metal.

See Figure 1.

[ISO 857-1]



Key

1 Induction heating element

2 Work chamber

3 Workpiece

4 Weld

Figure 1 — Diffusion welding

3.2
arc voltage
voltage across the arc, including the anode and cathode voltage drop, measured as near as possible to the arc

[IEC 60050-851]

See annex A.

4 Special considerations for weldments

4.1 General

The factors given in this clause may all influence the corrosion and/or mechanical properties of a weldment relative to that of the parent metal and their effects may require consideration in stress corrosion test procedures. Whilst the considerations listed below are relevant to the more common fusion welding processes, similar consideration shall also be given to solid phase (non-fusion) welding processes and diffusion welding.

Weld regions are more likely than the parent metal to contain defects which may influence corrosion and stress corrosion behaviour, e.g. microcracking, lack of fusion and porosity. For this reason, examination of the weld shall be undertaken to assess whether the failure of any specimen is the result of pre-existing defects rather than stress corrosion.

It is recommended that the weldment be characterized with regard to residual welding stresses, surface condition and weld defects prior to testing. See clause 7.

4.2 Changes in microstructure

In fusion welding, the application of heat to a parent metal produces microstructural changes in the heat affected zone (HAZ) of the parent metal adjacent to the weld junction. A rapidly-cooled weld metal differs microstructurally and chemically from the parent metal and is more typical of a cast structure. These differences may influence both weldment corrosion and mechanical properties, as well as susceptibility to stress corrosion cracking.

Some alloys such as C-Mn steels display a visible HAZ. However, in some alloys, welding may also produce precipitation and segregation effects within the parent metal remote from the visible HAZ.

4.3 Non-metallic inclusions

In addition to changes in chemical composition, the welding procedure and conditions used may result in a weld metal with a non-metallic inclusion content and distribution different from that of the parent metal. This may influence weldment corrosion and stress corrosion cracking behaviour.

4.4 Stress concentration effects

Shrinkage stresses following welding will introduce residual welding stresses which will be both transverse and longitudinal with respect to the welding direction (and through thickness in thick-walled samples). Tensile stresses are usually generated at the weld, with balancing compressive stresses in the parent metal. In addition, weld geometry may cause further stress concentration effects.

5 Specimen types

5.1 General

The design and type of specimen used depend on the form of the metal from which the specimen is to be made and on the objective of the test.

The test specimens described in ISO 7539 parts 2-7 are suitable for tests on weldments, subject to the additional considerations presented in this part of ISO 7539. In addition, a number of other types of specimens, as described in 5.2.1 to 5.2.8 below, can be used.

Specimens can be prepared from weldments in the as-welded or post-weld heat-treated conditions. It is recommended that specimens be tested in the same condition of heat treatment as that of the intended application.

5.2 Types of specimen

5.2.1 Flat weldment

See Figure 2.

This type of weldment is applicable for all tension and bend specimens and for any welding procedure whether involving single- or multi-pass welds. The weldment may also be used to evaluate the effect of residual welding stresses.

5.2.2 Circular bead weldment

See Figure 3.

The welding procedure involves one circular bead deposit of weld metal. The circular weld develops residual welding stresses. It is applicable to any material form that can be machined to the recommended size as specified in Figure 3.

5.2.3 Bead-on-bar weldment

See Figure 4.

The longitudinal fusion welds at diametrically opposite positions on the bar develop residual welding stresses in the bar. Hence, this weldment can be used to evaluate the tendency for stress corrosion cracking of the parent metal. It is applicable to materials that can be machined to approximately 25 mm diameter.

5.2.4 Direct tension specimen

See Figure 5.

This specimen type is stressed in uniaxially loaded tension (see ISO 7539-4 and ISO 7539-7). Notches, with or without pre-cracks, may be introduced into the weld metal, parent metal or heat affected zone (see ISO 7539-6). These specimens also may be made exclusively from weld metal.

5.2.5 U-bend specimen

See Figure 6.

The U-bend specimen is applicable to any weldment that can be formed into a U-shape without mechanical cracking or localized bending in the heat affected zone (see ISO 7539-3). The bending operation after welding creates high levels of elastic and plastic strain resulting in a wide range of stresses in a single specimen. The presence of residual welding stresses makes this a particularly severe test procedure.

5.2.6 Bent-beam specimens

See Figure 7.

These specimens are machined from welded plate into rectangular bar with the welding direction normal to or parallel to the axis of the specimen (see ISO 7539-2). They can be loaded in 3-point or 4-point bending to measure the stress corrosion tendencies in the weld region.

5.2.7 Pre-cracked specimens

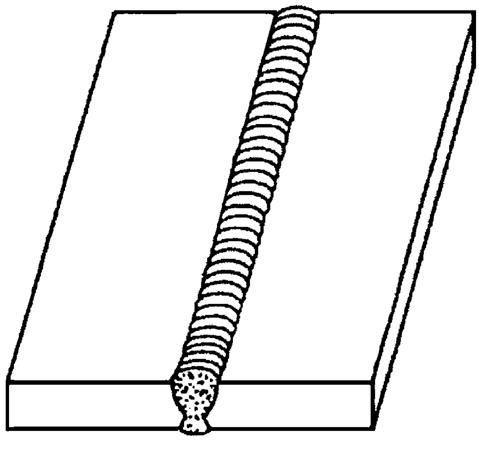
See Figure 8.

Pre-cracked specimens can be used to measure the tendency for stress corrosion cracking (see ISO 7539-6) in various parts of the weldment. Caution should be exercised in the interpretation and application of results for specimens where the stress corrosion cracks deviate from their expected path and the presence of residual welding stresses may affect the local stress intensity factor at the crack tip.

5.2.8 C-ring and slit-tube specimens

See Figure 9.

In the C-ring test (see ISO 7539-5), the stress is applied externally. In the slit-tubing test, the stress is applied by a wedge that is forced into the slit section. While any material form can be machined into a ring section, this test is specifically designed for tubing.

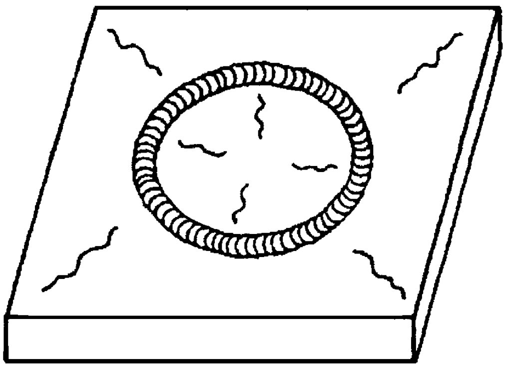


Procedure:

a) Discard weld ends.

b) Remove test sections as required. Sections may be taken across the weld or longitudinally with the weld.

Figure 2 — Flat weldment



Procedure:

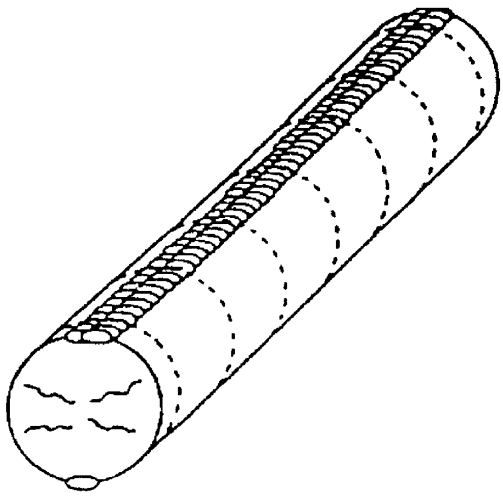
a) Specimen size: 100 × 100 × 3 mm.

b) Clamp or tack weld the edges of the test specimen to a base plate to obtain restraint.

c) Weld a 50 mm diameter circular bead using the selected weld procedure.

d) Examine both sides of specimen after exposure.

Figure 3 — Circular bead weldment



Procedure:

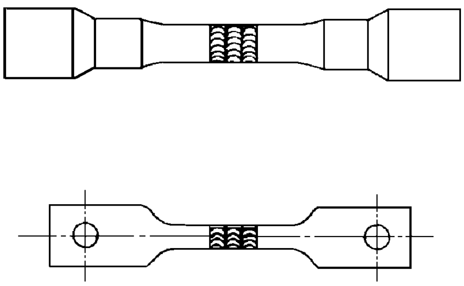
a) Specimen size: 25 mm diameter × 150 mm long.

b) Fusion weld entire length on opposite sides.

c) Discard 6 mm from ends and remove 20-mm test specimens.

d) Examine cross section for radial cracking.

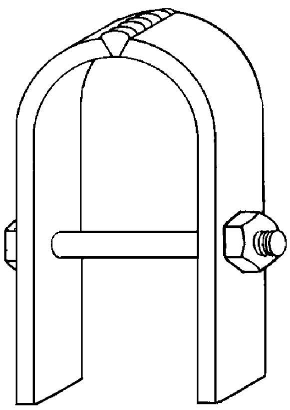
Figure 4 — Bead-on-bar weldment



Procedure:

a) Direct tension specimens to be machined directly from flat plate weldment (see Figure 2).

Figure 5 — Direct tension weldments

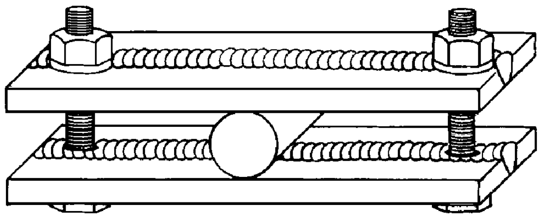


Procedure:

a) U-bend specimens to be machined directly from flat plate weldment (see Figure 2).

NOTE The welds may be oriented 90° to the direction shown.

Figure 6 — U-bend weldment



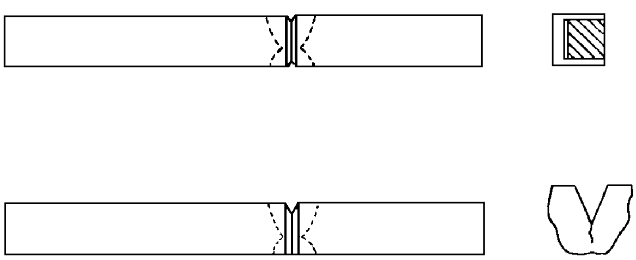
Procedure:

a) Bent-beam specimens to be machined directly from flat plate weldment (see Figure 2). Fulcrum should be notched so as not to contact weld bead.

b) Dimensions: as required.

NOTE The welds may be oriented at 90° to the direction shown.

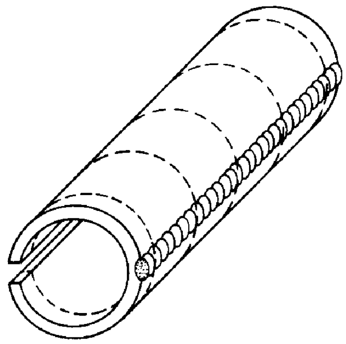
Figure 7 — Bent-beam weldment

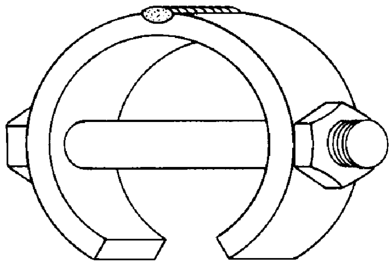


Procedure:

a) Specimens may be machined from flat plate weldment (see Figure 2) or K-weld (see Figure 10) or half K-weld preparations.

Figure 8 — Precracked cantilever beam weldment





NOTE It is also possible to deposit a circumferential weld.

Procedure:

a) Use plate, bar, tube or pipe of suitable size from which C-ring specimens can be machined.

b) Weld one side for the entire length before cutting slot. The weld bead may be applied in a 60° groove to obtain 100 % weld penetration or it may be applied on the surface only. Cut the slot after machining the plate or bar to form a tube.

c) Discard 6,4 mm on both ends and remove 25 mm long test specimens.

d) For slit-tubing test, machine a thin slit in the side opposite weld. Stress may be applied by forcing a wedge or block into the slit.

Figure 9 — Slit tubing and C-ring weldments

6 Preparation of weldments and test specimens

6.1 To ensure reproducibility of test results, all weld samples in a series shall be prepared under the same welding conditions and the welding procedure specification (WPS) shall be followed; e.g. for arc welding processes, where applicable the following information shall be specified.

— type of weld;

— parent metal condition and thickness;

— detail of weld preparation (angle of preparation, root gap, root face);

— welding consumable type, composition, diameter and method of drying;

— gas shield, composition and flow rate;

— parent metal type, manufacturer and heat number;

— welding process (e.g. submerged arc welding, GSAW, GTAW, etc.);

— test specimen preparation including welding conditions;

— number of passes;

— arc voltage;

— welding current;

— polarity (electrode positive or electrode negative);

— travel speed;

— sequence of weld passes;

— arc energy and/or calculated heat input;

— minimum and/or maximum preheat temperature (°C);

— minimum and/or maximum interpass temperature (°C);

— interpass delay;

— mode and pulse form (MIG welding);

— post weld heat treatment (PWHT) conditions;

— flux type and method of drying.

6.2 Unless specifically tested in the as-welded condition, samples shall be cleaned following welding in order to remove residual welding oxide or slag. Surface preparation of the sample shall be designed to reproduce, as closely as possible, that of the component of interest. Cleaning may be achieved by light grit blasting, abrasive brushing or acid pickling. With grit blasting, the use of clean, fresh grit is recommended and care should be taken to minimize the formation of compressive surface stresses. Cleaning by abrasive brushing should avoid surface contamination. Where chemical cleaning is carried out, preliminary trials are recommended to minimize associated attack of unscaled regions; furthermore, caution may be needed to avoid potential problems of hydrogen ingress, e.g., in high strength steels. Degreasing of the weldment is recommended in all cases.

6.3 Welds may also be prepared with both root and weld cap regions machined flush with the parent metal. This has the advantage of giving better reproducibility between samples and permitting a more accurate determination of outer fibre stress conditions, e.g., in bent-beam specimens. Where applied, machining shall be carried out carefully in order to avoid the introduction of additional surface stresses in the specimen. For pre-cracked specimens or slow strain rate specimens notched in specific weld areas, removal of the weld cap or root by machining is not required.

6.4 During preparation of test specimens by sectioning or machining of weld lengths, the residual welding stresses are reduced. However, the extent of reduction depends on sample size and configuration, and the level of residual welding stress may still be sufficient to affect test data. In compact tension specimens, for example, residual stresses may influence both threshold stress intensity factors and crack growth rates, as well as the shape of the crack front. Caution shall be exercised in relating results obtained with small specimens to large structures in which different residual welding stresses may be present.

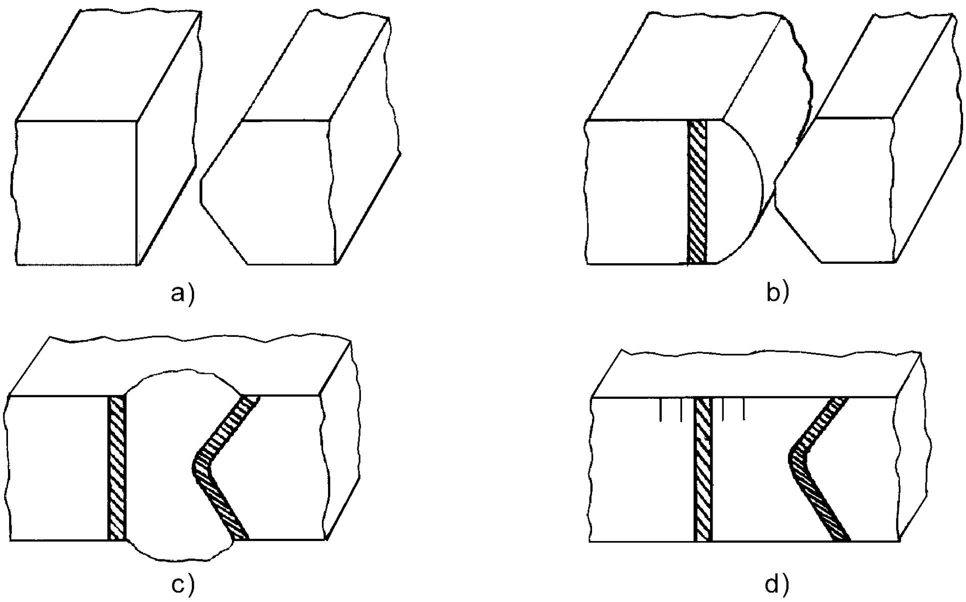
6.5 Reduction of residual welding stresses may be effected by post-weld heat treatment (PWHT) procedures. However, caution is necessary since microstructural changes associated with PWHT may also influence corrosion behaviour. Normally, PWHT of stress corrosion test samples would be carried out only where an assessment was to be made of a welded component used in the PWHT condition but subjected to external loads from service operation.

6.6 Test specimens for stress corrosion evaluation of weldments incorporate parent metal, heat affected zone (HAZ) and weld metal regions, although specimens comprised only of weld metal may also be readily prepared. To study the stress corrosion cracking resistance of HAZ regions alone, a sample configuration producing an approximately planar HAZ by multi-pass welding of thick plate is preferred. Such an HAZ may be produced using half-K or K preparation joints (see Figure 10). The HAZ may be subsequently notched and/or pre-cracked prior to testing.

6.7 An additional procedure for stress corrosion testing of HAZ regions is to use specimens which have been subjected to a heat treatment which produces a microstructure simulating that of HAZ material. This approach permits specimens of convenient shape to be tested, particularly as uniaxially loaded specimens or bent-beam specimens. Although such thermal simulation does not precisely represent the condition apparent in the HAZ of a weldment, it provides a useful technique for studying the influence of welding on parent metal behaviour. Where thermal simulation is applied, it should be based on heating and cooling cycles and time at temperature determined by preliminary measurements on full weld joint specimens using appropriately positioned thermocouples.

6.8 For slow strain rate testing of welded specimens, non-uniform straining of the sample is likely when samples are tested transverse to the welding direction and, for this reason, sample notching may be desirable in specific regions of the weldment. For the HAZ, the use of half-K or K preparation joints to produce an approximately planar region is recommended.

6.9 With uniaxially loaded tension specimens, samples are frequently loaded to a chosen percentage of the yield point of the parent metal. It should be recognized that, for a sample machined transverse to the welding direction, the load applied may represent a significantly different percentage of yield load for the weld metal or HAZ.



Procedure:

a) Double bevel groove butt-weld preparation.

b) Vertical face buttered with filler metal.

c) Weld joint completed with multiple passes of filler metal.

d) Joint machined and notched as required.

Figure 10 — K-weld preparation

7 Testing Procedures

7.1 Environmental considerations

7.1.1 Because of the specificity of metal/environment interactions, it is essential that the tests be conducted under controlled environmental conditions of direct relevance to the service application.

7.1.2 In addition to the chemical composition, conductivity and pH of the environment, its temperature, pressure and flow rate should simulate those encountered in service.

7.1.3 If tests are conducted in aqueous environments, the degree of aeration shall be controlled since this can influence the electrode potential of the metal and hence its stress corrosion properties. An alternative is to control the electrode potential of the specimen at an appropriate level (see ISO 7539-1).

7.2 Test exposure

7.2.1 Prior to exposure, examine the test specimen for the presence of cracks and weld defects.

7.2.2 Assemble the specimen in the loading system and place it in the environmental chamber.

7.2.3 Measures shall be taken to avoid galvanic effects between the test specimen and the loading system either by the use of similar metals for these components or by the use of electrical insulation.

7.2.4 In general the test environment should, where practicable, be introduced and time allowed for steady state conditions to be established prior to the application of load. Monitor and control environmental conditions during the test. However, there are situations where initial straining in the test environment should be avoided since initial "creep" can precipitate failure in softer regions of a weldment.

7.2.5 Continue testing until the specimen fails or until a predetermined time, agreed between the parties and of relevance to the intended application, has elapsed.

8 Assessment

8.1 The specimen shall be removed and examined for evidence of stress corrosion cracking as soon as possible after termination of the test.

8.2 Assessment of stress corrosion data for welded specimens is essentially the same as is recommended for parent metals (see ISO 7539 parts 2-7). Metallographic assessment, however, is more critical for welded joints and is usually necessary to determine the precise region of the weldment susceptible to cracking.

It is recommended that, where appropriate, the specimens are examined to determine:

a) time for visible cracks initiatition at a stated magnification;

b) presence or absence of cracks over a given time interval;

c) location of cracks (weld metal, weld junction, HAZ or parent metal);

d) microstructure of cracked area;

e) depth and number of cracks.

9 Test report

The test report shall include the following information:

a) full description of the parent metal, including the type of product, its size, form and section thickness, chemical composition, heat treatment, microstructural condition and strength level;

b) the welding procedure specification (see 6.1);

c) the orientation, type and size of test specimens, their location with respect to the parent product from which they were removed, machining processes and surface preparation;

d) details of any cracks or weld defects observed in any of the test specimens prior to the commencement of testing;

e) where monitored, the environmental conditions, including the initial solution composition, pH, degree of aeration (or concentration of other relevant gases), flow conditions, temperature and electrode potential. Specification of flow rate shall be in terms of approximate linear rate past the specimen if determined by the recirculation rate;

1) the reference electrode used and the potential in terms of a standard electrode (standard hydrogen electrode or saturated calomel electrode at 25 °C);

2) the starting procedure for the test; e.g., any change in initial electrode potential;

3) transients in the environment or in the loading (including test interruptions) during testing, noting the nature and durations;

f) the applied load, displacement or initial strain rate, where appropriate (depending on the type of specimen), the time to failure and the failure criterion;

g) methods used for detecting cracking;

h) location of cracks in specimens (weld metal, weld junction, HAZ or parent metal).

Annex A
(informative)

Terms and definitions which have not been internationally agreed

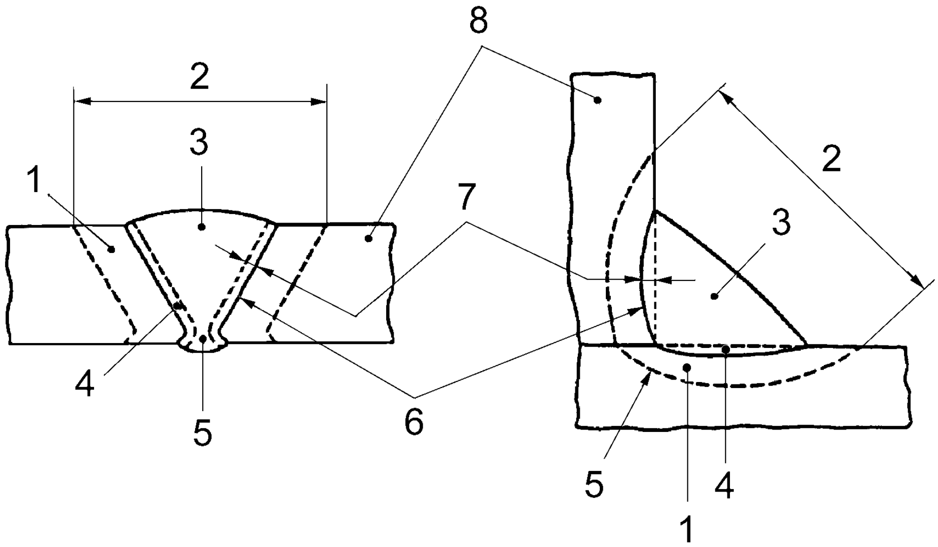
These are listed separately from those for which standardized definitions exist and are provided for information purposes only in the context of this part of ISO 7539 in order to facilitate its implementation by corrosion practitioners who are not experts in the field of welding. It is intended that these definitions be amended, if necessary, during future revisions of this part of ISO 7539 in order to harmonize them with standardized definitions as these become available.

A.1
weld
union of two pieces of metal made by welding

A.2
parent metal
base metal
metal to be joined or surfaced by welding, braze welding, brazing or surfacing

A.3
weld zone
weldment
zone containing the weld metal and heat-affected zone

See Figure A.1.



Key

1	Heat-affected zone	5	Root (of weld)
2	Weld zone	6	Weld junction
3	Weld metal	7	Fusion penetration
4	Fusion zone	8	Parent metal

Figure A.1 — Root, fusion penetration, weld junction and zones of typical welds

A.4
heat-affected zone
HAZ
part of the parent metal that is metallurgically affected by the heat of welding, or thermal cutting, but not melted

See Figure A.1.

A.5
welding procedure
specific course of action followed in welding including a list of materials and, where necessary, tools to be used

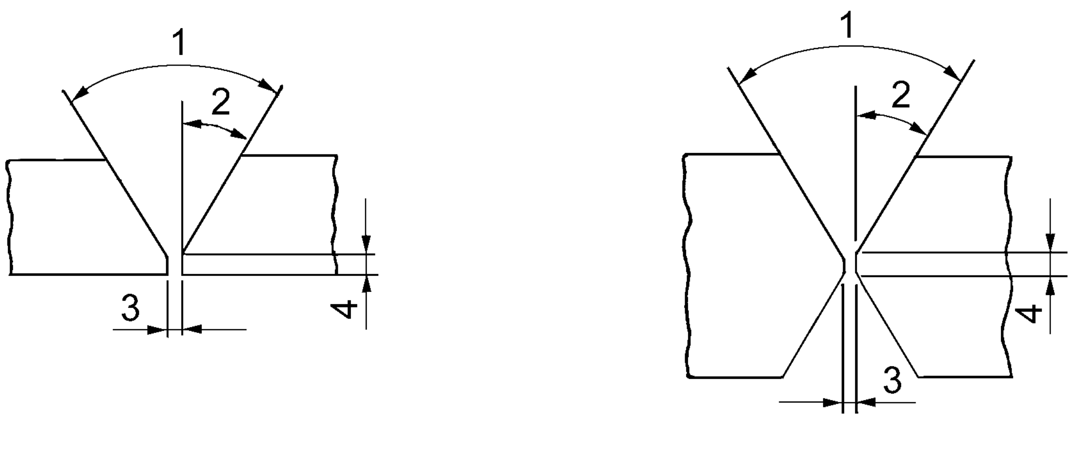
A.6
pass - as in **multi-pass weld**
run
metal melted or deposited during one passage of an electrode, torch or blow pipe

A.7
residual welding stresses
stress remaining in a metal part or structure as a result of welding

A.8
weld preparation
joint preparation
preparation for making a connection where the individual components, suitably prepared and assembled, are joined by welding or brazing

A.9
angle of bevel
angle of preparation
angle at which the edge of a component is prepared for making a weld

See Figure A.2.



Key

1 Included angle

2 Angle of bevel

3 Gap

4 Root face

Figure A.2 — Gap, root face, included angle and angle of bevel for typical weld preparations

A.10
lack of fusion
lack of union in a weld:

a) between weld metal and parent metal or

b) between parent metal and parent metal or

c) between weld metal and weld metal.

A.11
porosity
group of gas pores

A.12
solid-phase welding
pressure welding
welding process in which a weld is made by application of sufficient pressure to cause plastic flow of the surfaces, which may or may not be heated

A.13
gap
air gap
root gap
in fusion welding, the minimum distance at any cross-section between edges, ends or surfaces to be joined

A.14
root (of weld)
zone on the side of the first run farthest from the welder

See Figure A.1.

A.15
root face
portion of a fusion face at the root and that is not bevelled or grooved

See Figure A.2.

A.16
weld junction
weld interface
boundary between the fusion zone and the heat affected zone

A.17
weld metal
weld bead
all metal melted during the making of a weld and retained in the weld

See Figure A.1.

A.18
welding process
particular method of welding involving the application of certain metallurgical, electrical, physical, chemical or mechanical principles

A.19
crack
micro-cracking
linear discontinuity produced by fracture

NOTE Cracks may be longitudinal, transverse, edge, crater, centreline in form and in the fusion zone, underbead, weld metal or parent metal in location.

A.20
welding consumables
all materials used up during the making of a weld

A.21
travel speed
rate of travel
time required to complete a unit length of a single run of weld or melt run

A.22
welding current
current (excluding preheating current) used to bring the workpiece to, and maintain it at, welding temperature

A.23
gas shield
layer of gas surrounding the weld zone to facilitate the making of a weld

A.24
flux (type)
material used during welding, brazing or braze welding to clean the surfaces of the joint chemically, to prevent atmospheric oxidation and to reduce impurities

NOTE In arc welding, many other substances are added that perform special functions.

A.25
electrode positive
arc welding using direct current in which the electrode is connected to the positive pole of the supply

NOTE This has sometimes been known in British practice as “straight polarity” and in the U.S.A. as “reversed polarity”. For this reason, both these terms are deprecated.

A.26
electrode negative
arc welding using direct current in which the electrode is connected to the negative pole of the supply

NOTE This has sometimes been known in British practice as “reversed polarity” and in the U.S.A. as “straight polarity”. For this reason, both these terms are deprecated.

A.27
visible HAZ
in hardenable C-Mn steels, the area which has undergone transformation, either complete or partial, and is visible on a macroscopic scale on a polished and etched specimen

NOTE Steels which do not harden, e.g. austenitic stainless steels, do not have a discernible “visible” HAZ.

A.28
welding direction
direction in which the weld was made

NOTE In the context used, the actual direction in which the weld was made is not of major concern whereas the weld longitudinal axis is important.

A.29
weld geometry
profile of the weld

A.30
as-welded
condition of a weld without any subsequent treatment (e.g. either cleaning or heat treatment)

A.31
half-K or **K**
letter referring to the profile of the weld preparation prior to welding

NOTE The “V” preparation is easier to visualise, but the same principle applies.

A.32
post-weld heat treatment
thermal treatment applied to a welded component in order to improve mechanical and/or corrosion properties in the as-welded condition

A.33
arc energy
term designed to indicate the overall level of energy consumed when making a weld, expressed in Joules per minute and calculated as follows:

$$\frac{60IU}{v}$$

where

I is the current in amperes;

U is the potential difference in volts;

v is the travel speed in millimetres per minute.

A.34
interpass delay
duration between consecutive welding passes in a multipass weld

A.35
weld cap
region of a weld closest to the welder and usually the last welding pass to be made

Bibliography

[1] BS 499-1:1991, *Welding terms and symbols — Part 1: Glossary for welding, brazing and thermal cutting.*

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