

Code of practice for

Welding on steel pipes containing process fluids or their residuals

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Welding Standards Committee (WEE/-) to Technical Committee WEE/21, upon which the following bodies were represented:

- Associated Offices Technical Committee
- British Gas plc
- British Non-Ferrous Metals Federation
- British Steel Industry
- Electricity Supply Industry in England and Wales
- Engineering Equipment and Materials Users' Association
- Health and Safety Executive
- Heating and Ventilating Contractors' Association
- Institute of Refrigeration
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- Joint Industry Board for Plumbing Mechanical Engineering Services in England and Wales
- National Association of Plumbing, Heating and Mechanical Services Contractors
- Power Generation Association (BEAMA Ltd.)
- Stainless Steel Fabricators' Association of Great Britain
- Tubes Investments Limited
- United Kingdom Atomic Energy Authority
- Water Tube Boilermakers' Association
- Welding Institute
- Welding Manufacturers' Association (BEAMA Ltd.)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Association of Consulting Engineers
- British Institute of Non-destructive Testing
- Department of Energy (Petroleum Engineering Division)
- Institution of Production Engineers
- Pipeline Industries Guild
- United Kingdom Offshore Operators Association
- Water Research Centre

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Foreword

This British Standard Code of Practice has been prepared under the direction of the Welding Standards Committee. It is based on an up-dating of Draft for Development DD 39 which is withdrawn. It reflects the latest knowledge in the welding on steel pipelines and pipework which contain or have contained process fluids or the residuals of such process fluids, and covers welding operations where attachments are required and where it is not necessary or practical to decommission and/or decontaminate the system.

This method of attachment is sometimes, but incorrectly, termed “hot tapping”. Reference to current legislation is essential before any attempt to undertake work of this nature, and to follow the details of this code.

Since the preparation of DD 39 in 1974 considerable experience has been gained as the result of both on-shore and off-shore North Sea developments. To this knowledge has been added the expertise gained in the process plant field, resulting in an unified code which covers both spheres. Although new developments and refinements can be expected to emerge in the future, particularly with regard to off-shore exploration, the methods and recommendations in this code are considered to reflect up to date knowledge and sufficient experience of practical use to merit their adoption.

The up-dating has been extensive, covering practically every aspect of the technical changes in materials, welding technology and non-destructive testing.

The main purpose of this code is to give general details for welding, testing and acceptance criteria. Since the design, choice of materials and methods of construction are not covered by this code, reference should be made to the appropriate standards, such as CP 2010-2, BS 4515, BS 2633, BS 4677 and BS 8010-1.

To ensure that the workmanship and welding follow the details of this code, it would be normal for the contractor as well as the organization undertaking this specialist work to have and employ a suitable quality control system such as is recommended in BS EN ISO 9000.

Because of the wide range of pipelines and pipework and the products that can be conveyed and the range of attachments that may be required, general guidance has been given on some aspects. Specific details will be for agreement between the contracting parties after due consideration of the prevailing service conditions.

The techniques and equipment described herein require extensive facilities and specialist personnel and as such should not be attempted without such specialist equipment and personnel.

The use of the words “imperfection” or “flaw” or other phrases containing the words “imperfection” or “flaw” in this code is not intended to imply a defective condition or any lack of integrity of the weld as it is known that all welds contain certain features described as artefacts, flaws, imperfections or discontinuities. The acceptance criteria have been based on the present technical analysis of the various types, sizes, shapes and positions of these anomalies and on the suitability of the whole weld for its specific service.

Pipe dimensions. Unless otherwise qualified, for the purposes of this code nominal values of outside diameter and thickness of pipe apply.

It has been assumed in the drafting of this code that the execution of its provisions is entrusted to appropriately qualified and experienced people.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations. (See clause 4).

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This code covers operations relating to and involving arc welding on ferritic steel and austenitic stainless steel land or offshore pipelines and process plant pipework which contain or have contained a process fluid and which are at least 5 mm thick. It gives details of procedures prior to, during and after all these operations.

NOTE 1 Welding on pipes of thickness below 5 mm is not covered by this code although it can be undertaken.

The code covers manual, semi-automatic and mechanized arc welding by the following processes or combination of processes:

- a) manual metal-arc welding;
- b) MIG/MAG welding;
- c) TIG welding;
- d) flux cored arc welding;
- e) non-shielded welding.

It is essential that the items listed in clause 3 should be fully documented and followed.

Welding operations needing post-weld heat treatment for adequate weld quality are not within the scope of this code.

This code is not applicable to a pipeline or pipework that has been fully isolated and decontaminated or has not been commissioned. These are covered by other standards such as BS 2633, BS 4677 and BS 4515.

This code does not relate to a pipeline or pipework containing a process fluid or its residuals that will become explosively unstable upon the application of heat or will affect the pipe material by rendering it susceptible to ignition, stress corrosion cracking or embrittlement.

NOTE 2 The titles of the publications referred to in this code are listed on the inside back cover.

2 Definitions

For the purposes of this code the definitions given in BS 499-1 apply together with the following.

NOTE Terms marked with an asterisk (*) are taken from BS 499-1.

2.1

employer

the owner of the pipeline or pipework

NOTE The employer may act through a consultant, an inspector or other authorized representative.

2.2

contractor

the firm undertaking the contract and any subcontractors engaged in work covered by this code

2.3

inspector

the body, association or employee that ensures that the materials and construction are in accordance with this code

2.4

statutory authority

the body or organization that, through the power vested in it by Government Statute, regulates the requirements with which particular pipelines or pipework have to comply

NOTE One way in which such requirements may be promulgated is by making reference to British Standards.

2.5

joint

the completed weld joining two sections of pipe, a section of pipe to a fitting or two fittings

2.6

welding procedure*

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

2.7

welding procedure test

the making and testing of a welded joint, representative of that to be used on an actual job, in order to prove the feasibility of a welding procedure

NOTE This term is not usually applied to any tests that may have been made during the development of a welding procedure.

2.8

approved welding procedure

a documented welding procedure that has been approved by an inspecting authority either by means of a welding procedure test or as a result of authentic documented experience gained with the welding of joints similar to that to which the welding procedure applies

2.9

welder*

the operator who performs the welding

2.10

approved welder

a welder who has demonstrated his ability to produce welds meeting the details of this code

2.11

root run*

the first run deposited in the root of a multi-run weld

NOTE Also known as a "stringer bead" in vertical-down welding.

2.12**positional welding**

welding wherein the pipe or assembly is held stationary

2.13**semi-automatic welding***

welding in which some of the welding variables are automatically controlled, but manual guidance is necessary

2.14**mechanized welding***

welding in which the welding parameters are controlled mechanically or electronically and may be manually varied during welding to maintain the required welding conditions

3 Information, items to be approved and items to be agreed and to be documented

3.1 Information to be supplied by the employer

The following information to be supplied by the employer should be fully documented and followed.

- a) The location and identification of the pipeline or pipework.
- b) The type of process fluid and its temperature, pressure and flow rate. (See also 5.3 and 5.8.)
- c) The composition of the pipe material if known.
- d) The type of fitting to be used and its position on the pipe.

NOTE Typical fittings are shown in Figure 1.

- e) Whether batch testing of electrodes and filler metals is required (see 11.1).
- f) The interval before testing the test welds if other than 24 h [see 13.2 4) ii)].
- g) The period for which records of approved welding procedures should be kept (see 13.3).
- h) Whether prevailing weather conditions are such that welding is not to be carried out (see clause 23).

NOTE This information may not be able to be supplied until the appropriate stage of the work is reached.

- i) The methods of non-destructive testing (see 27.1, 27.3, 27.4 and 27.5) and the Examination Level to be used when ultrasonic examination in accordance with BS 3923-1 is to be applied (see 27.5).

NOTE The agreement of the statutory authority may also be required.

3.2 Items to be approved by the employer

The following items to be approved by the employer should be fully documented and followed.

- a) The minimum tensile strength of weld metal for fillet welds when this need not be as high as the minimum specified for the parent metal [see 11.1 b)].

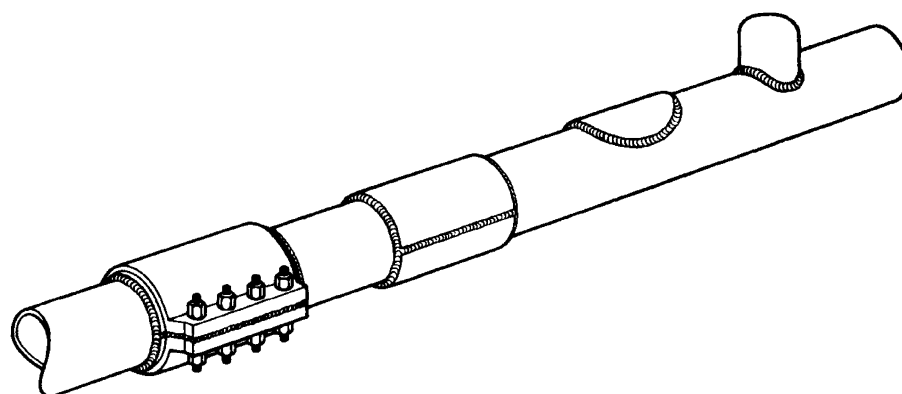
NOTE The agreement of the statutory authority may also be required.

- b) Electrodes and filler metals to be used (see 11.1).
- c) Documentation relating to welding procedure approval (see 13.3).
- d) Use of diameter and thickness grouping for welding procedure approval [see 13.4 b)].
- e) Use of a plate butt joint to simulate a longitudinal butt weld for welding procedure approval [see 13.4 c)].
- f) The welding procedure used for repairing defects in an encirclement fitting (see 18.1).
- g) The thermal cutting method for making large modifications to the radius of a set-on fitting (see 19.1).
- h) Repair or rejection of arc strikes (see clause 22).
- i) Non-destructive testing procedures (see 27.1).
- j) Inspection personnel (see 27.1).

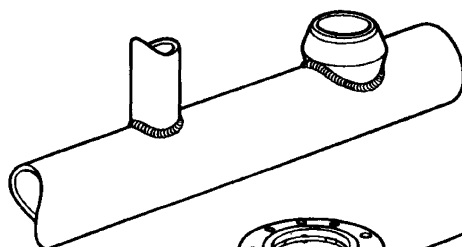
3.3 Items to be agreed

The following items to be agreed between the contracting parties should be fully documented and followed.

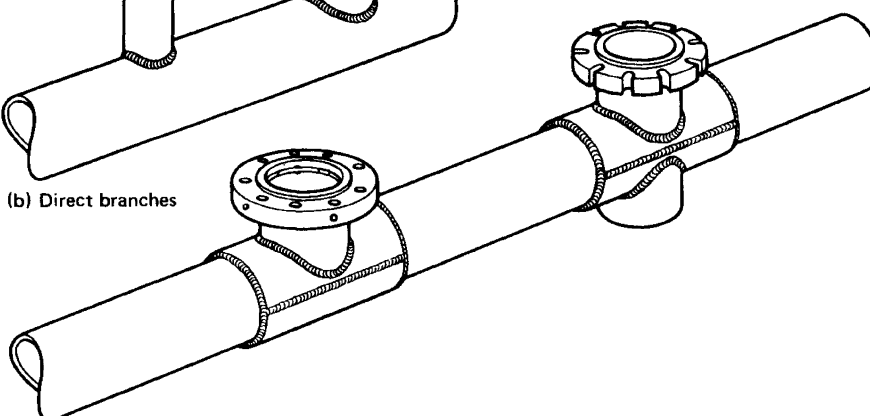
- a) The minimum pipe thickness on which welding is to be carried out when the conditions are other than those detailed in clause 7 (see clause 7).
- b) The specification of the material for a fitting (see clause 9).
- c) The definition of a batch when batch testing of electrodes and filler metals is required (see 11.1).



(a) Fittings for repair work



(b) Direct branches



(c) Full encirclement saddle tees
for hot-tapping work

Figure 1 — Typical fittings