

# Welding of Pipelines and Related Facilities

API STANDARD 1104  
NINETEENTH EDITION, SEPTEMBER 1997  
ERRATA 1, OCTOBER 31, 2001



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## Pipeline Segment

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## FOREWORD

This standard was prepared by a formulating committee that included representatives of the American Petroleum Institute, the American Gas Association, the Pipe Line Contractors Association, the American Welding Society, and the American Society for Nondestructive Testing, as well as representatives of pipe manufacturers and individuals associated with related industries.

The purpose of this standard is to present methods for the production of high-quality welds through the use of qualified welders using approved welding procedures, materials, and equipment. Its purpose is also to present inspection methods to ensure the proper analysis of welding quality through the use of qualified technicians and approved methods and equipment. It applies to both new construction and in-service welding.

The use of this standard is entirely voluntary and is intended to apply to welding of piping used in the compression, pumping, and transmission of crude petroleum, petroleum products, fuel gases, carbon dioxide, and nitrogen and, where applicable, to distribution systems.

This standard represents the combined efforts of many engineers who are responsible for the design, construction, and operation of oil and gas pipelines, and the committee appreciatively acknowledges their wholehearted and valuable assistance.

From time to time, revisions of this standard will be necessary to keep current with technological developments. The committee is always anxious to improve this standard and will give full consideration to all comments received.

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## CONTENTS

	Page
1 GENERAL.....	1
1.1 Scope.....	1
2 REFERENCED PUBLICATIONS.....	1
3 DEFINITION OF TERMS.....	2
3.1 General.....	2
3.2 Definitions.....	2
4 SPECIFICATIONS.....	2
4.1 Equipment.....	2
4.2 Materials.....	2
5 QUALIFICATION OF WELDING PROCEDURES FOR WELDS CONTAINING FILLER-METAL ADDITIVES.....	3
5.1 Procedure Qualification.....	3
5.2 Record.....	3
5.3 Procedure Specification.....	3
5.4 Essential Variables.....	6
5.5 Welding of Test Joints—Butt Welds.....	7
5.6 Testing of Welded Joints—Butt Welds.....	8
5.7 Welding of Test Joints—Fillet Welds.....	13
5.8 Testing of Welded Joints—Fillet Welds.....	15
6 QUALIFICATION OF WELDEES.....	15
6.1 General.....	15
6.2 Single Qualification.....	15
6.3 Multiple Qualification.....	16
6.4 Visual Examination.....	16
6.5 Destructive Testing.....	18
6.6 Radiography—Butt Welds Only.....	19
6.7 Retesting.....	19
6.8 Records.....	19
7 DESIGN AND PREPARATION OF A JOINT FOR PRODUCTION WELDING..	19
7.1 General.....	19
7.2 Alignment.....	19
7.3 Use of Lineup Clamp for Butt Welds.....	19
7.4 Bevel.....	19
7.5 Weather Conditions.....	19
7.6 Clearance.....	19
7.7 Cleaning Between Beads.....	20
7.8 Position Welding.....	20
7.9 Roll Welding.....	20
7.10 Identification of Welds.....	20
7.11 Pre- and Post-Heat Treatment.....	20
8 INSPECTION AND TESTING OF PRODUCTION WELDS.....	20
8.1 Rights of Inspection.....	20

	Page	
8.2	Methods of Inspection . . . . .	20
8.3	Qualification of Inspection Personnel . . . . .	20
8.4	Certification of Nondestructive Testing Personnel . . . . .	21
9	ACCEPTANCE STANDARDS FOR NONDESTRUCTIVE TESTING . . . . .	21
9.1	General . . . . .	21
9.2	Rights of Rejection . . . . .	21
9.3	Radiographic Testing . . . . .	21
9.4	Magnetic Particle Testing . . . . .	27
9.5	Liquid Penetrant Testing . . . . .	27
9.6	Ultrasonic Testing . . . . .	27
9.7	Visual Acceptance Standards for Undercutting . . . . .	28
10	REPAIR AND REMOVAL OF DEFECTS . . . . .	29
10.1	Authorization for Repair . . . . .	29
10.2	Repair Procedure . . . . .	29
10.3	Acceptance Criteria . . . . .	29
10.4	Supervision . . . . .	29
10.5	Welder . . . . .	29
11	PROCEDURES FOR NONDESTRUCTIVE TESTING . . . . .	29
11.1	Radiographic Test Methods . . . . .	29
11.2	Magnetic Particle Test Method . . . . .	34
11.3	Liquid Penetrant Test Method . . . . .	34
11.4	Ultrasonic Test Methods . . . . .	34
12	AUTOMATIC WELDING . . . . .	37
12.1	Acceptable Processes . . . . .	37
12.2	Procedure Qualification . . . . .	38
12.3	Record . . . . .	38
12.4	Procedure Specification . . . . .	38
12.5	Essential Variables . . . . .	39
12.6	Qualification of Welding Equipment and Operators . . . . .	40
12.7	Records of Qualified Operators . . . . .	40
12.8	Inspection and Testing of Production Welds . . . . .	40
12.9	Acceptance Standards for Nondestructive Testing . . . . .	40
12.10	Repair and Removal of Defects . . . . .	40
12.11	Radiographic Testing . . . . .	40
13	AUTOMATIC WELDING WITHOUT FILLER-METAL ADDITIONS . . . . .	40
13.1	Acceptable Processes . . . . .	40
13.2	Procedure Qualification . . . . .	40
13.3	Record . . . . .	46
13.4	Procedure Specification . . . . .	46
13.5	Essential Variables . . . . .	46
13.6	Qualification of Equipment and Operators . . . . .	46
13.7	Records of Qualified Operators . . . . .	46
13.8	Quality Assurance of Production Welds . . . . .	46
13.9	Acceptance Standards for Nondestructive Testing . . . . .	47
13.10	Repair and Removal of Defects . . . . .	47
13.11	Radiographic Procedure . . . . .	47

APPENDIX A	ALTERNATIVE ACCEPTANCE STANDARDS FOR	
	GIRTH WELDS . . . . .	49
A.1	General . . . . .	49
A.2	Additional Requirements for Stress Analysis . . . . .	49
A.3	Welding Procedure . . . . .	50
A.4	Qualification of Welders . . . . .	54
A.5	Inspection and Acceptable Limits . . . . .	54
A.6	Record . . . . .	55
A.7	Example . . . . .	55
A.8	Repairs . . . . .	59
A.9	Nomenclature . . . . .	59
APPENDIX B	IN-SERVICE WELDING . . . . .	61
B.1	General . . . . .	61
B.2	Qualification of In-Service Welding Procedures . . . . .	62
B.3	In-Service Welder Qualification . . . . .	63
B.4	Suggested In-Service Welding Practices . . . . .	64
B.5	Inspection and Testing of In-Service Welds . . . . .	67
B.6	Standards of Acceptability: Nondestructive Testing (Including Visual) . . . . .	67
B.7	Repair and Removal of Defects . . . . .	67

#### Figures

1	Sample Procedure Specification Form . . . . .	4
2	Sample Coupon Test Report . . . . .	5
3	Location of Test Butt-Weld Specimen for Procedure Qualification Test . . . . .	9
4	Tensile-Strength Test Specimen . . . . .	10
5	Nick-Break Test Specimen . . . . .	10
6	Root- and Face-Bend Test Specimen, Wall Thicknesses Less Than or Equal to 0.500 in. (12.7 mm) . . . . .	11
7	Side-Bend Test Specimen, Wall Thicknesses Greater than 0.500 in. (12.7 mm) . . . . .	12
8	Dimensioning of Imperfections in Exposed Weld Surfaces . . . . .	12
9	Jig for Guided Bend Tests . . . . .	13
10	Location of Nick-Break Test Specimens: Fillet-Weld Procedure and Welder Qualification Test Welds . . . . .	14
11	Location of Nick-Break Test Specimens: Fillet-Weld Procedure and Welder Qualification Test Welds, Including Size-to-Size, Branch-Connection Welder Qualification Test . . . . .	14
12	Location of Test Butt-Weld Specimens for Welder Qualification Test . . . . .	17
13	Inadequate Penetration Without High-Low (IP) . . . . .	21
14	Inadequate Penetration Due to High-Low (IPD) . . . . .	23
15	Inadequate Cross Penetration (ICP) . . . . .	23
16	Incomplete Fusion at Root of Bead or Top of Joint (IF) . . . . .	23
17	Incomplete Fusion Due to Cold Lap (IFD) . . . . .	23
18	Internal Concavity (IC) . . . . .	23
19	Maximum Distribution of Gas Pockets: Wall Thicknesses Less Than or Equal to 0.500 in. (12.7 mm) . . . . .	25
20	Maximum Distribution of Gas Pockets: Wall Thicknesses Greater Than 0.500 in. (12.7 mm) . . . . .	26
21	Standard Penetrameter . . . . .	32
22A	Reference Block for Manual UT . . . . .	36
22B	Establishing Distance, Refracted Angle, and Velocity . . . . .	37

	Page	
22C	Transfer Procedure . . . . .	37
23	Location of Test Butt-Weld Specimens for Flash-Weld Procedure Qualification Test: Outside Diameter Greater Than 18 in. (457 mm) but Less Than or Equal to 24 in. (610 mm) . . . . .	42
24	Location of Test Butt-Weld Specimens for Flash-Weld Procedure Qualification Test: Outside Diameter Greater Than 24 in. (610 mm) but Less Than or Equal to 30 in. (762 mm) . . . . .	43
25	Location of Test Butt-Weld Specimens for Flash-Weld Procedure Qualification Test: Outside Diameter Greater Than 30 in. (762 mm) . . . . .	44
26	Two-Inch Nick-Break Test Specimen . . . . .	45
A-1	Location of CTOD Test Specimens . . . . .	51
A-2	Machining Objective for CTOD Test Specimen With Respect to Pipe Wall . . . . .	52
A-3	Location of Notch for Weld-Metal Specimen . . . . .	52
A-4	Location of Notch for Heat-Affected Zone Specimen . . . . .	52
A-5	Alternative Acceptance Criteria for Circumferential Planar Imperfection . . . . .	53
A-6	Criteria for Evaluation of Imperfection Interaction . . . . .	56
A-7	Length Limit for Deep Imperfections in Heavy-Wall Pipe . . . . .	58
A-8	Nomenclature for Dimensions of Surface and Buried Imperfections . . . . .	59
B-1	Examples of Typical Temper-Bead Deposition Sequences . . . . .	61
B-2	Suggested Procedure and Welder Qualification Test Assembly . . . . .	64
B-3	Location of Test Specimens—In-Service Welding Procedure Qualification Test . . . . .	65
B-4	Macro Test Specimen—In-Service Weld . . . . .	66
B-5	Face-Bend Test Specimen . . . . .	66
B-6	Reinforcing Pad . . . . .	67
B-7	Reinforcing Saddle . . . . .	68
B-8	Encirclement Sleeve . . . . .	68
B-9	Encirclement Tee . . . . .	69
B-10	Encirclement Sleeve and Saddle . . . . .	69
B-11	Encirclement Saddle . . . . .	70

Tables

1	Filler Metal Group . . . . .	7
2	Type and Number of Test Specimens for Procedure Qualification Test . . . . .	8
3	Type and Number of Butt-Weld Test Specimens per Welder for Welder Qualification Test and Destructive Testing of Production Welds . . . . .	18
4	Maximum Dimensions of Undercutting . . . . .	29
5	Thickness of Pipe Versus Thickness of ASTM E 1025 Penetrameter . . . . .	31
6	Thickness of Pipe Versus Thickness of Penetrameter . . . . .	32
7	Thickness of Pipe Versus Diameter of ASTM E 747 Wire Penetrameter . . . . .	32
8	Type and Number of Test Specimens for Procedure Qualification Test (Flash Weld Only) . . . . .	41
A-1	Acceptance Limits for Buried Volumetric Imperfections . . . . .	54
A-2	Acceptance Limits for Unrepaired Arc Burns . . . . .	55
A-3	Imperfection Length Limits . . . . .	57
A-4	Allowable Imperfection Dimensions for Example . . . . .	58
A-5	Acceptable Planar Imperfection Dimensions for Example . . . . .	58
A-6	Example Alternative Acceptance Criteria . . . . .	59
B-1	Type and Number of Specimens—In-Service Welding Procedure Qualification Test . . . . .	65

# Welding of Pipelines and Related Facilities

## 1 General

### 1.1 SCOPE

This standard covers the gas and arc welding of butt, fillet, and socket welds in carbon and low-alloy steel piping used in the compression, pumping, and transmission of crude petroleum, petroleum products, fuel gases, carbon dioxide, and nitrogen and, where applicable, covers welding on distribution systems. It applies to both new construction and in-service welding. The welding may be done by a shielded metal-arc welding, submerged arc welding, gas tungsten-arc welding, gas metal-arc welding, flux-cored arc welding, plasma arc welding, oxyacetylene welding, or flash butt welding process or by a combination of these processes using a manual, semi-automatic, or automatic welding technique or a combination of these techniques. The welds may be produced by position or roll welding or by a combination of position and roll welding.

This standard also covers the procedures for radiographic, magnetic particle, liquid penetrant, and ultrasonic testing as well as the acceptance standards to be applied to production welds tested to destruction or inspected by radiographic, magnetic particle, liquid penetrant, ultrasonic, and visual testing methods.

The values stated in either inch-pound units or SI units are to be regarded separately as standard. Each system is to be used independently of the other, without combining values in any way.

Processes other than those described above will be considered for inclusion in this standard. Persons who wish to have other processes included shall submit, as a minimum, the following information for the committee's consideration:

- a. A description of the welding process.
- b. A proposal on the essential variables.
- c. A welding procedure specification.
- d. Weld inspection methods.
- e. Types of weld imperfections and their proposed acceptance limits.
- f. Repair procedures.

It is intended that all work performed in accordance with this standard shall meet or exceed the requirements of this standard.

## 2 Referenced Publications

The following standards, codes, and specifications are cited in this standard:

API

Spec 5L      *Specification for Line Pipe*

ASNT<sup>1</sup>

RP SNT-TC-1A *Personnel Qualification and Certification in Nondestructive Testing*

ACCP      *ASNT Central Certification Program*

ASTM<sup>2</sup>

E 164      *Standard Practice for Ultrasonic Contact Examination of Weldments*

E 165      *Standard Test for Liquid Penetrant Examination*

E 709      *Standard Guide for Magnetic Particle Examination*

E 747      *Standard Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology*

E 1025      *Standard Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology*

AWS<sup>3</sup>

A3.0      *Welding, Terms and Definitions*

A5.1      *Covered Carbon Steel Arc Welding Electrodes*

A5.2      *Iron and Steel Oxyfuel Gas Welding Rods*

A5.5      *Low Alloy Steel Covered Arc Welding Electrodes*

A5.17      *Carbon Steel Electrodes and Fluxes for Submerged Arc Welding*

A5.18      *Carbon Steel Filler Metals for Gas Shielded Arc Welding*

A5.20      *Carbon Steel Electrodes for Flux Cored Arc Welding*

A5.28      *Low Alloy Steel Filler Metals for Gas Shielded Arc Welding*

A5.29      *Low Alloy Steel Electrodes for Flux Cored Arc Welding*

BSI<sup>4</sup>

BS 7448: Part 2 *Fracture Mechanics Toughness Tests Part 2, Method for Determination of  $K_{Ic}$  Critical CTOD and Critical J Values of Welds in Metallic Materials*

<sup>1</sup>American Society for Nondestructive Testing, Inc., 1711 Arlingate Lane, P.O. Box 28518, Columbus, Ohio 43228-0518.

<sup>2</sup>American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.

<sup>3</sup>American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126.

<sup>4</sup>British Standards Institution, British Standards House, 389 Chiswick High Road, London, W4 4AL, United Kingdom.