

ANSI/AWS A9.1-92
An American National Standard

**Standard Guide
for Describing Arc Welds in
Computerized Material Property
and Nondestructive Examination
Databases**



American Welding Society

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Standard Guide for Describing Arc Welds in Computerized Material Property and Nondestructive Examination Databases

Prepared by
AWS Committee on Computerization of
Welding Information

Under the Direction of
AWS Technical Activities Committee

Approved by
AWS Board of Directors

Abstract

This standard guide provides a format for the fields and types of data that uniquely define an arc weld in a weld property database.



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Foreword

(This Foreword is not a part of ANSI/AWS A9.1-92, *Standard Guide for Describing Arc Welds in Computerized Material Property and Nondestructive Examination Databases*, but is included for information purposes only.)

This guide was developed in cooperation with ASTM Committee E 49 on Computerization of Material Property Data. As such, its form is similar to standards which they have developed in other materials areas. Information for arc welds is divided into two parts, one for weld identification and one for weld properties and nondestructive examination data. This standard includes information relating to the identification part. AWS A9.2 contains the weld property and nondestructive examination data.

The Committee on Computerization of Welding Information became an official AWS Committee in April 1989. This is the first standard that it has developed.

Comments and suggestions for improvement are welcome and should be sent to the Secretary, Committee on Computerization of Welding Information, American Welding Society, 550 N.W. LeJeune Road, P.O. Box 351040, Miami, Florida, 33135.

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Standard Guide for Describing Arc Welds in Computerized Material Property and Nondestructive Examination Databases

1. Scope, Purpose and Application

1.1 Scope. This document describes the data fields which are considered necessary to uniquely define an arc weld. It is a framework that can be used for recording data that is included in a Procedure Qualification Record (PQR).

1.2 Purpose. This document facilitates search strategies and reliable comparisons in computerized weld databases. The preparation of a Welding Procedure Specification (WPS) is facilitated by having Procedure Qualification Record (PQR) data in convenient formats.

1.3 Application. This document is limited to arc welding as defined in ANSI/AWS A3.0, *Standard Welding Terms and Definitions*.

2. Applicable Documents

2.1 AWS Standards

- (1) Metric Practice Guide for the Welding Industry—A1.1
- (2) Standard Welding Terms and Definitions—A3.0
- (3) Filler Metal Specifications—A5.1 to A5.30
- (4) Standard Guide for Recording Arc Weld Material Property Data in Computerized Databases—A9.2
- (5) Standard Methods for Mechanical Testing of Welds—B4.0

2.2 ASTM Standards

- (1) E 527 Practice for Numbering Metals and Alloys (UNS)

- (2) E 1313 Standard Guide for Development of Standard Data Records for Computerization of Materials Property Data

- (3) E 1338 Standard Guide for the Identification of Metals and Alloys in Computerized Material Property Databases

- (4) E 1443 Definitions of Terms Relating to Building and Accessing Materials Databases

3. Significance and Use

3.1 This document describes the data fields which uniquely define an arc weld. A separate document (ANSI/AWS A9.2) has been developed to describe the data categories and elements that define the weld material properties and nondestructive examination. Together, these documents will provide a mechanism to accurately and precisely store weld data for later computerized searches or comparisons.

3.2 For effective manipulation by any possible search strategy, all possible data elements should be collected and stored. Supplementary fields (for example, comments, other information) are available to store any data that do not seem to fit a particular category but provide important information.

3.3 A weldment is an assembly whose component parts are joined by welding. Weldments consist of a base metal, a fused region (weld), perhaps one or more additional base metals (identical to or different from the first), and perhaps backing. A portion of the base metal

adjacent to the weld is affected by the heat of welding and is known as the heat-affected zone (HAZ). To completely define these aspects of the weld, this document includes information to identify the base metals, the weld metal(s), if utilized, and a list of the various parameters that produced the arc weld and the HAZ.

3.4 The completeness of any database depends on its specific purpose. A single organization may include substantial detail in its database. Less detail may be included in a common database used by several organizations because of commercial and other considerations. However, comparisons of property data from multiple sources will be expedited if all the information in the guidelines is present.

3.5 These guidelines and data format were designed for use in computerized material property databases. Utilization of the guidelines and data format will be most direct for computerized databases, but the guidelines and data format are equally valid for other situations where the identification of a metal is desired.

4. Definitions

4.1 Data Element (Data Item). One individual piece of information used in describing a material or the welding parameters. For example, A 516, 25 V, etc.

4.2 Field (Data Field). Space in layout of information for an individual data element or item.

4.3 Record. The collection of data elements used to describe the weld in its entirety; all the data associated with one weld.

5. Weld Identification Data

This weld information section contains a list of the fields that should be considered for a welding database,

the format or units for the data, examples of where information might fit best, and the types of unusual information that should be placed into a category such as "other information." Use this section for reference when designing a database or determining how to enter information. Tables 1 and 2 list the closed set of choices for the type of weld and welding process.

Table 1
Types of Arc Welds

Groove
Fillet
Plug
Slot
Spot
Seam
Flange
Stud
Surfacing

Table 2
Arc Welding Processes

electrode gas welding	EGW
flux cored arc welding	FCAW
gas metal arc welding	GMAW
— pulsed arc	GMAW-P
— short circuiting arc	GMAW-S
gas tungsten arc welding	GTAW
— pulsed arc	GTAW-P
plasma arc welding	PAW
shielded metal arc welding	SMAW
stud arc welding	SW
submerged arc welding	SAW
— series	SAW-S

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.1 Material Information		
5.1.1 First Base Metal		
5.1.1.1 Specification Organization	string	ASTM
5.1.1.2 Specification Number	string	A 516
5.1.1.3 Specification Version	string	1985
5.1.1.4 Specification Designation	string	Grade 70
5.1.1.5 UNS Number	string	K02700
5.1.1.6 CAS Number	string	
5.1.1.7 Common Name	string	
5.1.1.8 Manufacturer/Supplier	string	
5.1.1.9 Heat/Lot Identification	string	
5.1.1.10 Composition (repeat as many times as necessary)		
5.1.1.10.1 Elemental Symbol	string	Mn
5.1.1.10.2 Measured Weight Percent	percent	1.02
5.1.1.10.3 Method of Analysis	string	Optical Emission Spectroscopy
5.1.1.11 Material Condition		
5.1.1.11.1 Manufacturing History	string	cold worked, normalized, annealed
5.1.1.11.2 Service History	string	sour crude
5.1.1.12 Product Form	string	plate, pipe
5.1.1.13 Thickness (wall thickness for pipe)	mm (in.)	
5.1.1.14 Diameter (for tubular sections)	mm (in.)	
5.1.2 Second Base Metal (if same as 5.1.1, leave blank)		
5.1.2.1 Specification Organization	string	ASTM
5.1.2.2 Specification Number	string	A 516
5.1.2.3 Specification Version	string	1985
5.1.2.4 Specification Designation	string	Grade 70
5.1.2.5 UNS Number	string	K02700
5.1.2.6 CAS Number	string	
5.1.2.7 Common Name	string	
5.1.2.8 Manufacturer/Supplier	string	
5.1.2.9 Heat/Lot Identification	string	
5.1.2.10 Composition (repeat as many times as necessary)		
5.1.2.10.1 Elemental Symbol	string	Mn

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.1.2.10.2 Measured Weight Percent	percent	1.02
5.1.2.10.3 Method of Analysis	string	Optical Emission Spectroscopy
5.1.2.11 Material Condition		
5.1.2.11.1 Manufacturing History	string	cold worked, normalized, annealed
5.1.2.11.2 Service History	string	
5.1.2.12 Product Form	string	plate, pipe
5.1.2.13 Thickness (wall thickness for pipe)	mm (in.)	
5.1.2.14 Diameter (for tubular sections)	mm (in.)	
5.1.3 Backing		
5.1.3.1 Specification Organization	string	ASTM
5.1.3.2 Specification Number	string	A 516
5.1.3.3 Specification Version	string	1985
5.1.3.4 Specification Designation	string	Grade 70
5.1.3.5 UNS Number	string	K02700
5.1.3.6 CAS Number	string	
5.1.3.7 Common Name	string	
5.1.3.8 Manufacturer/Supplier	string	
5.1.3.9 Heat/Lot Identification	string	
5.1.3.10 Composition (repeat as many times as necessary)		
5.1.3.10.1 Elemental Symbol	string	Mn
5.1.3.10.2 Measured Weight Percent	percent	1.02
5.1.3.10.3 Method of Analysis	string	Optical Emission Spectroscopy
5.1.3.11 Material Condition		
5.1.3.11.1 Manufacturing History	string	cold worked, normalized, annealed
5.1.3.11.2 Service History	string	
5.1.3.12 Product Form	string	bar, pipe
5.1.3.13 Thickness (wall thickness for pipe)	mm (in.)	
5.1.3.14 Width	mm (in.)	
5.1.4 Filler Metal (if more than one filler material, repeat the list below as many times as necessary)		
5.1.4.1 Specification Organization	string	AWS
5.1.4.2 Specification Number	string	A5.1

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.1.4.3 Specification Version	string	1991
5.1.4.4 Classification	string	E7018
5.1.4.5 UNS Number	string	W07018
5.1.4.6 CAS Number	string	
5.1.4.7 Common Name (trade name)	string	
5.1.4.8 Manufacturer/Supplier	string	
5.1.4.9 Heat/Lot Identification	string	
5.1.4.10 Date of Receipt of Material	YYYYMMDD	19920731
5.1.4.11 Composition (repeat as many times as necessary)		
5.1.4.11.1 Elemental Symbol	string	Mn
5.1.4.11.2 Measured Weight Percent	percent	1.02
5.1.4.11.3 Method of Analysis		Optical Emission Spectroscopy
5.1.4.12 Product Form	string	rod, wire, strip
Dimensions	mm (in.)	
5.1.4.13 Other Information	string	slag system, copper coating, prebaking conditions
5.1.5 Flux		
5.1.5.1 Specification Organization	string	AWS
5.1.5.2 Specification Number	string	A5.23
5.1.5.3 Specification Version	string	1990
5.1.5.4 Specification Title	string	
5.1.5.5 Particle Size	string	20x200
5.1.5.6 CAS Number	string	
5.1.5.7 Common Name/Type (trade name/type)	string	
5.1.5.8 Manufacturer/Supplier	string	
5.1.5.9 Heat/Lot Identification	string	
5.1.5.10 Date of Receipt of Material	YYYYMMDD	19920731
5.1.5.11 Composition (repeat as many times as necessary)		
5.1.5.11.1 Element/Compound Symbol	string	SiO ₂
5.1.5.11.2 Measured Weight Percent	percent	12
5.1.5.11.3 Method of Analysis	string	Optical Emission Spectroscopy

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.1.6 Additive (alloying materials etc.)		
5.1.6.1 Type	string	iron powder
5.1.6.2 Amount	string	10% by weight
5.1.6.3 Placement	string	
5.1.7 Gases (repeat as many times as necessary)		
5.1.7.1 Specification Organization	string	MIL
5.1.7.2 Specification Number	string	A-18455C
5.1.7.3 Specification Version	string	1986
5.1.7.4 Specification Title	string	
5.1.7.5 CAS Number	string	
5.1.7.6 Common Name/Type	string	Ar/2%O ₂
5.1.7.7 Manufacturer/Supplier	string	
5.1.7.8 Heat/Lot Identification	string	
5.1.7.9 Date of Receipt of Material	YYYYMMDD	19920731
5.1.7.10 Composition (repeat as many times as necessary)		
5.1.7.10.1 Elemental Symbol	string	O ₂
5.1.7.10.2 Measured Weight Percent	percent	2
5.1.7.10.3 Method of Analysis	string	chromatograph
5.1.7.11 Dew Point	°C (°F)	
5.1.7.12 Gas Nozzle Inside Diameter	mm (in.)	
5.1.7.13 Gas Nozzle Flow Rate	L/min (ft ³ /hr)	
5.1.7.14 Root Shielding (Back Side) Flow Rate	L/min (ft ³ /hr)	
5.1.7.15 Trailing Gas Shield Flow Rate	L/min (ft ³ /hr)	
5.1.7.16 Plasma Orifice Gas Flow	L/min (ft ³ /hr)	
5.1.7.17 Other Information (orifice diameter or details for PAW orifices)		
5.1.8 Tungsten Electrode		
5.1.8.1 Specification Organization	string	AWS
5.1.8.2 Specification Number	string	A5.12
5.1.8.3 Specification Version	string	1992
5.1.8.4 Classification	string	EWTh-2
5.1.8.5 UNS Number	string	
5.1.8.6 CAS Number	string	
5.1.8.7 Common Name/Type	string	W/2% Th

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.1.8.8 Manufacturer/Supplier	string	
5.1.8.9 Heat/Lot Identification	string	
5.1.8.10 Diameter	mm (in.)	
5.1.8.11 Electrode Tip Geometry	string	30° angle
5.1.9 Comments (material and consumables)		
5.2 Welding Procedure		
5.2.1 Applicable Standard		
5.2.1.1 Specification Organization	string	AWS
5.2.1.2 Specification Number	string	D1.1
5.2.1.3 Specification Version	string	1990
5.2.1.4 Specification Title	string	Structural Welding Code—Steel
5.2.2 Joint		
5.2.2.1 Joint Type	string	butt, lap
5.2.2.2 Joint Preparation Techniques	string	oxyfuel gas cutting, sawing, plasma arc cutting
5.2.2.3 Groove Type	string	single V
5.2.2.4 Surface Preparation Techniques	string	wire brushing, chemical cleaning
5.2.2.5 Backing Placement	string	
5.2.2.6 Back Gouging	string	arc gouging to sound metal
5.2.2.7 Other Information (dimensions, tolerances, reinforcement)		
5.2.3 Weld Type	string	See Table 1, Page 2.
5.2.4 Welding Process (repeat as many times as necessary)	string	See Table 2, Page 2.
5.2.4.1 Method of Application	Choose from: AD for Adaptive Control AU for Automatic MA for manual ME for machine RO for Robotic SA for semiautomatic	
5.2.5 Setup		
5.2.5.1 Contact Tip to Work Distance	mm (in.)	
5.2.5.2 Electrode Extension	mm (in.)	
5.2.5.3 Travel Speed	mm/s (in./min)	

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.2.5.4 Oscillation Method	string	manual
5.2.5.5 Oscillation Width	mm (in.)	
5.2.5.6 Pass/Layer Sequence (and limits)	string	
5.2.5.7 Peening	string	
5.2.5.8 Interpass Cleaning Techniques	string	wire brushing, chipping
5.2.5.9 Other Information (multiple electrodes, hot or cold wire feed, tacking, electrode extension/set back)	string	
5.2.6 Orientation		
5.2.6.1 Weld Position (orientation of joint)	string	3G
5.2.6.2 Welding Progression	string	vertical up or down
5.2.6.3 Travel Angle	string	10° trailing
5.2.6.4 Work Angle	string	
5.2.6.5 Other Information	string	
5.2.7 Welding Thermal Cycle		
5.2.7.1 Preheat Temperature	°C (°F)	
5.2.7.2 Preheat Maintenance (temperature kept above minimum during duration of welding)	string	yes or no
5.2.7.3 Interpass Temperature, Maximum	°C (°F)	
5.2.7.4 Postheat Temperature (for example, promote hydrogen outgassing)	°C (°F)	
5.2.7.5 Postheat Time		
5.2.7.6 Other Procedure Details		
5.2.8 Postweld Heat Treatment		
5.2.8.1 Heating Rate	°C/hr (°F/hr)	
5.2.8.2 Holding Temperature Range	°C (°F)	
5.2.8.3 Holding Time	hr	
5.2.8.4 Cooling Procedure (cooling rate or quench procedure)	string	
5.2.8.5 Other Procedure Details (for example, step cooling procedure, furnace type, atmosphere)	string	
5.2.9 Electrical Characteristics (repeat for multiple power sources and for change as the weld progresses)		
5.2.9.1 Manufacturer/Supplier	string	
5.2.9.2 Common Name	string	
5.2.9.3 Current Type	string	dc, ac

<u>Field Name</u>	<u>Field Type Values or Units</u>	<u>Examples</u>
5.2.9.4 Polarity	string	ep, en
5.2.9.5 Welding Current (rms)	A	
5.2.9.6 Wire Feed Speed	mm/s (in./min.)	
5.2.9.7 Welding Voltage	V	
5.2.9.8 Comments (for example, pulsed power parameters, machine settings, and conditions for parameter changes)	string	
5.2.10 Weld Metal		
5.2.10.1 Composition (in actual weld, including dilution) (repeat as many times as necessary)		
5.2.10.1.1 Elemental Symbol	string	Mn
5.2.10.1.2 Measured Weight Percent	wt. %	0.85
5.2.10.1.3 Method of Analysis		Optical Emission Spectroscopy
5.2.10.2 Other Information (for example, FN)	string	3.5 FN by WRC
5.3 Laboratory Testing Information		
5.3.1 Weld Identification Number	string	
5.3.2 Laboratory Which Performed Test	string	
5.3.2.1 Laboratory PQR Identification	string	
5.3.2.2 Date of Completion	YYYYMMDD	19920731
5.3.3 Comments (general)		